2020 Ambient Air Quality Monitoring 5 – Year Network Assessment For Mecklenburg County Air Quality

Land Use and Environmental Services Agency
Air Quality
2145 Suttle Ave, Charlotte NC 28208
Phone 704-336-5430 • Fax 704-336-4391
July 1, 2020

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CERTIFICATION

By the signatures below, Mecklenburg County Air Quality (MCAQ) certifies that the information contained in the "Ambient Air Quality Monitoring 5 – Year Network Assessment for Mecklenburg County Air Quality" is complete and accurate, to the best of MCAQ's knowledge at the time of submittal to EPA Region 4. The assessment is submitted to comply with the requirements of 40 CFR 58.10(d). Due to unforeseen circumstances or the need for adjustments to the monitoring network that may arise during the sampling year, some network information may change. Changes will be updated in the annual network plan.

Print Name: Jeff Francis Signature: Jeff Francis Date: 06/26/2020

Air Quality Monitoring Manager, MCAQ

Print Name: Leslie Rhodes Signature: Leslie D. Rhodes Date: 06/26/2020

Director, MCAQ

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Summary of Findings

Ambient Air Quality Monitoring 5 – Year Network Assessment
For Mecklenburg County Air Quality

- **Ozone** – The MCAQ monitoring stations (37-119-0041 and 37-119-0046) meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The two stations operated by MCAQ meet the minimum requirements for ozone monitoring stations in the MSA.

  There is a total of 7 stations operated in the Charlotte-Concord-Gastonia, NC-SC MSA. The North Carolina Division of Air Quality (NCDAQ) operates 3 stations in the MSA: one each in Rowan, Lincoln and Union counties. South Carolina Department of Health and Environmental Control (SCDHEC) operates 1 station in York County, SC in the MSA. Catawba Indian Nation also operates 1 station in York County, SC in the MSA.

- **$PM_{2.5}$** - The network assessment indicates that 3 of the currently operating stations (37-119-0041, 37-119-0045 and 37-119-0048) should be maintained. The $PM_{2.5}$ monitoring network operated by MCAQ meets the monitoring objectives defined in 40 CFR 58 Appendix D.

- **Carbon Monoxide** - The network assessment indicates the network should be maintained in its current configuration. MCAQ operates two sites that meet the requirements of 40 CFR 58, Appendix D, one near-road CO station (37-119-0045) and one area-wide site (NCore-37-119-0041).

- **Sulfur Dioxide** – The current SO_2 NAAQS (June 2, 2010) requires one site in the CBSA. MCAQ operates one (1) NCore site, which meets the requirement. SCDHEC operates an additional SO_2 site at the York Landfill (45-091-0008) in York County, SC. This site has been placed on a rotation schedule. It will run for 2 years from January 1, 2020-December 31, 2021. Then it will be taken out of rotation for 2 years.

- **Nitrogen Dioxide** – MCAQ currently operates two NO_2 sites, one near-road NO_2 station (37-119-0045) and one area-wide site (NCore-37-119-0041). The 2019 U.S. Census population estimate for the CBSA is 2,636,883. The maximum AADT measured in the CBSA by the North Carolina Department of Transportation (NCDOT) for 2018 is 180,000 AADT. Based on the population information and the maximum AADT, the requirements of 40 CFR 58 Appendix D §4.3.2-4.3.3 specify a monitoring network consisting of two (2) near-road NO_2 monitoring station and one (1) area-wide monitoring station. MCAQ will work with the EPA to determine the optimal location and timing for establishment of an additional near-road NO_2 site in Mecklenburg County. As of the submission date of the 2020 5-year Assessment, EPA has not provided funding for operations, maintenance, equipment or capital expenditures in support of the operation of an additional near-road NO_2 monitoring station. As soon as practical and after EPA funding for implementation becomes available, MCAQ will work to install and

operate an additional near-road NO_2 monitoring station in the MCAQ monitoring network.

- **PM_{10} –** PM_{10} is a lower priority because measured concentrations in the MCAQ network have been below 80% of the NAAQS. Two to four stations are required. MCAQ is operating 2 stations (37-119-0041 and 37-119-0047).

- **Lead** – MCAQ currently does not operate any lead monitors. MCAQ shut down the lead monitor located at the Garinger NCore monitoring site on April 30, 2016 in accordance with revisions to 40 CFR 58, Appendix D (3). Concentrations of Pb measured at the station were well below the NAAQS (0.15 µg/m3). The maximum rolling three (3) month average for the period January 1, 2012 through December 31, 2015 was 0.003 µg/m3, approximately 2% of the NAAQS.

Ambient Air Monitoring Network Assessment Summary

	Ozone	$PM_{2.5}$	CO	SO_2	NO_2	PM_{10}	Lead
1. 40 CFR 58 Appendix D, §1.1Monitoring Objectives	Comp-lies	Comp-lies	Comp-lies	Comp-lies	Comp-lies	Comp-lies	NA
2. Need New Monitoring Sites?	No	No	No	No	Yes	No	NA
3. Need to Terminate Sites?	No	No	No	No	No	No	NA
4. Need New Technology?	Yes	No	Yes	Yes	No	No	NA
5. Air Quality Measured Near Susceptible Individuals?	Yes	Yes	Yes	Yes	Yes	Yes	NA
6. Impact of Site Discontinuance on Data Users?	None	None	NA	NA	NA	NA	NA
7. Change $PM_{2.5}$ Siting Due to Population Changes?	NA	No	NA	NA	NA	NA	NA
8, Population Statistics in Assessment?	Yes	Yes	Yes	Yes	Yes	Yes	NA
9. Historical Data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Appropriate Spatial Scale of Representativeness?	Yes	Yes	Yes	Yes	Yes	Yes	NA
11. Spatial Redundancy (SR) and / or Gaps (G)?	SR – No G - No	SR – No G - No	SR – No G - No	SR – No G - No	SR – No G – No	SR – No G - No	SR – No G - No
12. Programmatic Trends or Shifts?	Highest Priority	High Priority	NCore High Priority	NCore High Priority	NCore High Priority	Low Priority	NA

Table 1. Air Monitoring Assessment Summary

Ambient Air Quality Monitoring 5 – Year Network Assessment for Mecklenburg County Air Quality

1.0 Introduction and Requirements of 5-Year Network Assessment

The Mecklenburg County Air Quality (MCAQ) monitoring program, a division of the Mecklenburg County Land Use and Environmental Services Agency (LUESA); provides air quality monitoring services for Mecklenburg County, North Carolina. Mecklenburg County Air Quality is a state "certified local air pollution program" whose purpose is to improve and maintain ambient air quality and reduce exposure to unhealthy levels of air pollution.

MCAQ operates an ambient air surveillance monitoring network as required by the United States Environmental Protection Agency (EPA). The ambient air surveillance monitoring network is required to operate in accordance with the United States Code of Federal Regulations (CFR). Title 40 CFR §58.10(d) requires a "periodic network assessment" of the "air quality surveillance system". The periodic network assessment is to be conducted once every five years. The specific language follows:

"…40 CFR §58.10…(d) 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 information contained herein *("Ambient Air Quality Monitoring 5 – Year Network Assessment for Mecklenburg County Air Quality")* provides pollutant specific assessments of the monitoring network as required by 40 CFR 58.10(d).

2.0 Monitoring Objectives and Spatial Scales

The ambient air monitoring network is designed to meet three basic monitoring objectives. These basic objectives per 40 CFR 58 Appendix D are:

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

b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development.

c) Support air pollution research studies.

2.1 Site Types

In order to support the air quality management work indicated in the three basic air monitoring objectives, a network must be designed with a variety of types of monitoring sites. Monitoring sites must be capable of informing monitoring agencies about many things including the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific sources. To summarize some of these sites, here is a listing of six general site types:

a) Sites located to determine the highest concentrations expected to occur in the area covered by the network.

b) Sites located to measure typical concentrations in areas of high population density.

c) Sites located to determine the impact of significant sources or source categories on air quality.

d) Sites located to determine general background concentration levels.

e) Sites located to determine the extent of regional pollutant transport among populated areas, and in support of secondary standards.

f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

2.2 Spatial Scales

The concept of spatial scale of representativeness is defined to clarify the nature of the link between general monitoring objectives, site types, and the physical location of a particular monitor. The goal in locating monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring site type, air pollutant to be measured, and the monitoring objective. Thus, spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar.

The scales of representativeness of most interest for the monitoring site types described above are as follows:

a) Micro Scale	0 - 100 meters diameter
b) Middle Scale	100 – 500 meters diameter
c) Neighborhood Scale	0.5 – 4 kilometers diameter
d) Urban Scale	4 – 50 kilometers diameter
e) Regional	10 – 100s of kilometer diameter
f) National or Global	Nation and globe as a whole

Proper siting of a monitor requires specification of the monitoring objective, the types of sites necessary to meet the objective, and then the desired spatial scale of representativeness.

2.3 Monitoring Station Types

The National ambient air monitoring system includes several types of monitoring stations, each targeting a key data collection need and each varying in technical sophistication.

a) Research Grade Stations – platforms for scientific studies, either involved with health or welfare impacts, measurement methods development, or other atmospheric studies.

b) NCore Multi-pollutant Stations – sites that measure multiple pollutants in order to provide support to integrated air quality management data needs.

c) State and Local Air Monitoring Stations (SLAMS) – sites intended to address specific air quality management interest.

d) Special Purpose Monitoring (SPM) Stations – short-term monitoring station for criteria pollutants or longer-term monitoring station for non-criteria pollutants or non-federal reference method (FRM)/non-federal equivalent (FEM) methodologies.

2.4 Information to Evaluate

Information to be considered in the evaluation of the ambient air surveillance monitoring network relative to the monitoring objectives and spatial scale includes:

a) General monitoring requirements, design criteria for NCore sites and pollutant-specific design criteria for State and Local Air Monitoring Stations (SLAMS) monitoring for National Ambient Air Quality Standards (NAAQS) pollutants.

b) Air quality summary information available for each NAAQS pollutant of interest.

c) Meteorological summary information.

d) 40 CFR §58 Appendix D Objectives Evaluation

e) Monitoring site type evaluation.

f) Population summary information.

g) Emissions inventory (source and mobile) summary information.

2.5 Requirements of Assessment

The 5-year network assessment is required to determine at a minimum:

a) If the network meets the monitoring objectives defined in 40 CFR §58 Appendix D.

b) Whether new sites are needed.

c) Whether existing sites are no longer needed and can be terminated.

d) Whether new technologies are appropriate for incorporation into the ambient air monitoring network.

e) Whether the network sufficiently supports characterization of air quality in areas with large populations of susceptible individuals.

f) Whether discontinuance of a monitoring site would have an adverse impact on other data users or health studies.

g) For $PM_{2.5}$, the assessment must identify needed changes to population-oriented sites.

h) If monitoring is required near any additional Pb sources according to the most recent National Emissions Inventory. (Monitoring is required near sources with Pb emissions greater than 0.5 tons per year.)

i) Any waiver of 40 CFR 50 and /or 58 regulatory requirements must be renewed during each 5-year assessment unless otherwise specified to be renewed annually during the network plan process. To include:

- Pb source monitoring waivers.
- Continuous $PM_{2.5}$FEM Comparability (NAAQS Exclusion).
- Siting criteria
- Any additional waiver of Part 50 and/or 58 Appendix E, Section 10.

3.0 Pollutant Specific Assessment of Network

The MCAQ ambient air surveillance monitoring network, as currently configured, consists of five (5) monitoring stations (Figure 1):

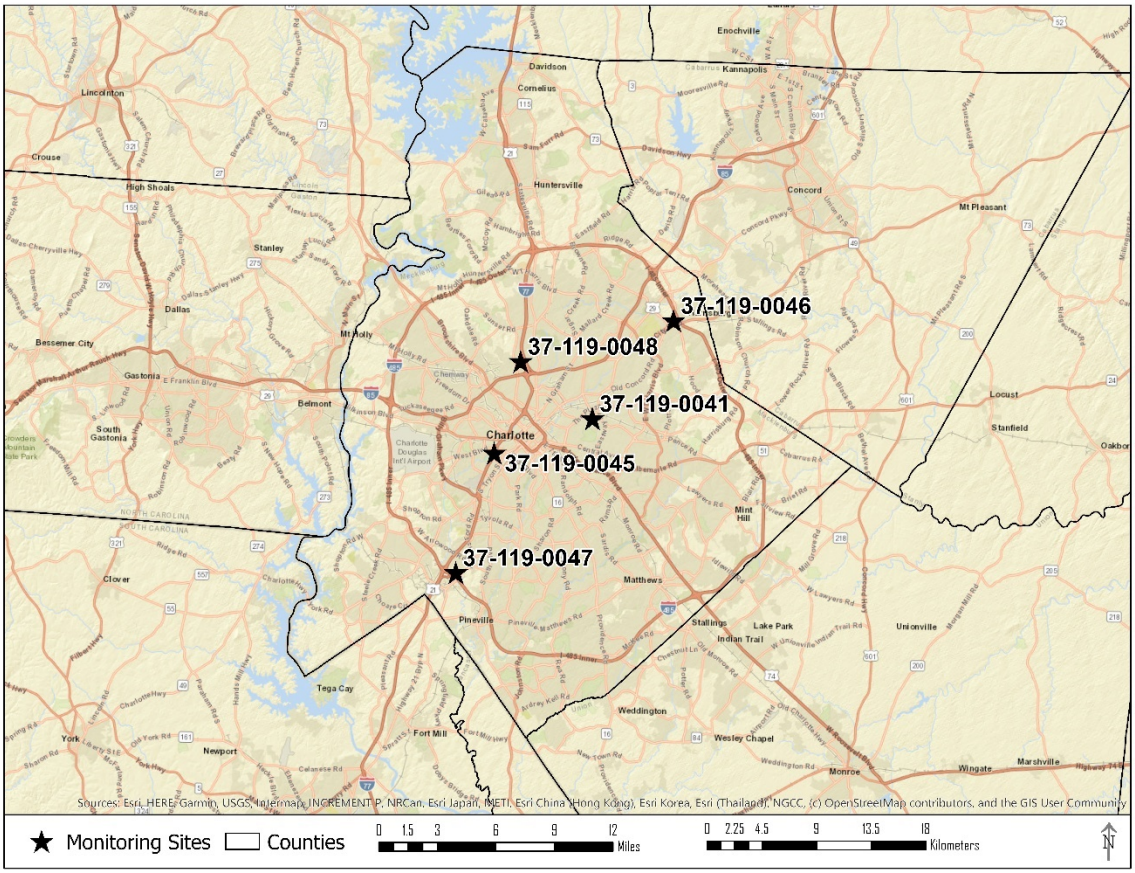

Figure 1. MCAQ Monitoring Sites

Station Name	EPA AQS ID	CO	NO_2	O_3	$PM_{2.5}$	PM_{10}	SO_2
Garinger	37-119-0041	X	X	X	X	X	X
Remount	37-119-0045	X	X		X		
University Meadows	37-119-0046			X			
Ramblewood Park	37-119-0047					X	
Friendship Park	37-119-0048				X		

Table 2. Site Name, Site AQS ID, Pollutant Monitored

The MCAQ network consists of one (1) National Core multi-pollutant monitoring station (NCore, Station-37-19-0041), one near-road station (Station-37-19-0045) and three (3) State and Local Air Monitoring Stations (SLAMS). The U.S. EPA has set National Ambient Air Quality Standards for six air pollutants. These air pollutants (also known as "criteria pollutants") are particulate matter ($PM_{2.5}$ and PM_{10}), ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and lead (Pb).

Pollutant [final rule cite]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide [76 FR 54294, Aug 31, 2011]		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead [81 FR 71906, Oct 18,2016]		primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$ (1)	Not to be exceeded
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [77 FR 20218, April 3, 2012]		primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	Annual	53 ppb (2)	Annual Mean
Ozone [80 FR 65292, Oct 26, 2015]		primary and secondary	8-hour	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate Matter [78 FR 3086, Jan 15, 2013]	$PM_{2.5}$	primary	Annual	12 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [84 FR 9866, Apr 17, 2019] [38 FR 25678, Sept 14, 1973]		primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Table 3. National Ambient Air Quality Standards

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards
(4) Reviewed April 17, 2019, without revision. Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

The following sections will provide an assessment of the monitoring network for each criteria pollutant that is monitored in the MCAQ network per the requirements of 40 CFR 58.10(d) and as outlined in Section 1.0 “Introduction and Requirements of 5-Year Network Assessment” above.

3.1 Ozone (O3) Network Monitoring Requirements and General Description

The minimum monitoring requirements for ozone are listed in Table D-2 of 40 CFR 58 Appendix D, §4.1. Table D-2 is reproduced below (Table 4):

MSA population[1,2]	Most recent 3-year design value concentrations ≥85% of any O_3 NAAQS[3]	Most recent 3-year design value concentrations <85% of any O_3 NAAQS[3,4]
>10 million	4	2
4–10 million	3	1
350,000–<4 million	2	1
50,000–<350,000[5]	1	0

Table 4. Appendix D to Part 58- SLAMS Minimum O3 Monitoring Requirements

The number of sites required in the network is based on MSA population and design value (NAAQS compliance value). Mecklenburg County is in the Charlotte-Concord-Gastonia (16740) metropolitan statistical area (MSA). The MSA component counties are Anson, Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan and Union Counties in North Carolina and Chester, Lancaster and York Counties in South Carolina. The 2019 U.S. Census population estimate for the MSA is 2,636,883.

The most recent design value (2017-2019) for the MSA is 0.070 ppm (8-hour design value). Eighty five percent (85%) of the 8-hour NAAQS is 0.059 ppm. The design value for the MSA is ≥85% of the 8-hour NAAQS (0.070 ppm).

Based on the 2019 U.S. Census population estimate and the most recent design value ≥85% of the 8-hour design value, the minimum number of required monitoring sites for the MSA is two (2).

There are currently 7 ozone monitoring stations operating in the MSA. The 7 stations and their respective 2019 design values are listed in Table 5:

AQS ID	Site Name	County, State	2019 Design Value
37-109-0004	Crouse	Lincoln, NC	0.064 ppm
37-119-0041	Garinger	Mecklenburg, NC	0.070 ppm
37-119-0046	University Meadows	Mecklenburg, NC	0.069 ppm
37-159-0021	Rockwell	Rowan, NC	0.062 ppm
37-179-0003	Monroe	Union, NC	0.068 ppm
45-091-0008	York	York, SC	0.067 ppm
45-091-8801	Catawba Indian Nation	York, SC	0.064 ppm

Table 5. Active O3 Monitoring Stations in Charlotte-Concord-Gastonia MSA

The location of the ozone monitoring stations (indicated by ★) in the Charlotte-Concord-Gastonia MSA are shown in Figure 2. The ozone sites located in Mecklenburg county are shown in Figure 3.

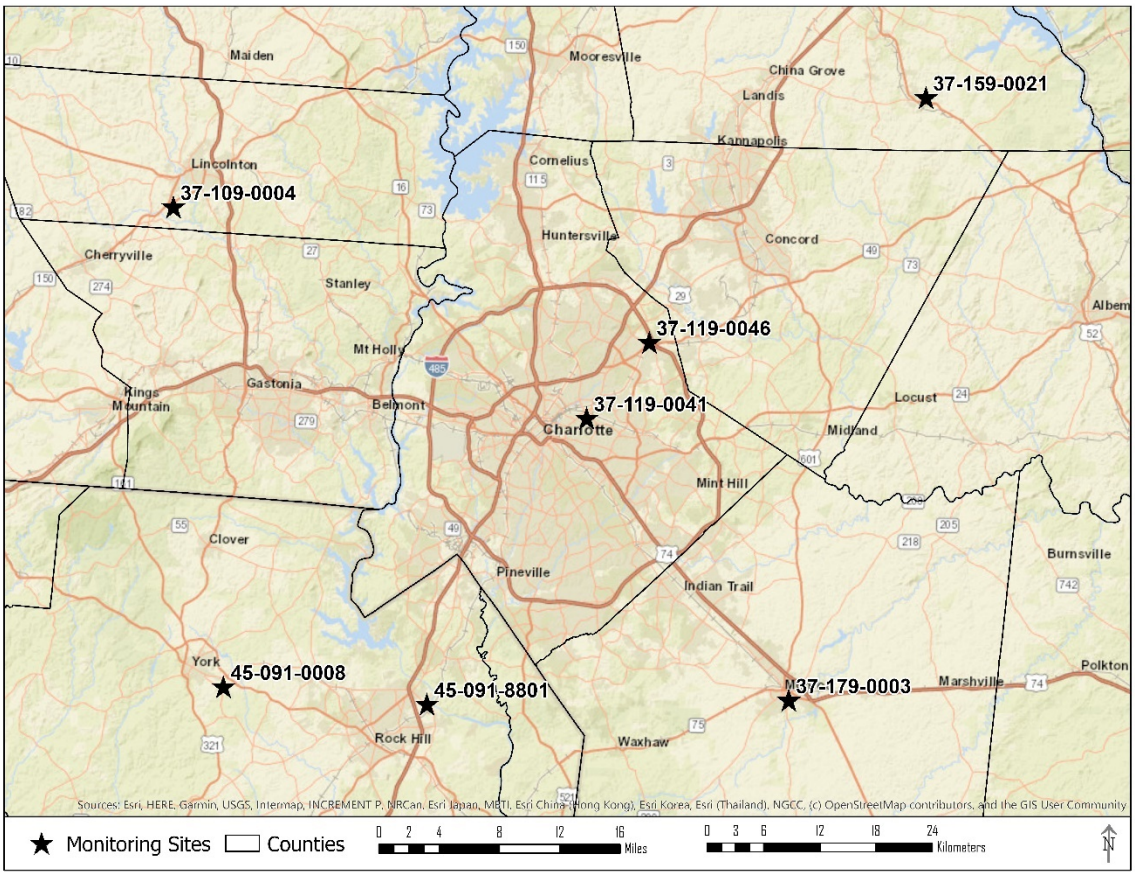

Figure 2. Active O3 Monitoring Stations in Charlotte-Concord-Gastonia MSA

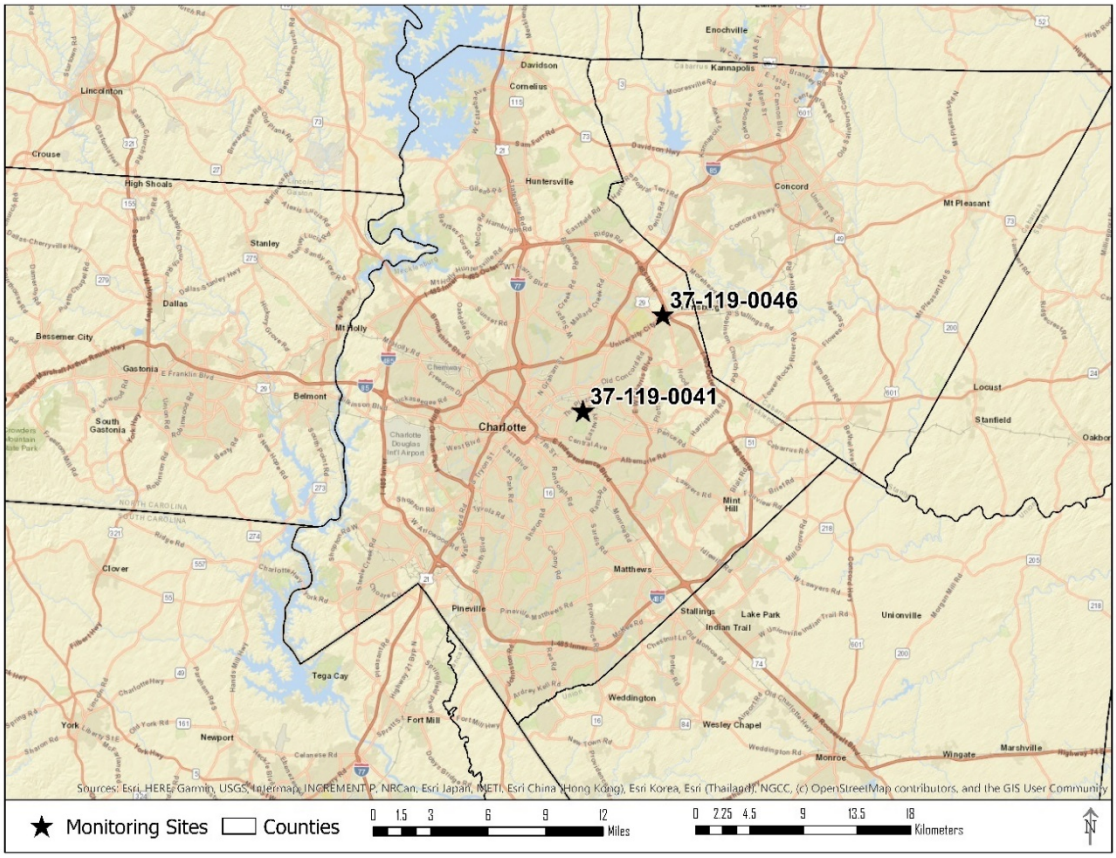

Figure 3. MCAQ O3 Monitoring Stations

Ozone forms more readily during warmer times of the year. The MCAQ ozone monitoring site locations are geographically oriented along a vector that corresponds to the direction of the seasonal prevailing southwesterly winds during the summer months (Figure 4 below).

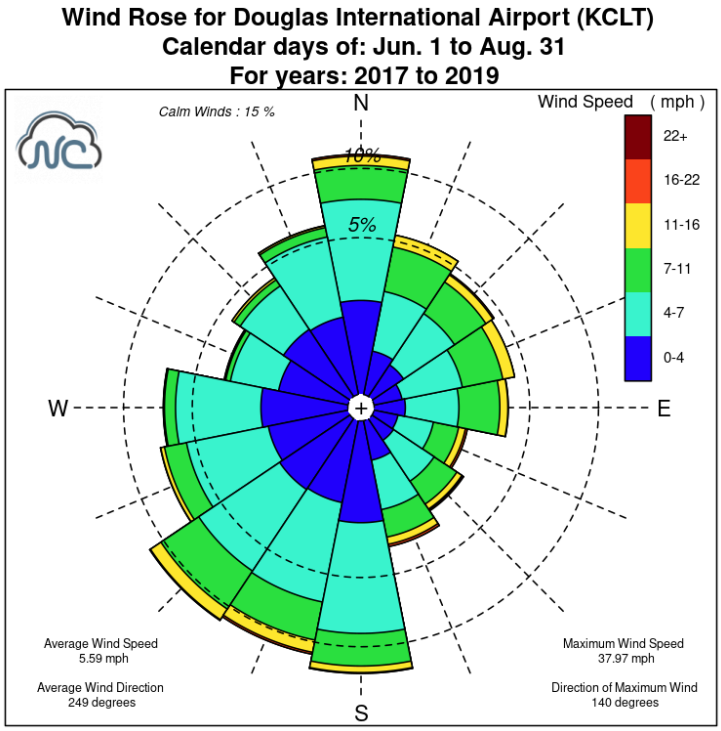

Figure 4.Wind Rose NWS Station KCLT – Summer 2017-2019

Annual wind data (Figure 5) demonstrates an orientation similar to data collected during the summer months.

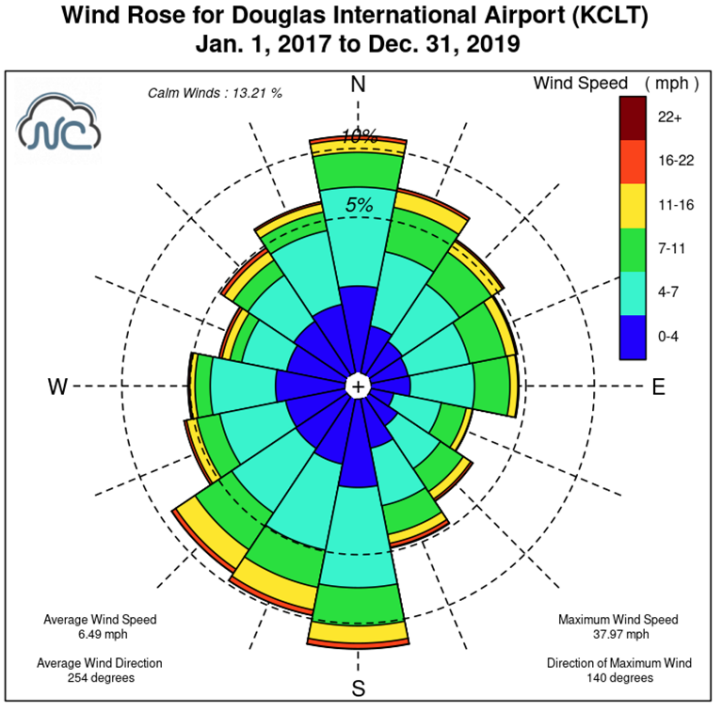

Figure 5. Wind Rose NWS Station KCLT – 2017-2019

Within the MCAQ monitoring network, stations 37-119-0041 and 37-119-0046 are designed to record the maximum concentrations in the network. Both stations are downwind (prevailing wind from the SW) of the central business district of the city of Charlotte, NC.

Station 37-119-0041 (Garinger, Figure 6) is 5.4 kilometers ENE of the central business district of Charlotte and monitors maximum concentrations in an area of high population density. The site is typical of urban areas within Mecklenburg County. The site is neighborhood scale (4 km diameter). The Garinger site design value (0.070 ppm 8-hour ozone) is the maximum design value site (2017-2019) in the MSA.

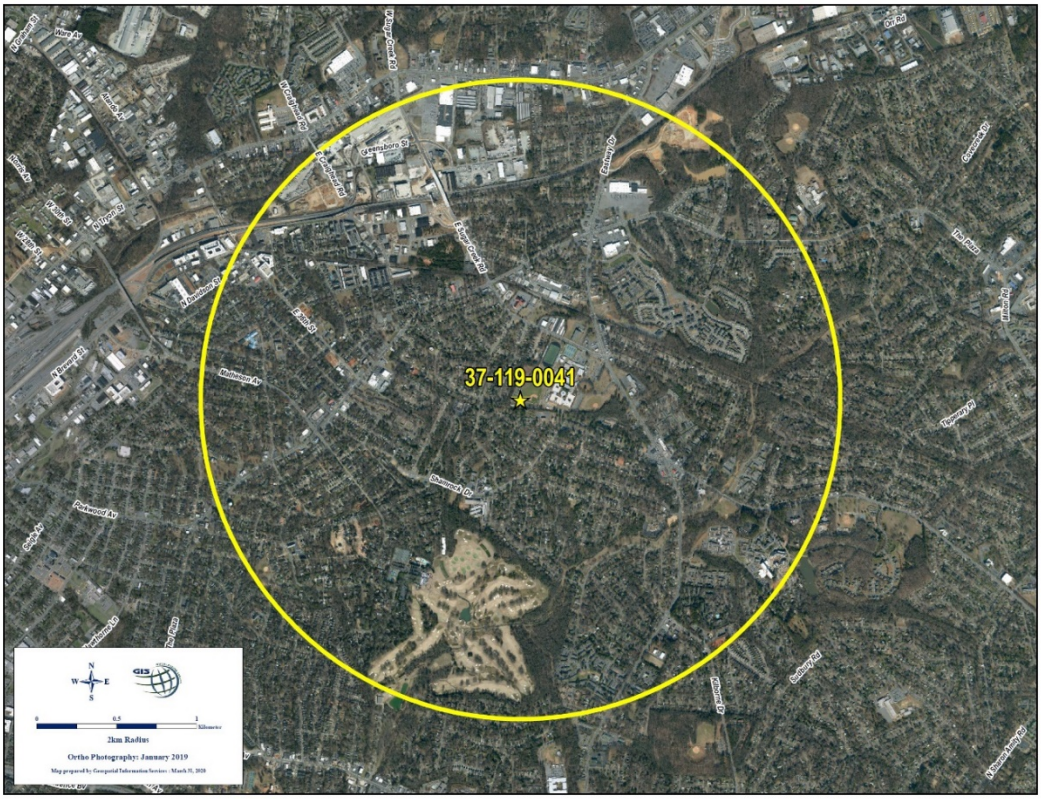

Figure 6. Garinger (37-119-0041) with 4 km diameter circle

Station 37-119-0046 (University Meadows, Figure 7) is 15 kilometers NE of the central business district of Charlotte and is a maximum concentration monitoring site downwind of the urban core. The University Meadows station scale of representativeness is urban (4 km – 50 km diameter).

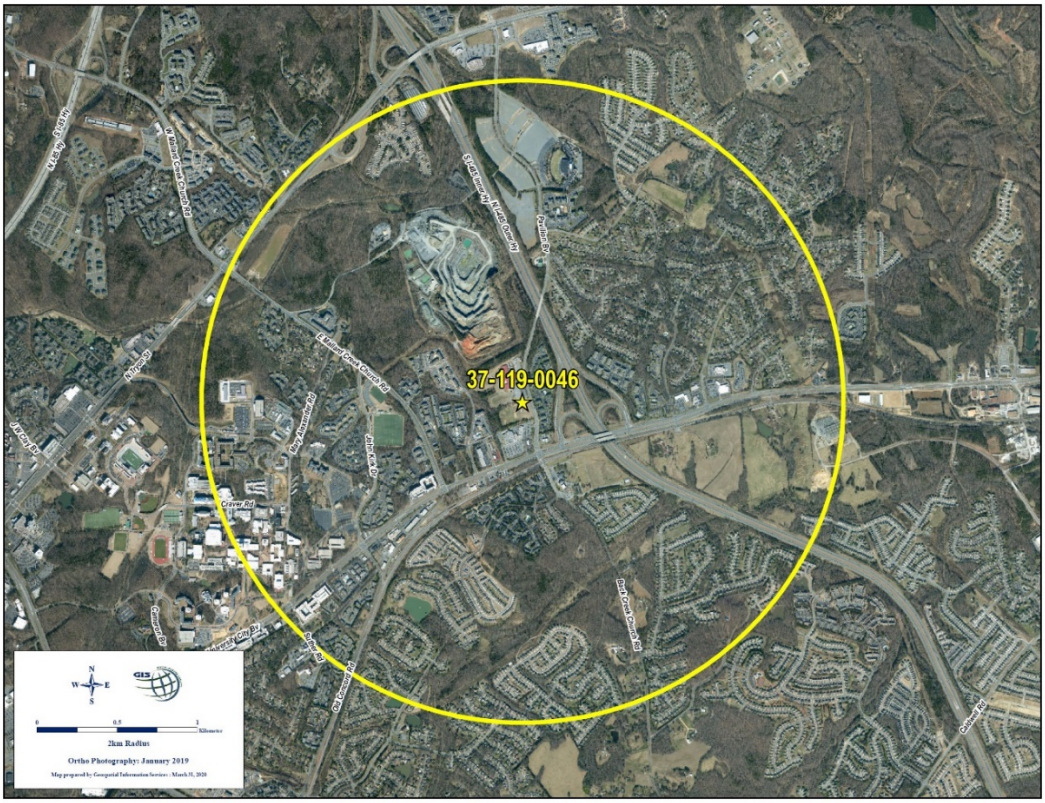

Figure 7. University Meadows (37-119-0046) with 4 km diameter circle

3.1.1 Compliance with 40 CFR 58 Appendix D, §1.1

3.1.1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from two (2) ozone monitoring sites. Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ ozone data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After ozone data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:

Data from the MCAQ ozone monitoring network complies with applicable siting requirements and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the two monitoring sites operated by MCAQ may be used in the development of attainment and maintenance plans. Data from the SLAMS site (37-119-0046) and the NCore site (37-119-0041) is available for use in the evaluation of regional air quality models used in developing emission strategies and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:

Site 37-119-0041 (Garinger) is an NCore site and may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development.

3.1.1.2 Types of Monitoring Sites (40 CFR 58 Appendix D§1.1.1):

The MCAQ ozone monitoring network is designed to support the air quality management work indicated in the three basic air monitoring objectives listed above by providing information regarding peak air pollution levels, typical levels in populated areas, and air pollution transported into and outside the county.

The stations in the MCAQ network are located geographically to track ozone transport over the county. The sites are also located so that measurements are conducted in areas of expected maximum concentration and in areas of high population density (Figure 8).

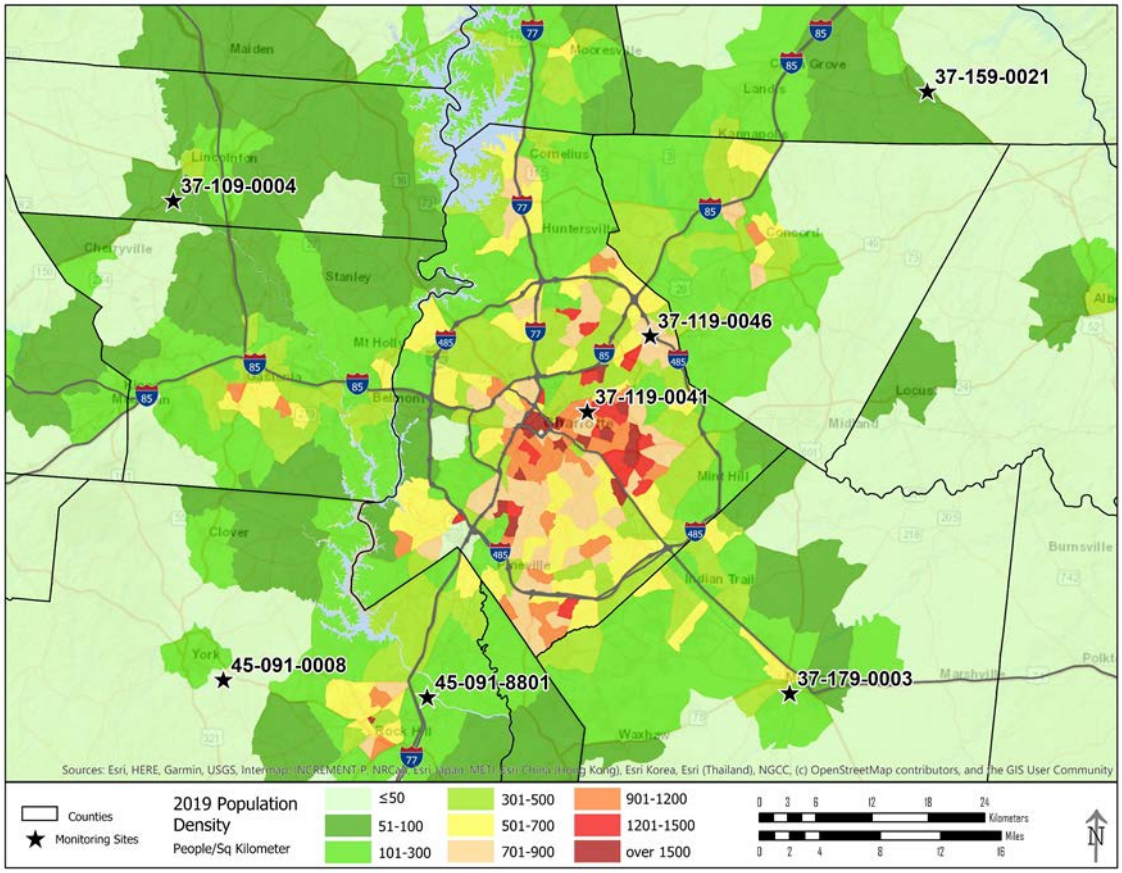

Figure 8. 2019 Census Population Projections.

3.1.2 Need for New Monitoring Sites

The MCAQ network is comprised of 2 monitoring stations. These stations (37-119-0041, 37-119-0046) meet the minimum requirements for the entire MSA.

Station 37-119-0041 is the maximum design value site for the MSA (2017-2019). This site is designed to record maximum concentrations in the MSA (40 CFR 58 Appendix D § 4.1(b).

Station 37-119-0046 is designed to measure maximum concentrations. The site may measure maximums due to transport or during periods of stagnation and recirculation.

The ozone monitoring network operated by MCAQ meets the monitoring requirements of 40 CFR 58 Appendix D. Based on this analysis, no new ozone sites are proposed for Mecklenburg County.

3.1.3 Need to Terminate Existing Sites

Each site operated by MCAQ serves a specific purpose. 37-119-0041 is an approved NCore ozone site and is required. 37-119-0046 site is oriented along the primary summer wind vector (SW to NE) which intersects the central business district of Charlotte, NC and measures air quality conditions directly downwind of a major urban area. Stations 37-119-0041 and 37-119-0046 should continue operating in the MCAQ network.

3.1.4 Appropriateness of New Technologies

MCAQ is currently utilizing ozone monitoring instrumentation manufactured by Thermo Environmental Instruments, Inc. (Model 49i). Two ozone calibration standards are also Thermo Environmental Instrument, Inc. 49iPS devices. This instrumentation is one generation older than the most recently designated instrumentation and should be replaced as funding is available.

3.1.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Station 37-119-0041 is located in an area of high population density and downwind from the prevailing southwest wind direction. Susceptible individuals in this assessment are defined as those < 5 years of age and > 64 years of age. The maps in Figures 9 and 10 display the location of the Garinger site in relation to the population densities of person under the age of 5 (Figure 9) and over the age of 64 (Figure 10). Station 37-119-0041 is well sited for monitoring susceptible individuals as it is located near areas with higher density populations of the very young (<5 years of age) and older adults (>64 years of age).

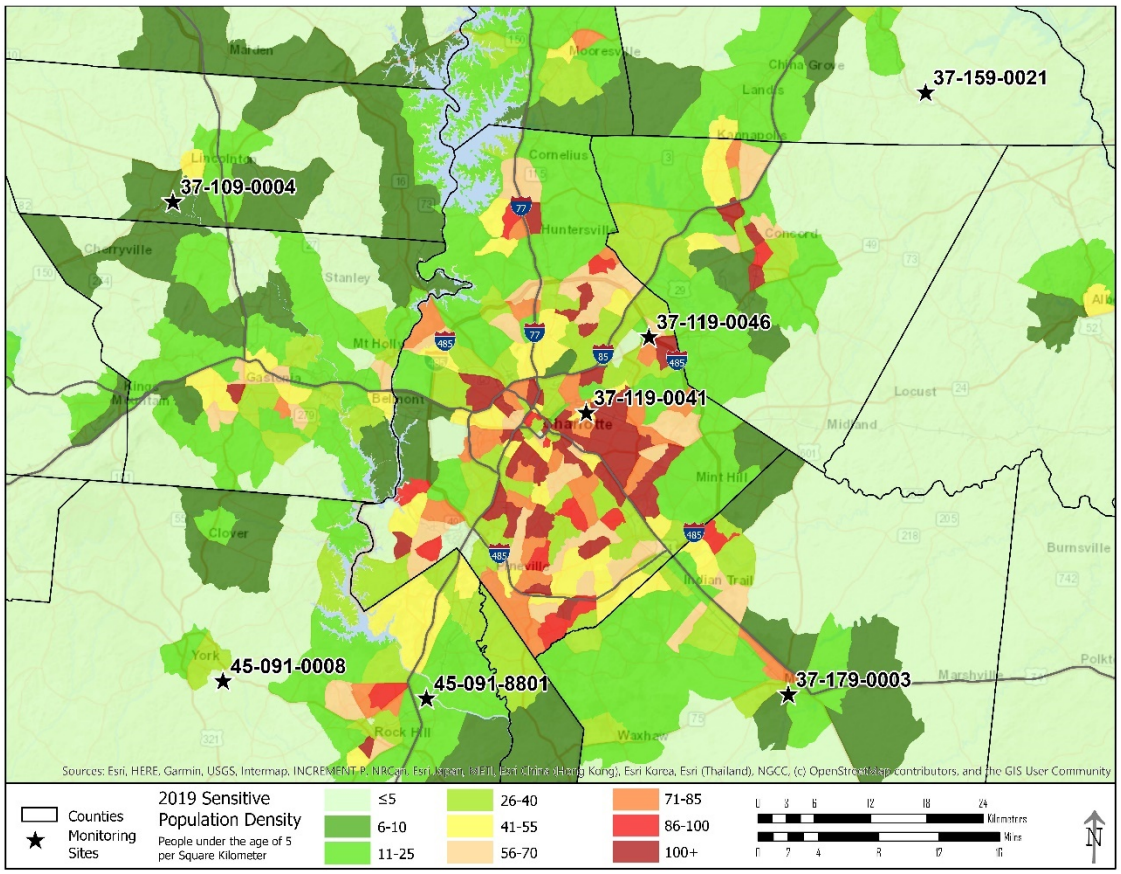

Figure 9. 2019 Census Population Projections - People under the age of 5.

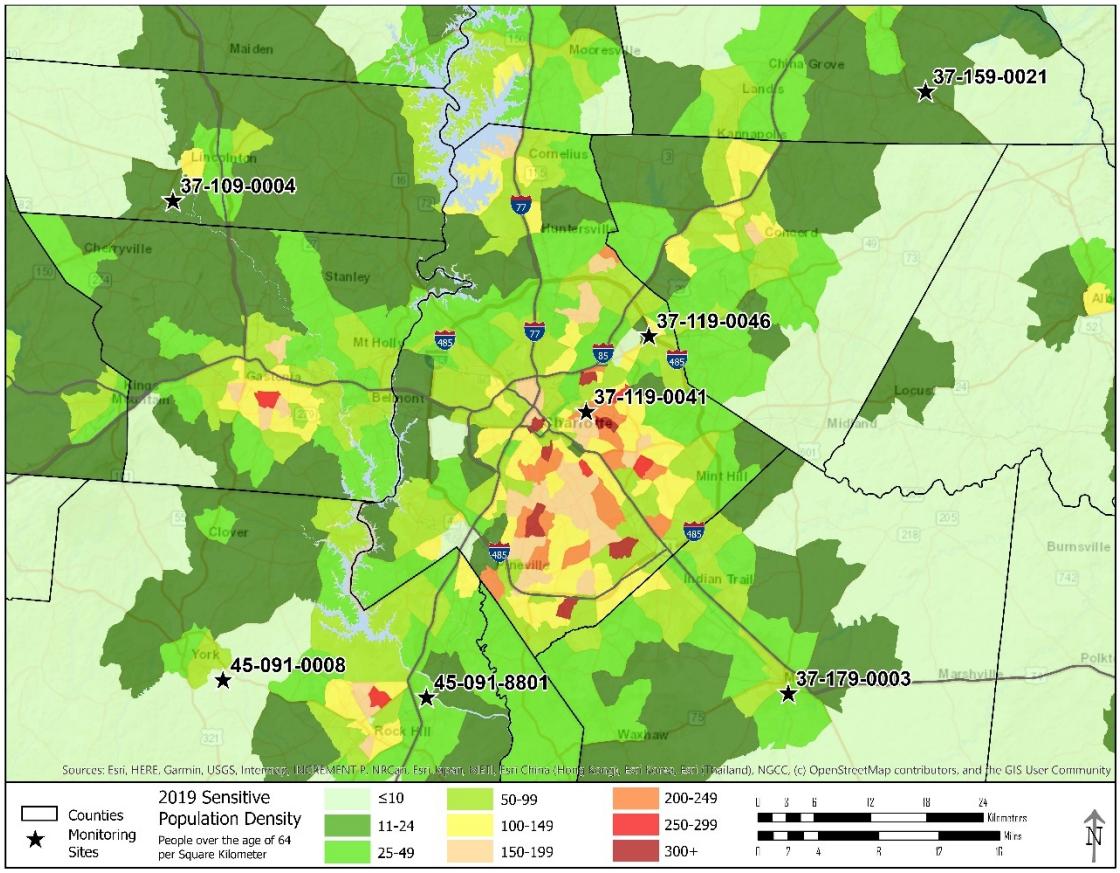

Figure 10. 2019 Census Population Projections - People over the age of 64.

3.1.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of two ozone monitoring stations in the network. There should be minimal impact on data users or health studies resulting from the relocation of station 37-119-1009 (County Line).

3.1.7 $PM_{2.5}$ Changes to Population-Oriented Sites

Not Applicable.

3.1.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.1.9. Historical Data

Design values measured at MCAQ monitoring stations in 2019 have declined by -26.7% from year 2000 levels and are – 9.8% lower than 2010 levels. See figures 11 and 12 below.

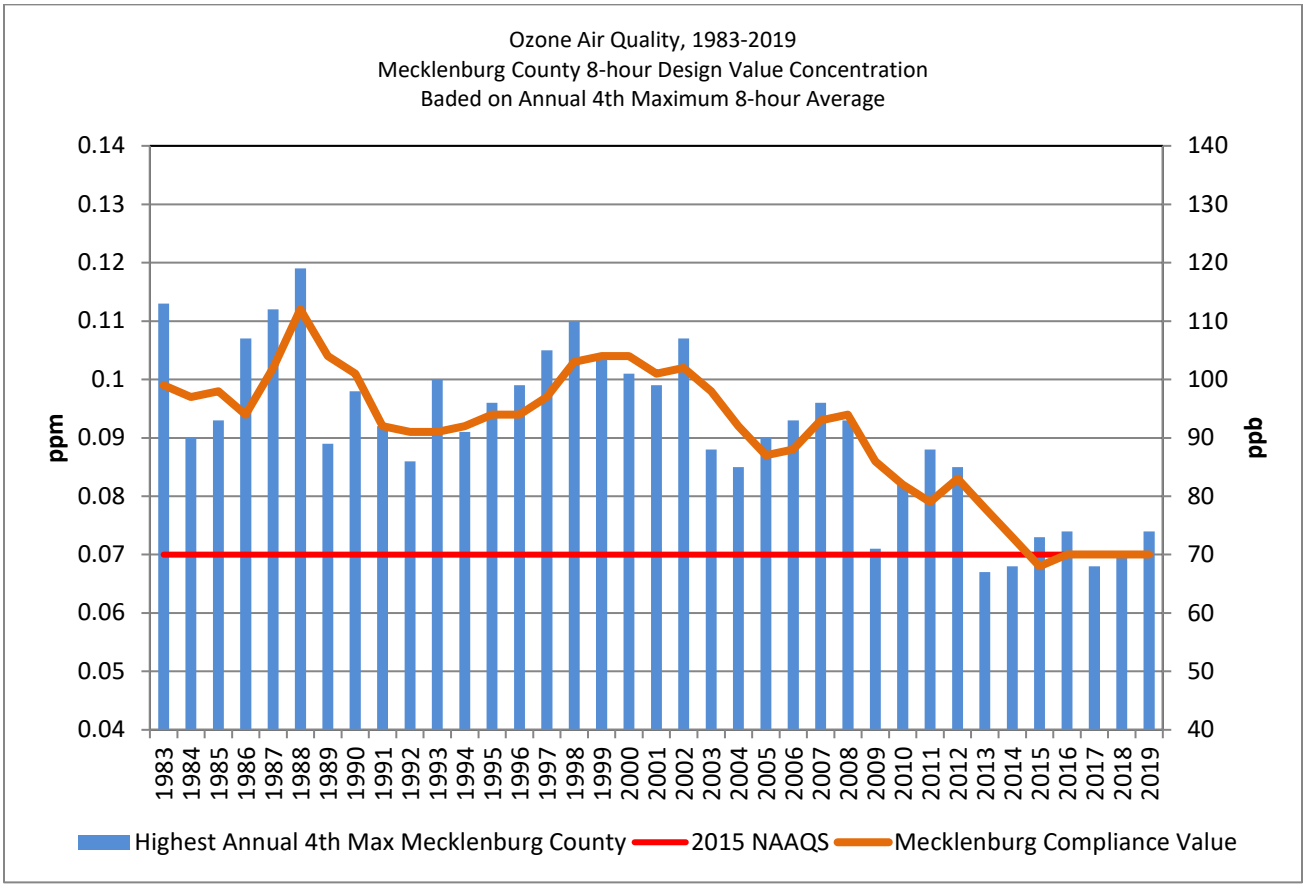

Figure 11. O3 8-Hr Design Value 1983-2019

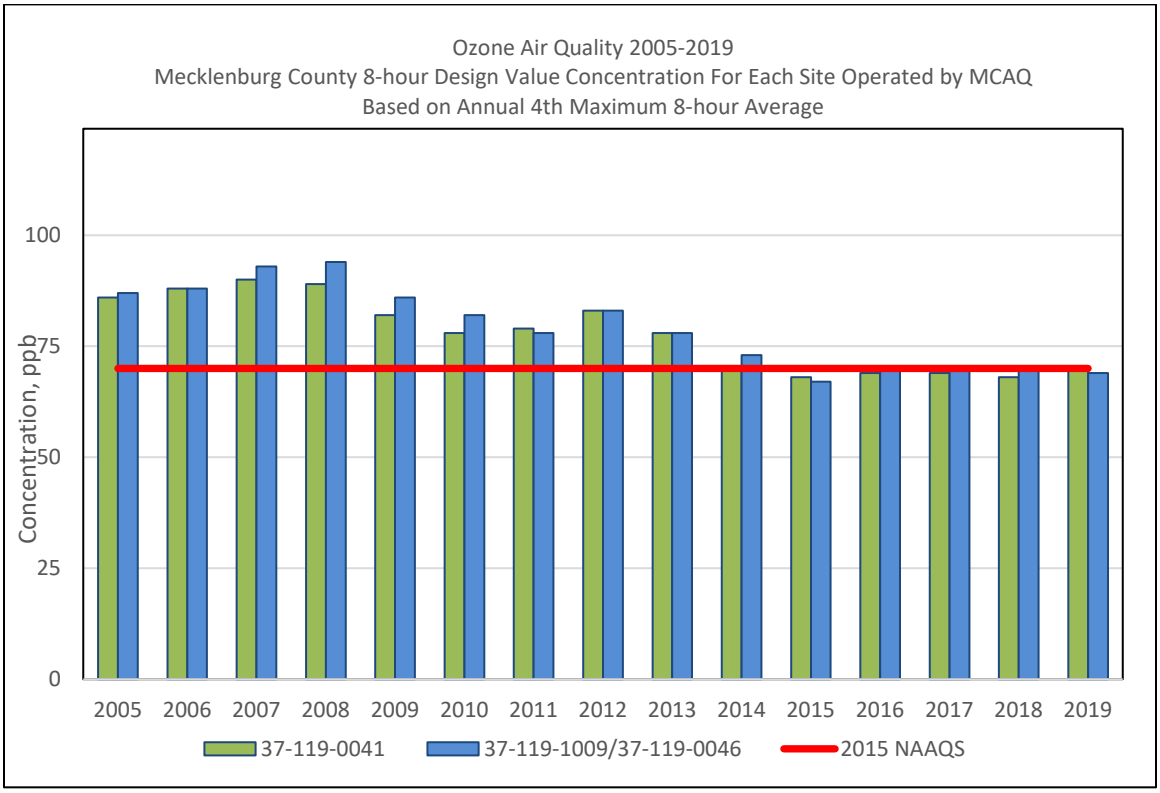

Figure 12. O3 8-Hr Design Value for each MCAQ Site

3.1.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

Station 37-119-0041 is neighborhood scale. The scale of representativeness of this site is suitable for ozone measurements in a "reasonably homogeneous urban sub-region" (40 CFR 58 Appendix D § 4.1(c)(1).

Site 37-119-0046 is urban scale and is suitable for the measurement of maximum concentrations that may occur in the network. Urban scale measurements are used to estimate concentrations over large portions of an urban area with dimensions of a few kilometers to 50 kilometers.

3.1.11 Monitoring Spatial Redundancy or Gaps

The monitoring stations operated by MCAQ are relatively close geographically. Typical concentrations measured at each site may be somewhat similar during periods of low ozone concentrations. When conditions become more extreme (due to ozone transport, stagnation, recirculation, etc.), meteorological effects on ozone concentrations at individual monitoring sites may be significant. To ensure that ozone concentrations are measured under various conditions; monitoring sites serve specific functions in the monitoring network (as outlined previously), and thus an acceptable level of potential geographic redundancy is tolerated to achieve the specific objective(s) of the individual site.

3.1.12 Programmatic Trends or Shifts in Data Needs

Monitoring indicates the MSA does not currently (2017-2019) violate the 2015 ozone NAAQS. The design value for the MSA for the most recent period was recorded at station 37-119-0041. The design value at this station is 0.070 ppm, just at the NAAQS of 0.070 ppm. Monitored 8-hour ozone concentrations remain at or near the current

NAAQS at both monitoring stations operating in the MCAQ network, therefore the highest priority for the MCAQ ambient air quality monitoring group is the on-going operation of an accurate and reliable ozone monitoring network that is in full compliance with the requirements of 40 CFR 58 Appendix D. Stations 37-119-0041 and 37-119-0046 support the needs of the program.

3.1.13 NO_x and VOC Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figures 13 and 14 depict the location of the MCAQ ozone monitoring stations relative to point source emissions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). NO_x and VOCs are important precursor compounds in the formation of ozone. Point sources plotted on these maps represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

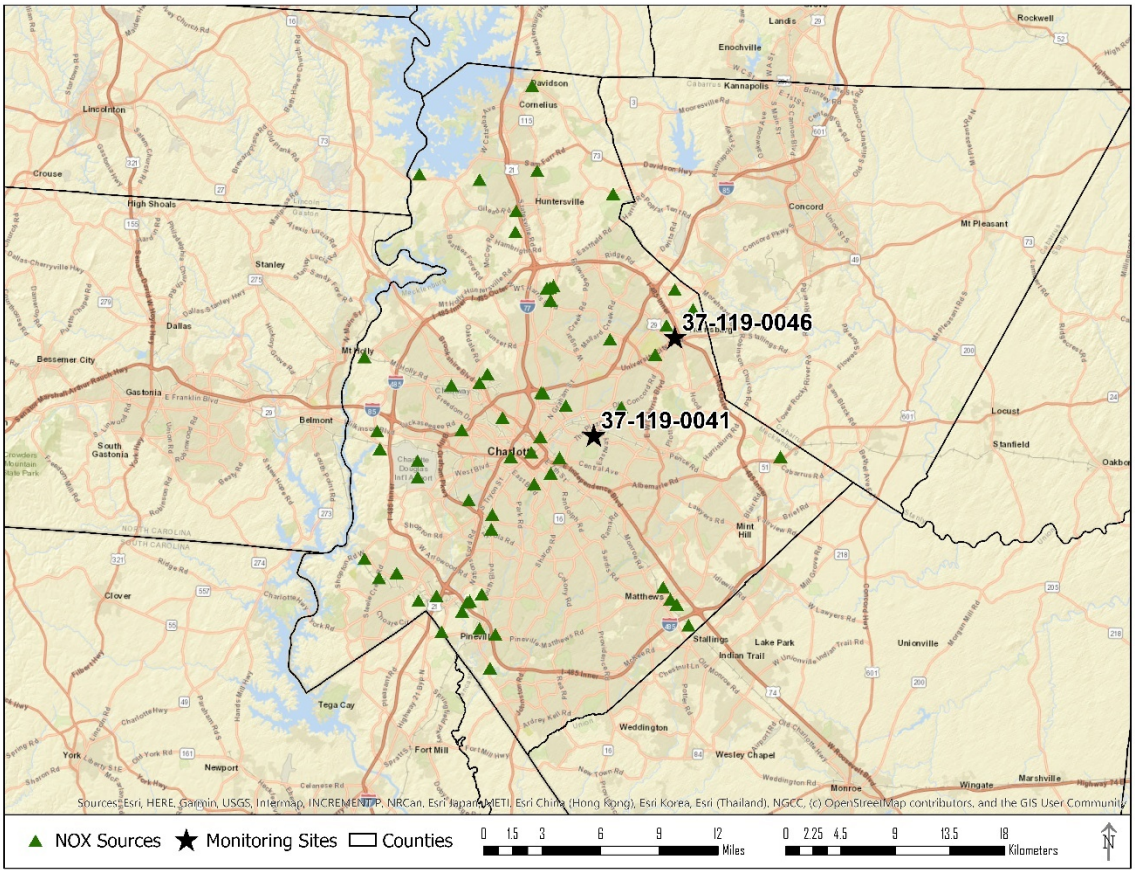

Figure 13. NO_x Emission Point Sources (Synthetic Minor and Title V).

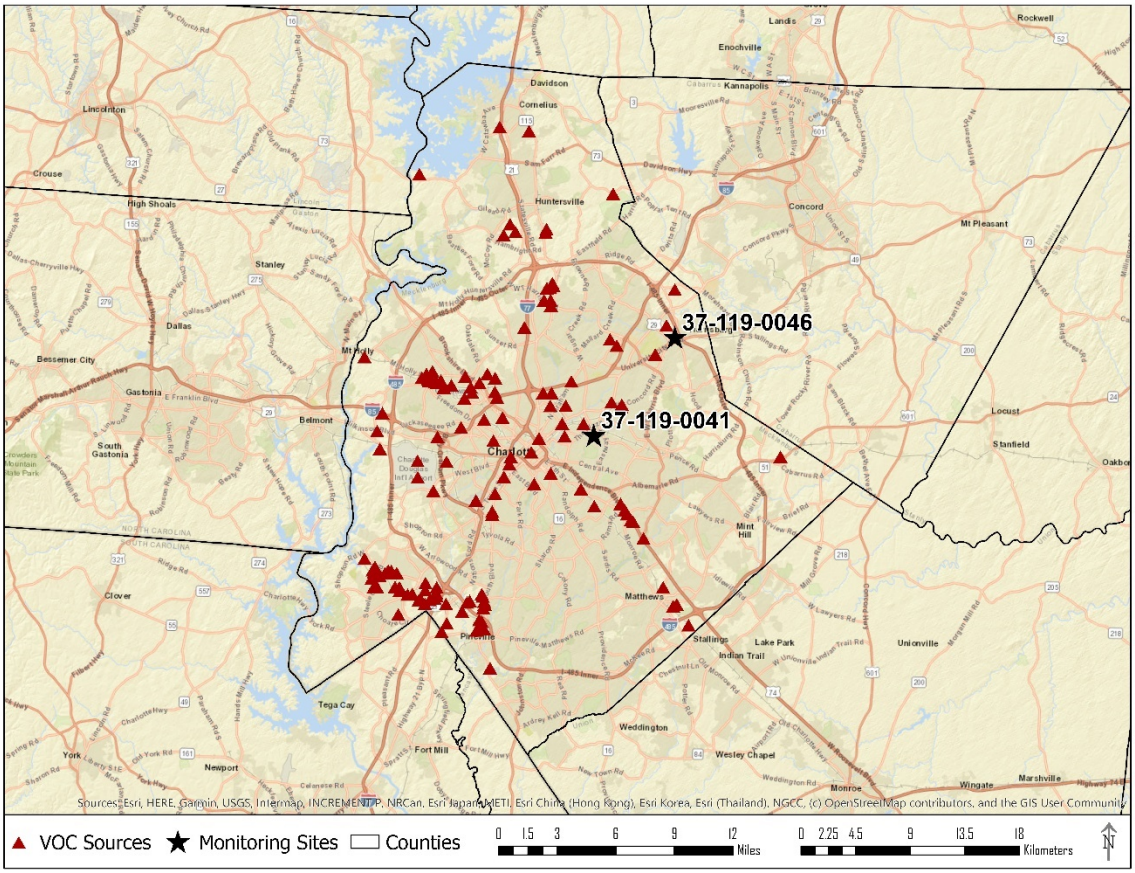

Figure 14. VOC Emission Point Sources (Synthetic Minor and Title V).

3.1.14 Summary of Assessment for Ozone

The MCAQ monitoring stations (37-119-0041 and 37-119-0046) as discussed above meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The two monitoring stations operated by MCAQ are located to determine expected maximum concentrations and to provide air quality concentration data in an area of high population density at the appropriate spatial scales. These two stations meet the minimum requirements for ozone monitoring stations in the MSA.

Additionally, three monitoring stations operated by North Carolina Division of Air Quality (NCDAQ) and one station operated by South Carolina Department of Health and Environmental Control (SCDHEC) and one operated by the Catawba Indian Nation provide stations in areas adjacent to Mecklenburg County and within the MSA. The combination of stations operated throughout the MSA by multiple agencies exceed the minimum requirements of 40 CFR 58, Appendix D and provide an adequate ozone monitoring network.

3.2 Particulate Matter – $PM_{2.5}$

The minimum monitoring requirements for $PM_{2.5}$ are listed in Table D-5 of 40 CFR 58 Appendix D, §4.7.1. Table D-5 is reproduced below (Table 6):

MSA population[1,2]	Most recent 3-year design value concentrations ≥85% of any $PM_{2.5}$ NAAQS[3]	Most recent 3-year design value concentrations <85% of any $PM_{2.5}$ NAAQS[3,4]
>1,000,000	3	2
500,000-1,000,000	2	1
50,000-<500,000[5]	1	0

Table 6. $PM_{2.5}$ Monitoring Requirements

The number of stations required in the network is based on population and design value. Mecklenburg County is located in the Charlotte-Gastonia-Concord (16740) metropolitan statistical area (MSA). The MSA component counties are Anson, Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan and Union Counties in North Carolina and Chester, Lancaster and York Counties in South Carolina. The 2019 U.S. Census population estimate for the MSA is 2,636,883.

The 2019 design values for the MSA are 9.0 $\mu g/m^3$ (annual design value) which is 75% of NAAQS and 18 $\mu g/m^3$ (24-hour design value) which is 51% of NAAQS. The controlling design value is the annual standard. The design value for the MSA is ≤85% of any $PM_{2.5}$ NAAQS, therefore based on population and design value the number of required monitoring sites for the MSA is 2.

There are currently four (4) $PM_{2.5}$ monitoring sites operating in the MSA:

AQS ID	Site Name	County	2019 Annual DV	2019 24-Hour DV
37-119-0041	Garinger	Mecklenburg, NC	8.1 $\mu g/m^3$	17 $\mu g/m^3$
37-119-0045[1]	Remount	Mecklenburg, NC	9.0 $\mu g/m^3$	18 $\mu g/m^3$
37-119-0048[2]	Friendship	Mecklenburg, NC	NA	NA
45-091-8801[3]	Catawba	York, NC	NA	NA

[1]-Station 37-071-0045 was added by MCAQ in 2017.
[2]-Station 37-071-0048 was added by MCAQ in 2020.
[3]-Station 45-091-8801 was added by Catawba Indian Nation in 2018.

MCAQ operated a continuous $PM_{2.5}$ monitor at Montclaire (37-119-0042), which was discontinued on March 31, 2019 due to eviction from the site by the property owner. The $PM_{2.5}$ monitor was relocated to Friendship Park (37-119-0048, Figure 16) on January 6, 2020.

The monitoring site locations for the MSA are shown in Figure 15 and the sites in Mecklenburg County are shown in Figure 16.

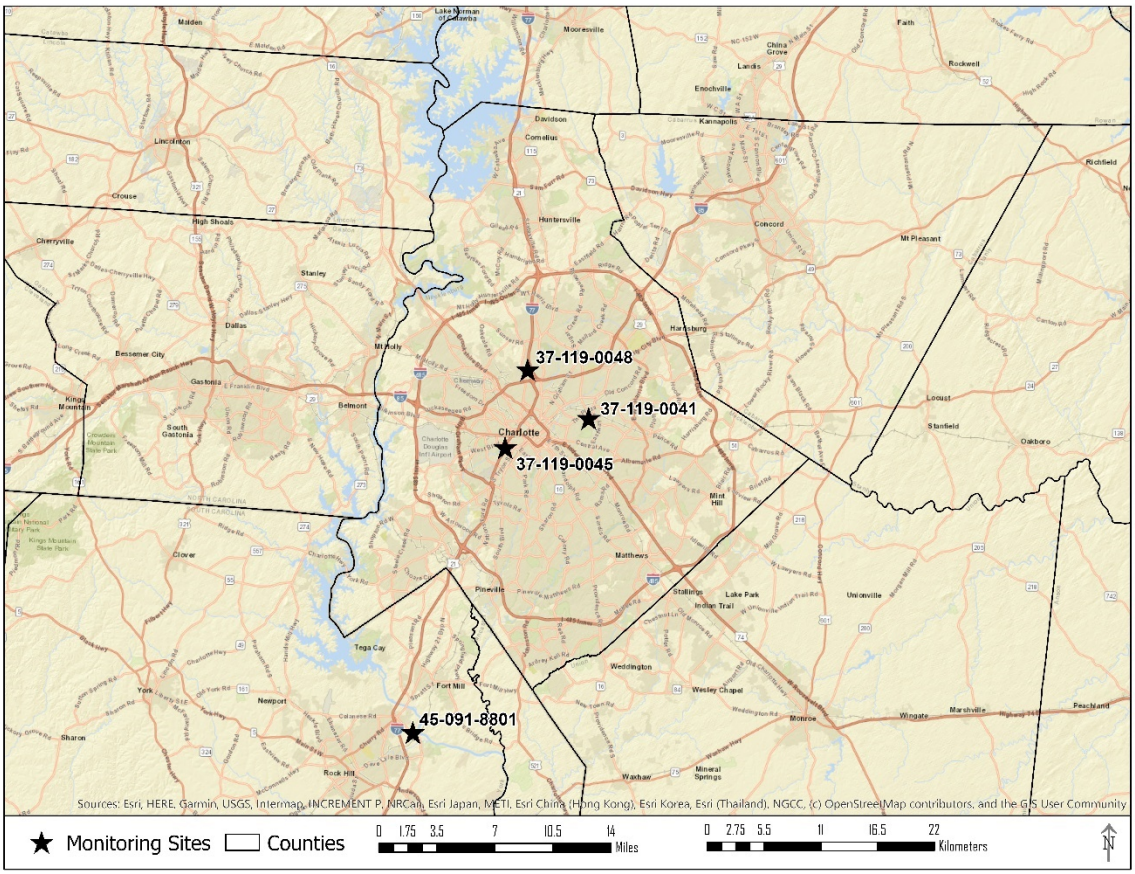

Figure 15. Active $PM_{2.5}$ Sites in the Charlotte-Concord-Gastonia MSA

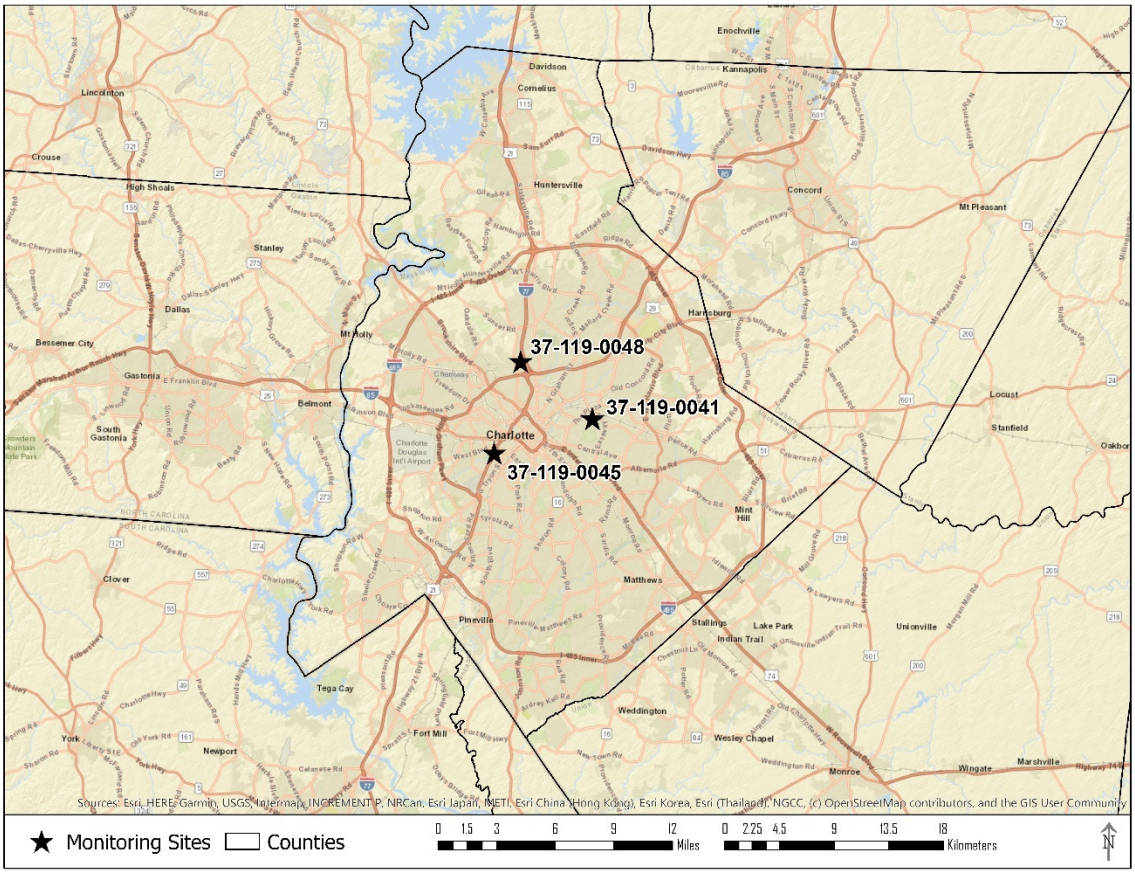

Figure 16. Active $PM_{2.5}$ Sites in MCAQ

According to 40 CFR 58 Appendix D § 4.7.1(b): "…The required monitoring stations or sites must be sited to represent area-wide air quality..." The MCAQ $PM_{2.5}$ monitoring stations are sited to represent area-wide air quality. Section 4.7.1 continues with 3 basic requirements:

- 40 CFR 58 Appendix D § 4.7.1(b)(1): "At least one monitoring station is to be sited at neighborhood or larger scale in an area of expected maximum concentration…"

- 40 CFR 58 Appendix D § 4.7.1(b)(2): "…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 NO_2 station required in section 4.3.2(a) of this appendix…"

- 40 CFR 58 Appendix D § 4.7.1(b)(3): "…For areas with additional required SLAMS, a monitoring station is to be sited in an area of poor air quality."

- Additionally, 40 CFR 58 Appendix D § 4.7.2 states: "…4.7.2 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 this appendix…"

This section would require 2 $PM_{2.5}$ stations and at least one continuous $PM_{2.5}$ analyzer of any kind. MCAQ currently operates 2 $PM_{2.5}$ stations equipped with federal reference method (FRM) samplers at 37-119-0041 and 37-119-0045. MCAQ operates three (3) continuous $PM_{2.5}$ monitors at 37-119-0041, 37-119-0045 and 37-119-0048.

The section (40 CFR 58 § 4.7) also requires a $PM_{2.5}$ analyzer to be located at the near-road NO_2 monitoring station. MCAQ established a federal reference monitor and continuous $PM_{2.5}$ monitor at station 37-119-0045 in 2017.

The annual wind rose in Figure 17 indicates prevailing winds from the southwest with both a northerly and southerly component.

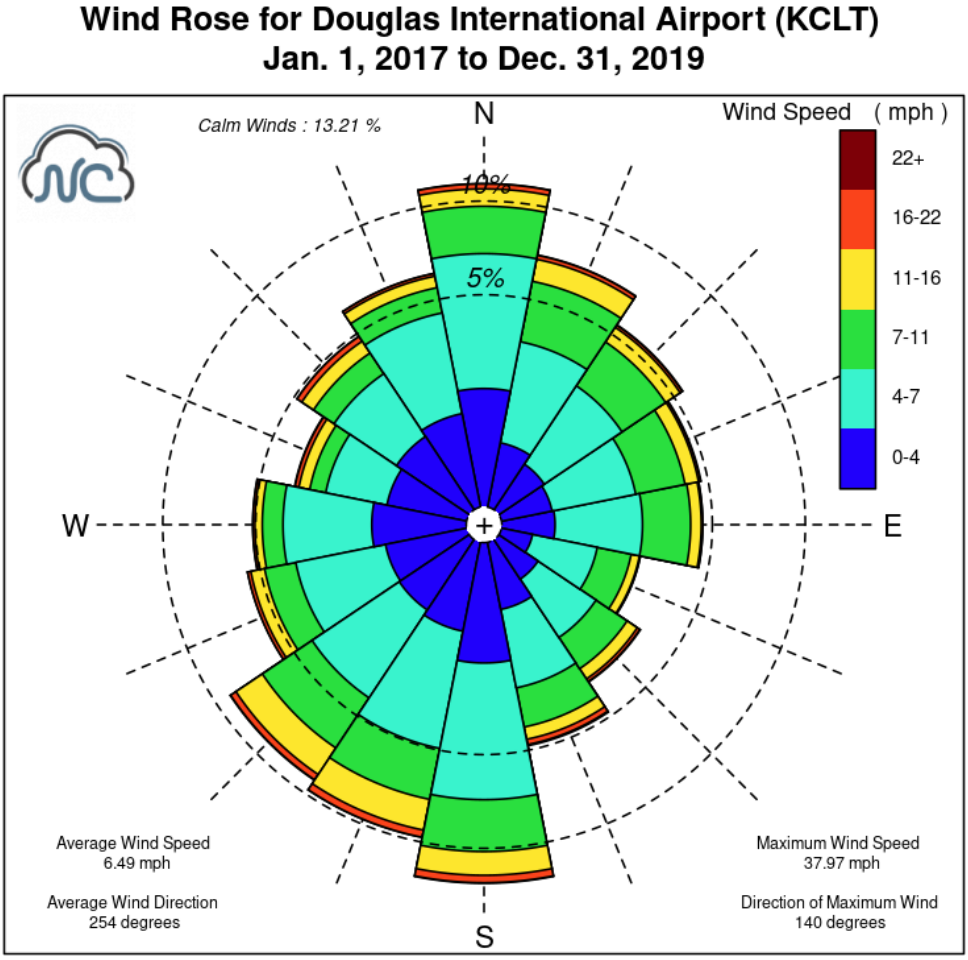

Figure 17. Wind Rose NWS Station KCLT - 20172019

Station 37-119-0041 (Garinger, Figure 18) is located 5.4 kilometers ENE of the central business district of Charlotte, NC and monitors maximum concentrations in an area of high population density. The site is typical of urban areas within Mecklenburg County. The site is designed to measure particulate emissions originating from a wide variety of mobile, commercial, and industrial sources.

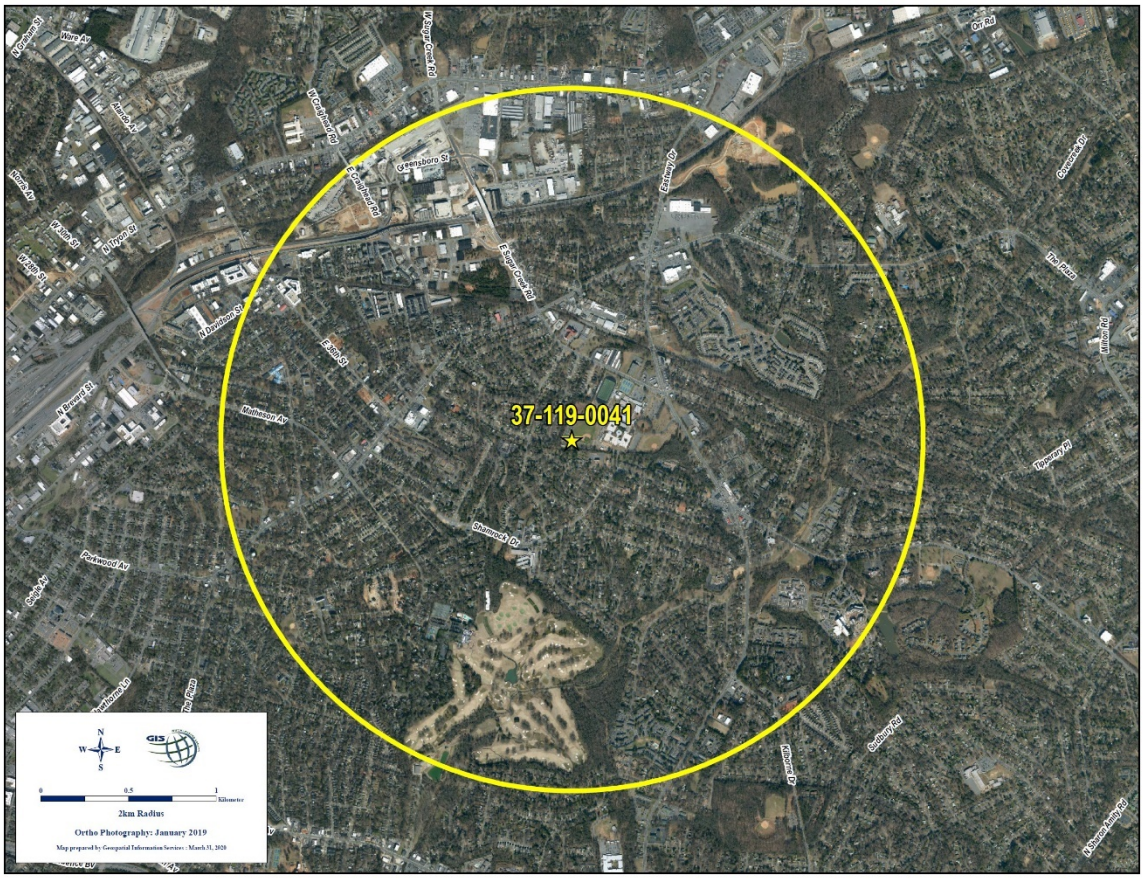

Figure 18. Garinger (37-119-0041) with 4 km diameter circle

Station 37-119-0045 (Remount, Figure 19) is located 8.8 kilometers SSW of the central business district of uptown Charlotte, NC. The site is designed to monitor maximum concentrations in the near-road environment in an area of high population density.

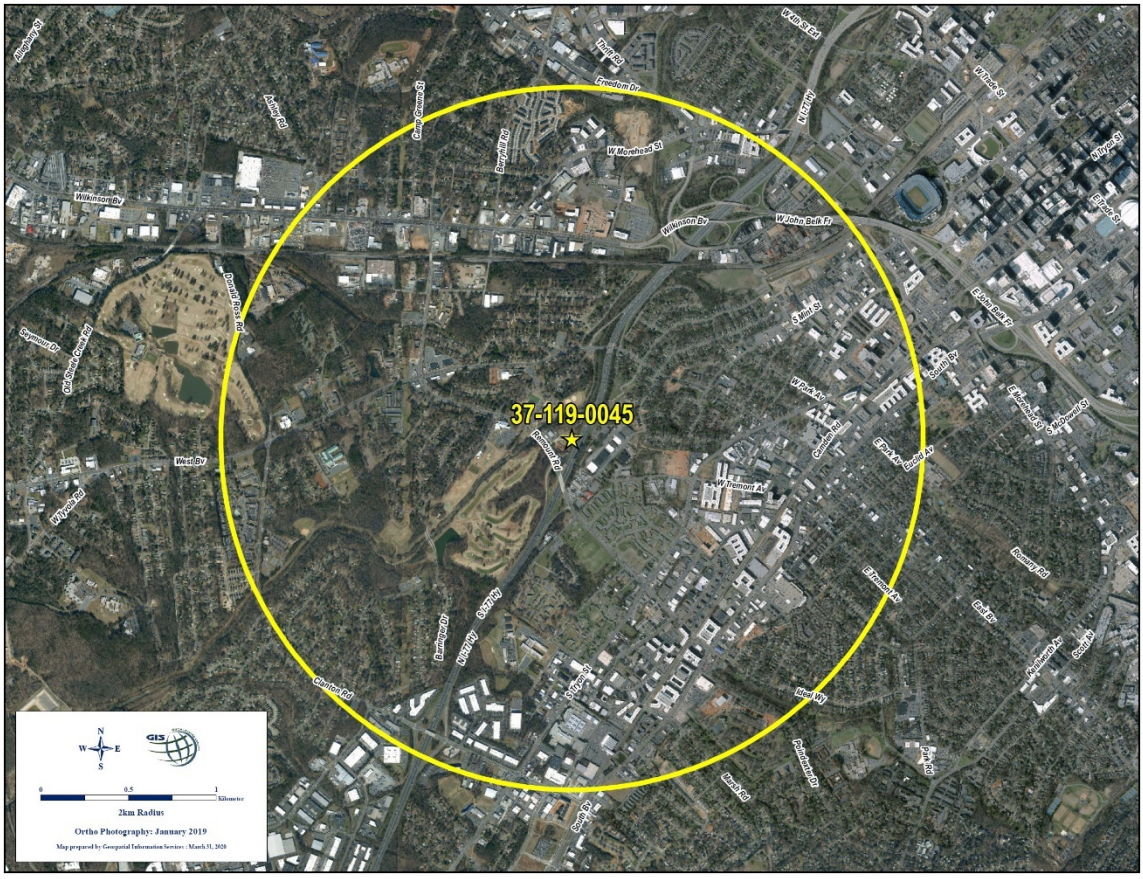

Figure 19. Remount (37-119-0045) with 4 km diameter circle

Station 37-119-0048 (Friendship Park, Figure 20) is located 6.4 kilometers North of the central business district of Charlotte, NC. The site is designed to monitor population exposure in an area of high population density.

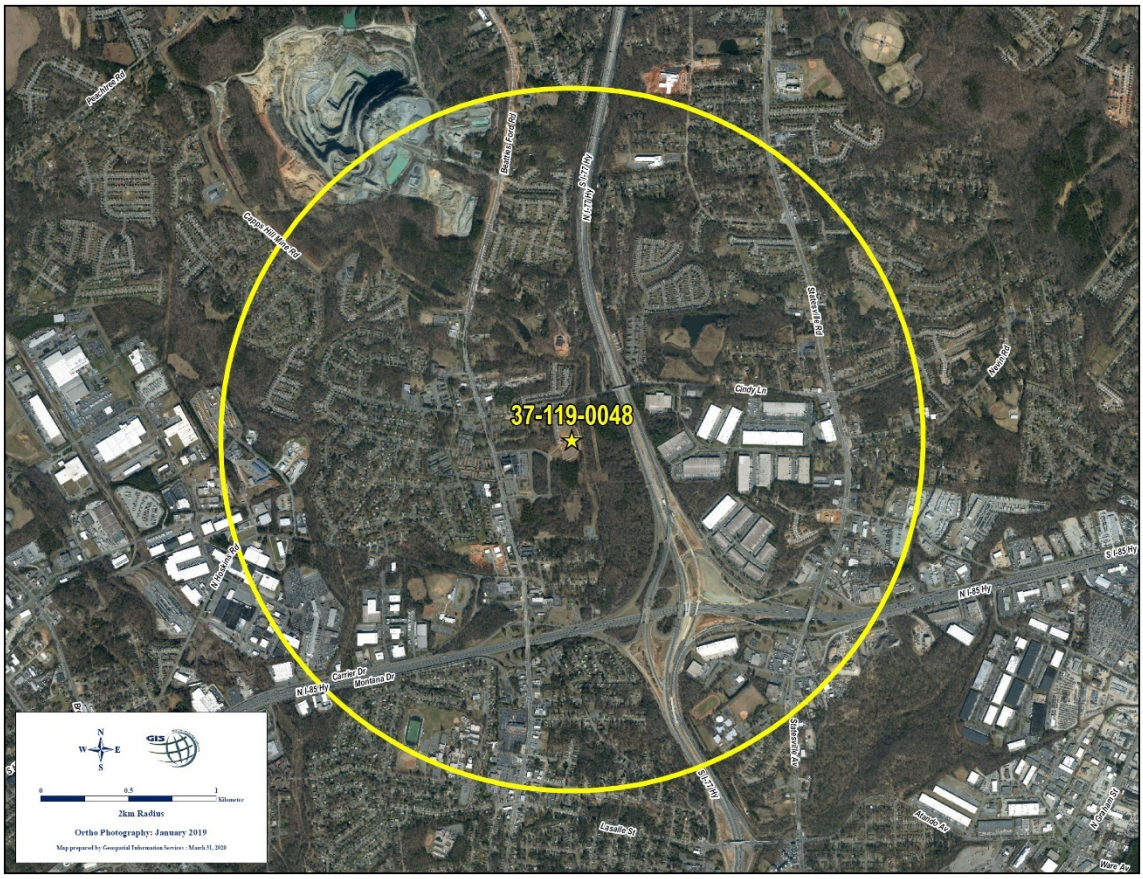

Figure 20. Friendship Park (37-119-0048) with a 4km diameter circle

3.2.1 Compliance with 40 CFR 58 Appendix D, §1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from three (3) continuous $PM_{2.5}$ monitoring sites in order to comply with the requirement to provide data to the public in a timely manner. Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ $PM_{2.5}$ data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After $PM_{2.5}$ data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:
Data from the MCAQ $PM_{2.5}$ monitoring network complies with applicable siting requirements and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the three monitoring sites operated by MCAQ may be used in the development of attainment and maintenance plans. Data from the two (2) SLAMS sites (37-119-0045 and 37-119-0048) and the NCore site (37-119-0041) is available for use in the evaluation of regional air quality models used in developing emission strategies, and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:
Site 37-119-0041 (Garinger) is an NCore site and may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development. Additionally, a $PM_{2.5}$ speciation sampler is operated at the Garinger (37-119-0041) site as part of the speciation trends network (STN).

Discussion of 40 CFR 58 Appendix D§1.1.1 Types of Monitoring Sites:
The MCAQ $PM_{2.5}$ monitoring network is designed to support the air quality management work indicated in the three basic air monitoring objectives listed above by providing measurements at sites in areas that represent area-wide air quality.

The three sites in the MCAQ network are located to measure area wide $PM_{2.5}$ concentrations in three geographically distinct areas of the county. The sites are located to measure population exposure (Figure 21) and expected maximum concentrations under a variety of meteorological conditions in areas of poor air quality. The monitoring sites measure emissions from a wide variety of emission source types, including industrial, commercial, and mobile sources.

The MCAQ network as summarized above meets the monitoring objectives of 40 CFR 58, Appendix D, §1.1.

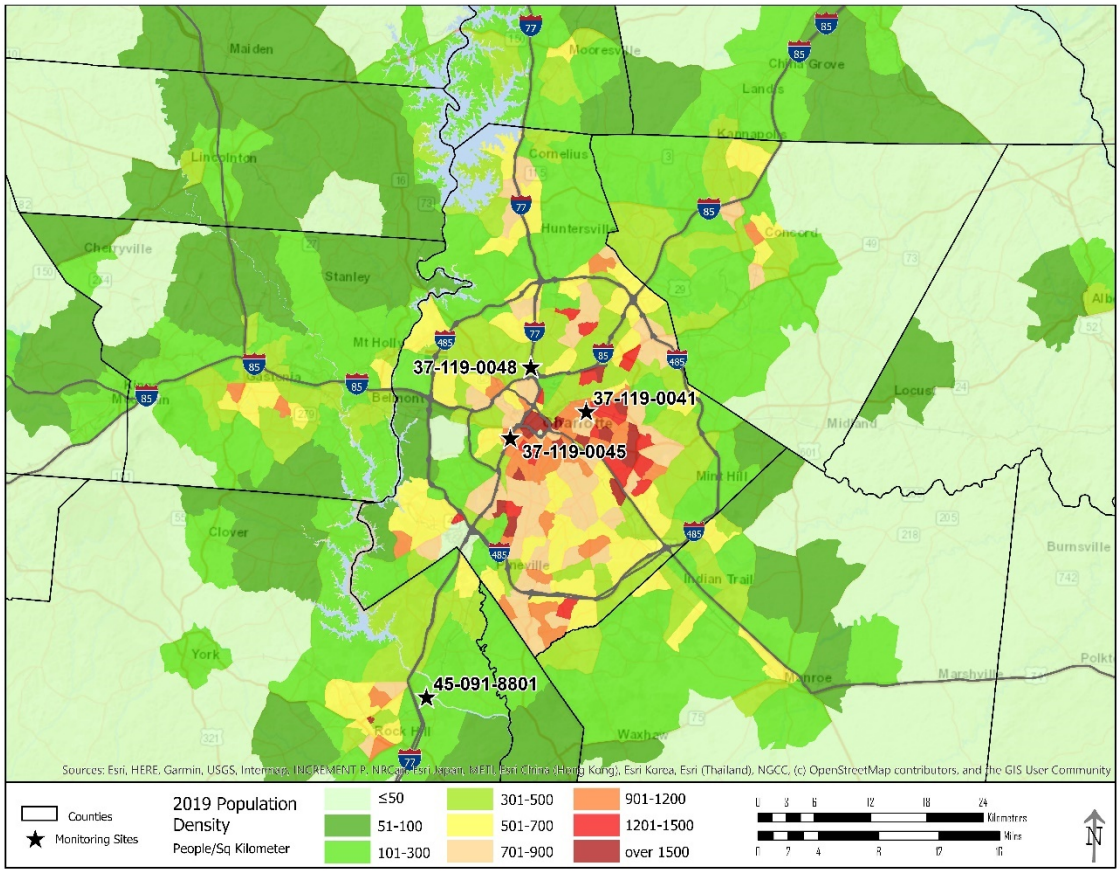

Figure 21. 2019 Census Population Projections

3.2.2 Need for New Monitoring Sites

The MCAQ network is comprised of 3 monitoring sites. A minimum of two $PM_{2.5}$ sites are required for the MSA. MCAQ operates 3 of 4 sites in the MSA.

Station 37-119-0041 is an approved NCore site. The site is population-oriented and is designed to measure expected maximum concentrations in an area of high population density. The site is located 5.4 km downwind of the central business district of Charlotte, NC.

Station 37-119-0045 is a required near-road site for $PM_{2.5}$ per section (40 CFR 58 § 4.7). The site is located 35 m from I-77. I-77 at this location has a 2018 AADT of 154,000 and is ranked 13th highest AADT in Mecklenburg County.

Station 37-119-0048 is a population-oriented site. The site measures concentrations in an area downwind of industrial and commercial emission sources west of Charlotte's central business district.

Currently, the $PM_{2.5}$ monitoring network operated by MCAQ meets and exceeds the minimum monitoring requirements of 40 CFR 58 Appendix D.

3.2.3 Need to Terminate Existing Sites

To ensure that $PM_{2.5}$ concentrations are fully characterized geographically, the three $PM_{2.5}$ monitoring sites in the MCAQ network should continue operation.

3.2.4 Appropriateness of New Technologies

MCAQ is currently using the Thermoenvironmental Model 2025i Sequential $PM_{2.5}$ samplers for filter-based sampling. The technology is a proven Federal Reference Method (FRM) that meets monitoring requirements.

MCAQ operates a Met One Beta Attenuation Monitor (BAM - Model 1020) at the NCore monitoring station (37-119-0041). MCAQ operates Met One Beta Attenuation Monitors (BAM - Model 1022) at 37-119-0045 and 37-119-0048. During the next five (5) years it is expected that as technologies for continuous $PM_{2.5}$ monitoring improve, MCAQ may transition to them if resources are available.

$PM_{2.5}$ speciation sampling is required at the NCore monitoring site (37-119-0041). Monitoring is conducted with the Met One SuperSASS sampler (inorganic compounds and ions) and the URG 3000n sampler (carbon parameters). Due to the age of the instruments, both the Met One and URG instruments may need replacing in the next 5 years, if resources are available.

3.2.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Susceptible individuals in this assessment are defined as those individuals less than (<) 5 years of age and greater than (>) 64 years of age. Site 37-119-0041 is located in an area of high population density of individuals under 5 years of age and over 64 years of age. Site 37-119-0048 is also located in an area with a high density of susceptible individuals (under the age of 5). The maps in Figures 22 and 23 display the location of the sites in relation to the population densities of person under the age of 5 (Figure 22) and over the age of 64 (Figure 23).

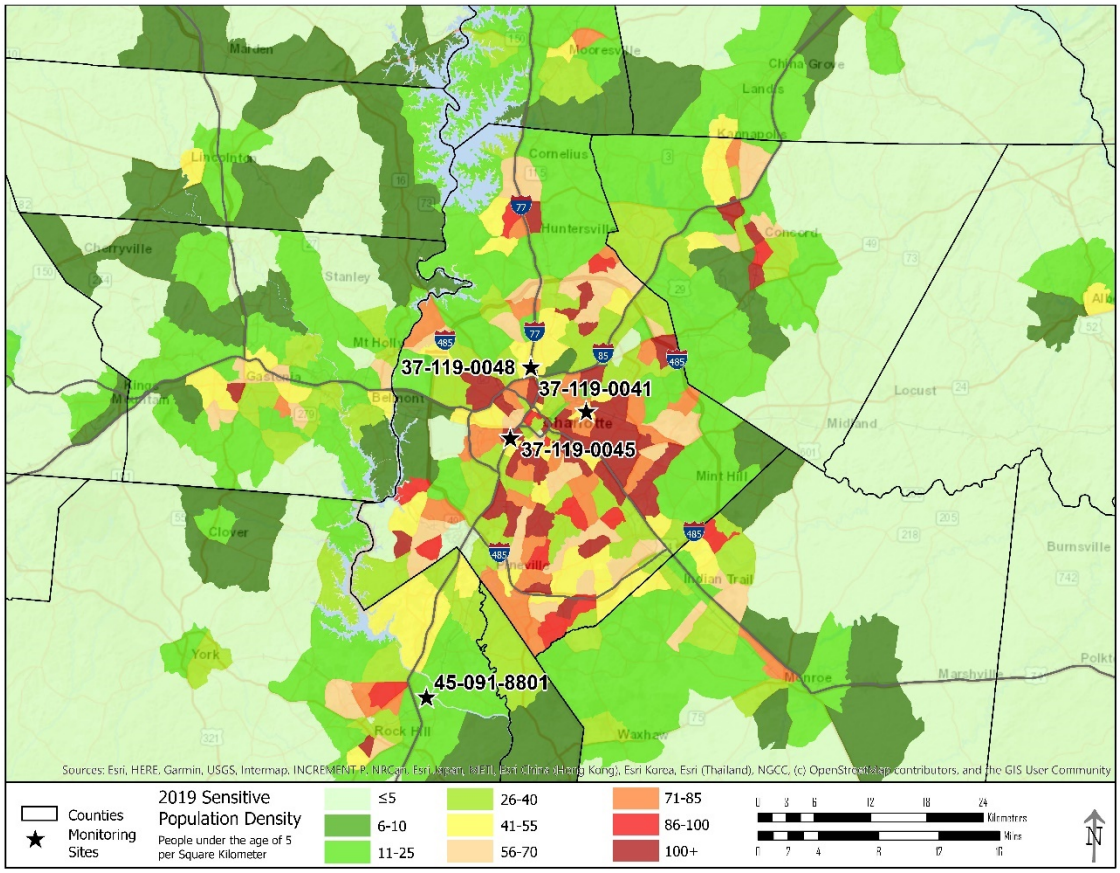

Figure 22. 2019 Census Population Projections - People under the age of 5

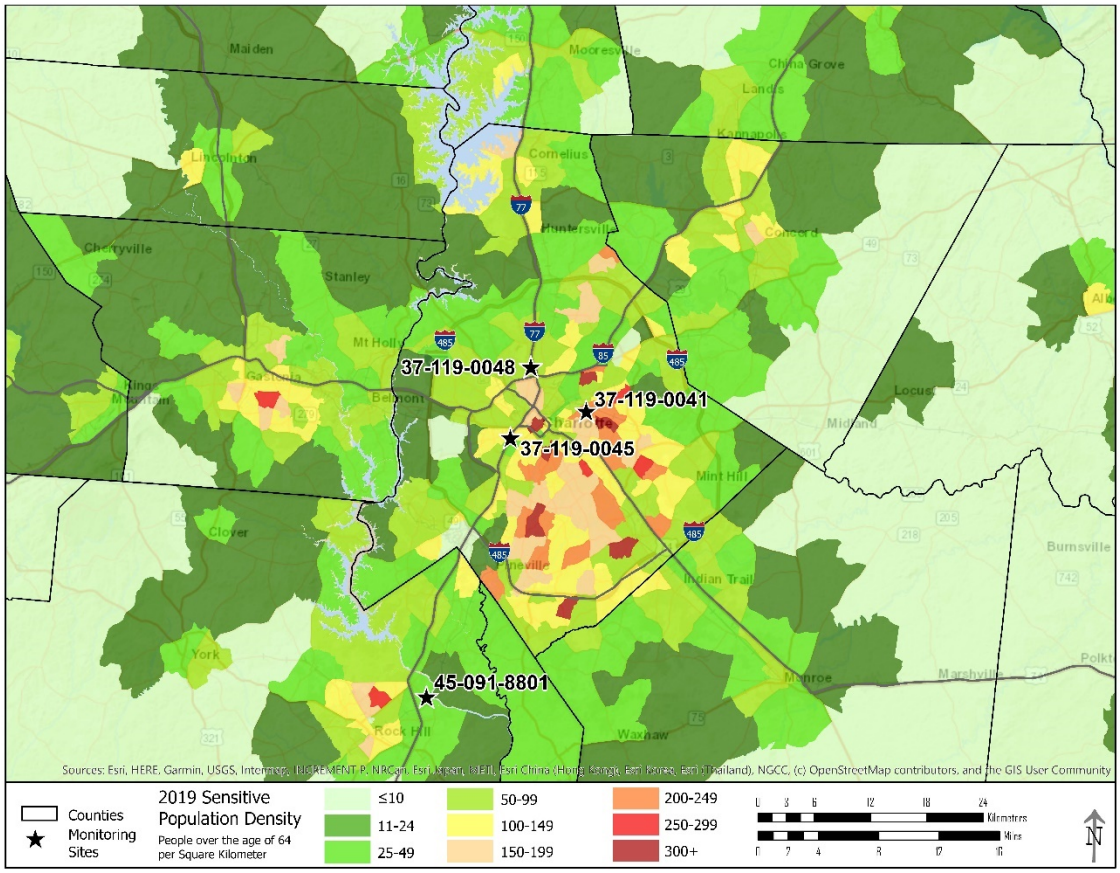

Figure 23. 2019 Census Population Projections - People over the age of 64

3.2.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of the three $PM_{2.5}$ monitoring sites in the network. There should be no impact on data users or health studies resulting from the relocation of the Montclaire (37-119-0042) monitoring station.

3.2.7 $PM_{2.5}$ Changes to Population-Oriented Sites

The MCAQ $PM_{2.5}$ monitoring sites 37-119-0041 and 37-119-0048 are sited for population-oriented monitoring. The population of Mecklenburg County has increased by 7.0% from 2015 (1,033,282) to 2019 (1,110,901). Population increases have occurred in almost all areas of Mecklenburg County.

3.2.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.2.9. Historical Data

24-hour design values (compliance value) measured at MCAQ monitoring stations in 2019 have declined by -25.0% from year 2010 levels (Figure 24). Annual design values have declined by -24.4% from 2010 levels (Figure 25).

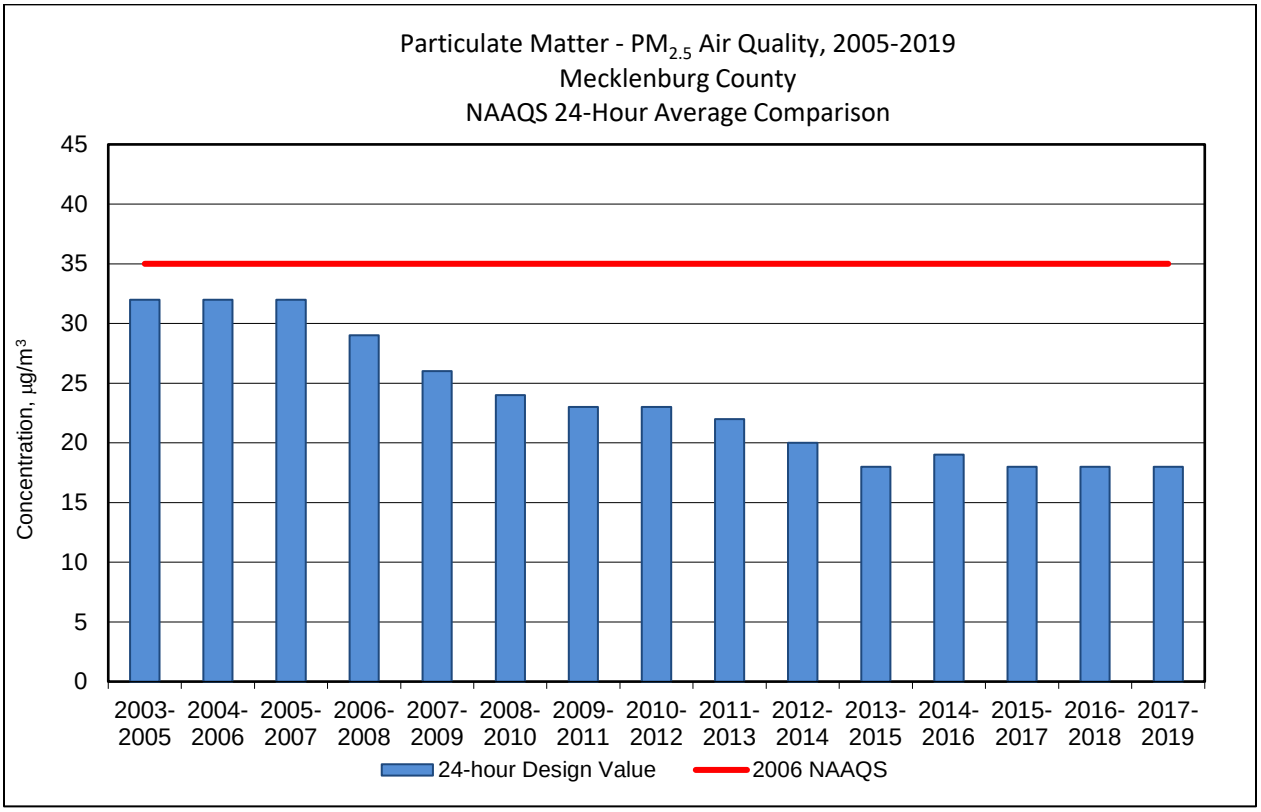

Figure 24. $PM_{2.5}$ 24-Hr NAAQS Comparison

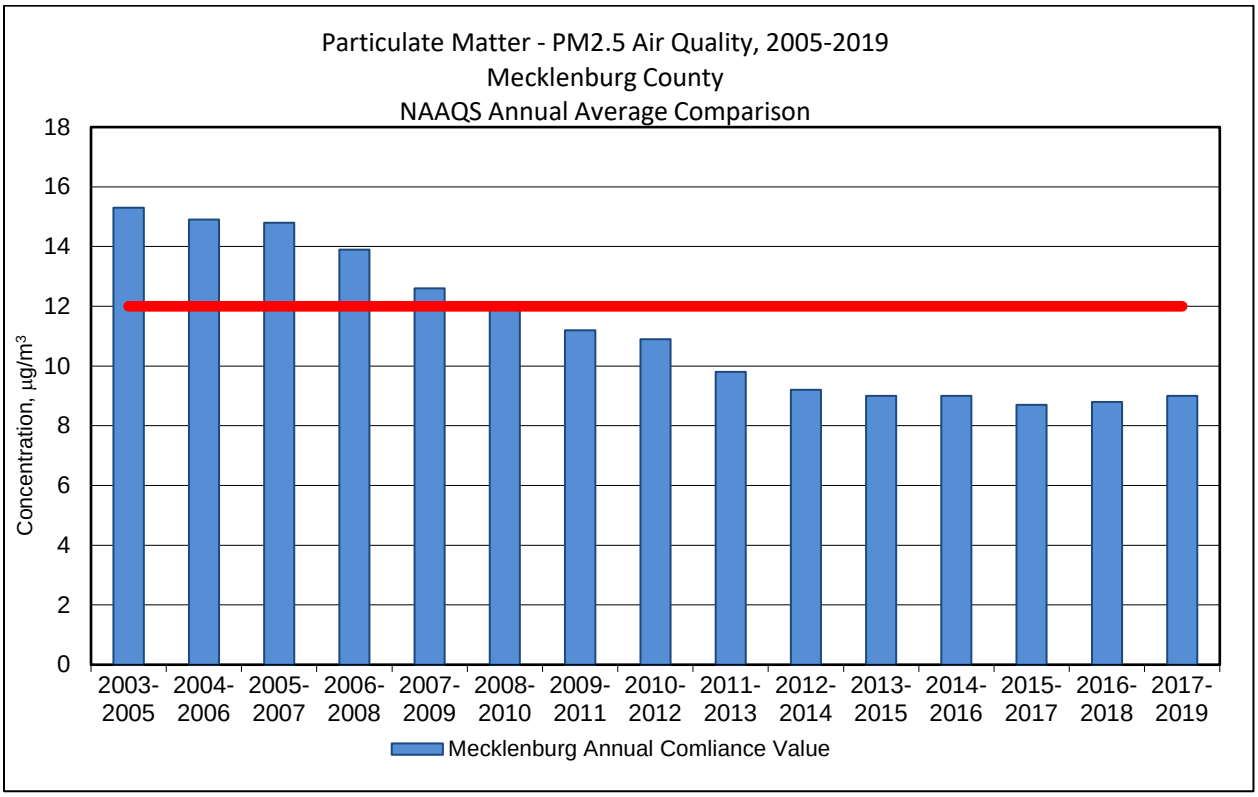

Figure 25. $PM_{2.5}$ Annual NAAQS Comparison

3.2.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

40 CFR 58 Appendix D § 4.7.1(b): "…The required monitoring stations or sites must be sited to represent area-wide air quality. These sites can include sites collocated at PAMS. These monitoring stations will typically be at neighborhood or urban-scale; however, micro-or middle-scale $PM_{2.5}$ monitoring sites that represent many such locations throughout a metropolitan area are considered to represent area-wide air quality…"

Station 37-119-0041 and 37-119-0048 represents area-wide air quality. They are population-oriented neighborhood scale sites. These sites are located to measure population exposure in areas of potentially poor air quality. The sites are also suitable for the measurement of expected maximum concentrations that may occur in the network.

The near-road monitoring station (37-119-0045) is micro-scale in accordance with 40 CFR 58 requirements and represents area-wide air quality.

3.2.11 Monitoring Spatial Redundancy or Gaps

Each site operated in the MCAQ network is sited to provide information regarding concentrations in distinct geographical regions of the county and to provide data under a variety of the most common meteorological conditions. All three sites are sited to measure area-wide air quality. The MCAQ $PM_{2.5}$ monitoring sites provide data that "represent conditions in areas where people commonly live and work for periods comparable to those specified in the NAAQS" (40 CFR 58 Appendix D § 4.7.1(c)(3). Each site provides data from areas that are somewhat unique but are representative of several basic area types within the county. Site 37-119-0041 is an urban residential area

with institutional, commercial, and light industrial development. Site 37-119-0048 is urban, commercial, and industrial. Site 37-119-0045 is micro-scale with commercial and mobile sources. The network provides spatial uniformity with an acceptable level of redundancy, while minimizing gaps in coverage of the area served.

3.2.12 Programmatic Trends or Shifts in Data Needs

In the past 5 years Mecklenburg County has monitored levels of $PM_{2.5}$ below the annual NAAQS of 12.0 $\mu g/m^3$. Operation of a representative, accurate, and reliable $PM_{2.5}$ monitoring network should remain a high priority.

3.2.13 $PM_{2.5}$ Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figure 26 depicts the location of the MCAQ $PM_{2.5}$ monitoring stations relative to point source emissions of $PM_{2.5}$. Point sources plotted on these maps represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

The MCAQ $PM_{2.5}$ monitoring stations are located so that they should capture the influence of upwind sources.

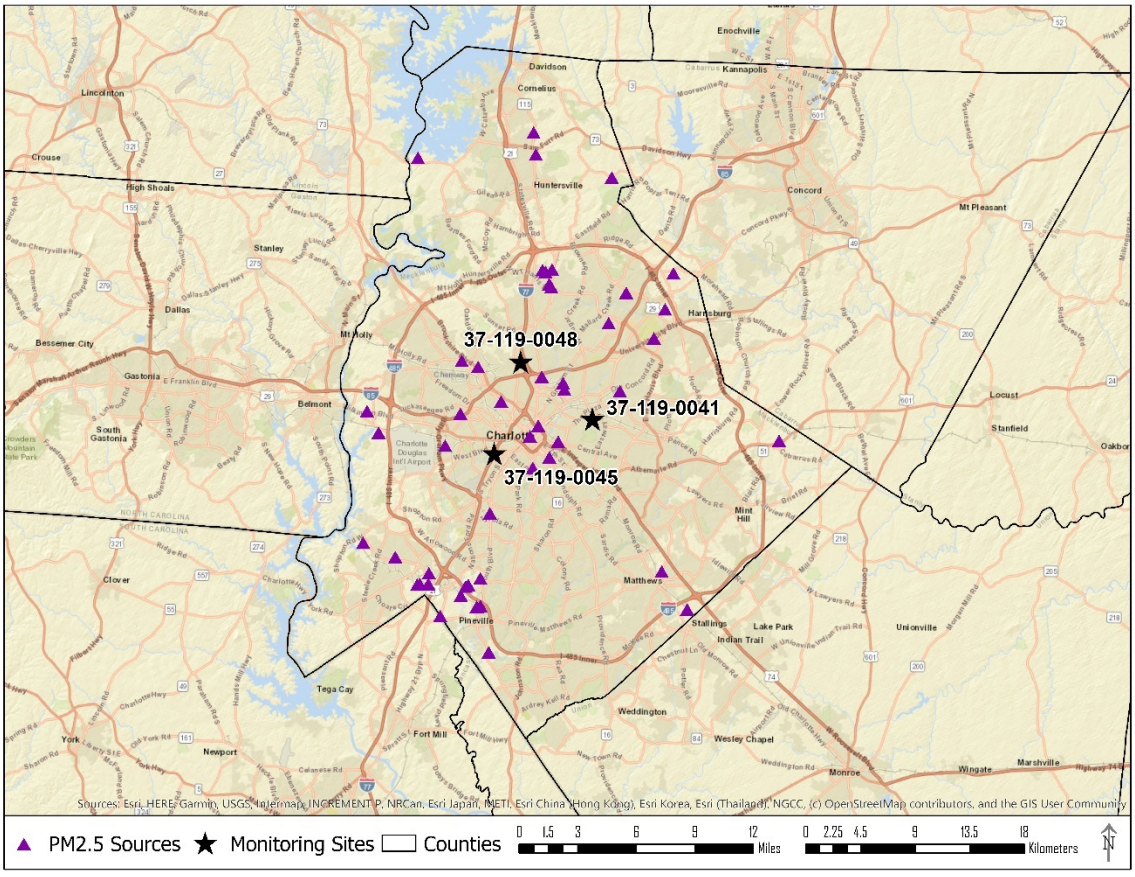

Figure 26. $PM_{2.5}$ Emission Point Sources - Synthetic Minor and Title 5

3.2.14 Summary of Assessment for $PM_{2.5}$

The MCAQ monitoring stations (37-119-0041 and 37-119-0048) as discussed above meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The stations are sited in accordance with 40 CFR 58, Appendix D, §4.7. They are sited to represent area-wide air quality at the neighborhood scale of representativeness in areas of expected maximum concentration. Station 37-119-0045 complies with 40 CFR 58 Appendix D, §4.7.1 (b)(2) requirements for a $PM_{2.5}$ station at a near-road location.

3.3 Carbon Monoxide (CO)

40 CFR 58 Appendix D, §3(b) and 40 CFR 58 Appendix D, §4.2 provide the design criteria for CO monitoring. CO monitoring is required at NCore stations and at a near-road NO_2 monitoring station (Figure 27).

MCAQ operates one (1) neighborhood scale CO monitor (37-119-0041) at the Garinger NCore station (Figure 28). MCAQ also operates one (1) microscale CO monitor (37-119-0045) at the Remount near-road station (Figure 29).

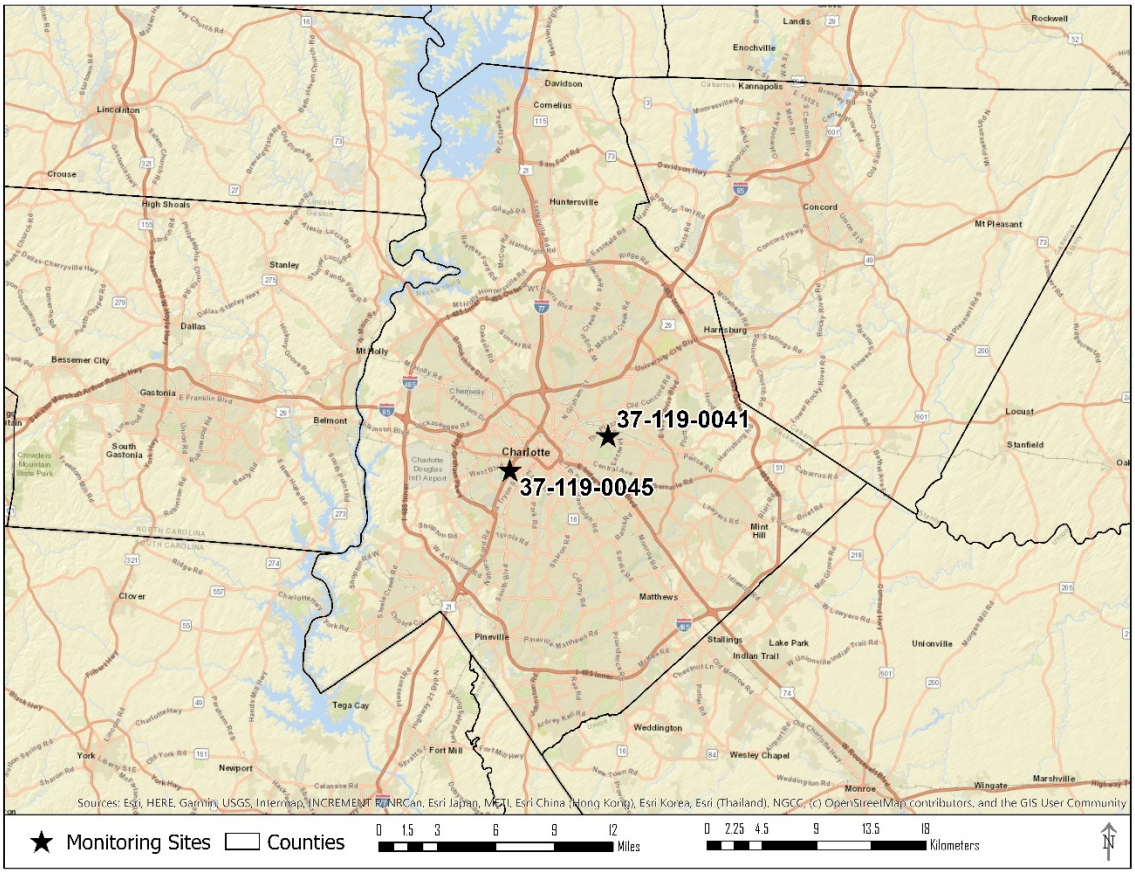

Figure 27. MCAQ CO Monitoring Stations

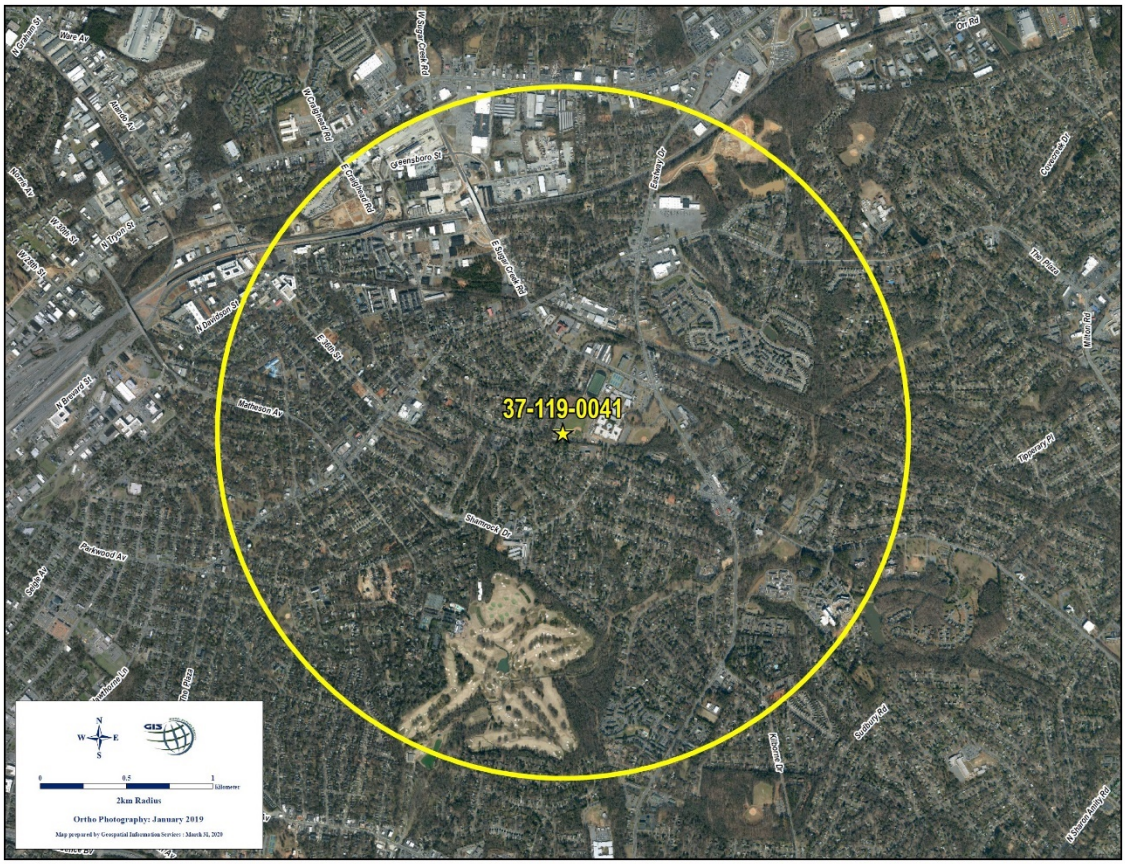

Figure 28. Garinger (37-119-0041) with 4 km diameter circle

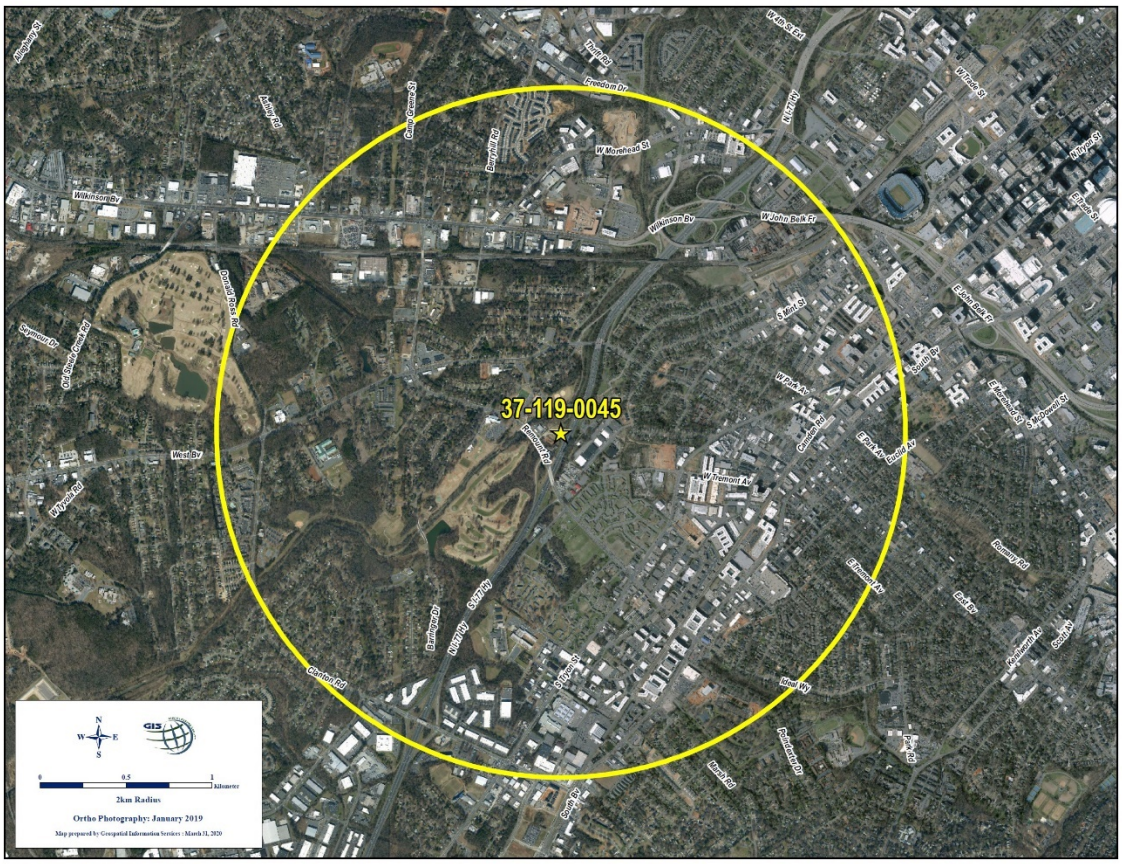

Figure 29. Remount (37-119-0045) with 4km diameter circle

3.3.1 Compliance with 40 CFR 58 Appendix D, §1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from two (2) CO monitoring sites. Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ CO data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After CO data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:

Data from the MCAQ CO monitoring network complies with applicable siting requirements and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the two CO monitoring sites operated by MCAQ may be used in the development of attainment and maintenance plans. Data from the near-road site (37-119-0045) and the NCore site (37-119-0041) is available for use in the evaluation of regional air quality models used in developing emission strategies and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:

Site 37-119-0041 (Garinger) is an NCore site and may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development.

Discussion of 40 CFR 58 Appendix D§1.1.1 Types of Monitoring Sites:

Two monitoring stations are required in the CBSA. One CO monitor is required to operate at an NCore site. Station 37-119-0041 meets this requirement. One CO monitor is required at a near-road station, as required in Section 4.3.2, in CBSAs having a population of 1,000,000 or more persons. The near-road station (37-119-0045) meets the requirements for the additional station.

The MCAQ CO station 37-119-0041 is located to measure CO concentrations in an area of high population density (Figure 30).

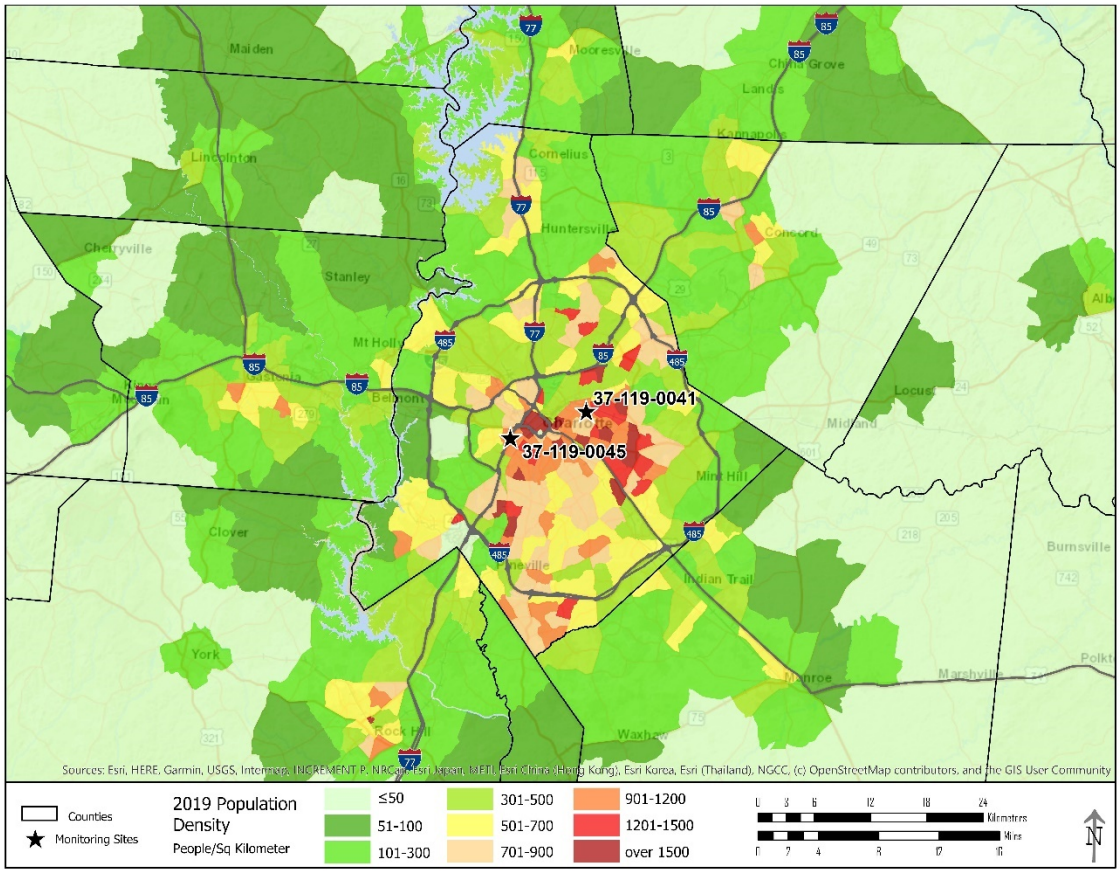

Figure 30. 2019 Census Population Projections

3.3.2 Need for New Monitoring Sites

No new monitoring stations are required as of the date of this assessment.

3.3.3 Need to Terminate Existing Sites

The existing monitoring stations in the MCAQ network should continue in operation.

3.3.4 Appropriateness of New Technologies

MCAQ is currently utilizing CO monitoring instrumentation manufactured by Thermo Environmental Instruments, Inc. (Model 48i-TLE). This instrumentation is one generation older than the most recently designated instrumentation and should be replaced as funding is available.

3.3.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Susceptible individuals in this assessment are defined as those individuals less than (<) 5 years of age and greater than (>) 64 years of age. Site 37-119-0041 and Site 37-119-0045 are located in an area of high population density of individuals under 5 years of age and over 64 years of age. (See Figures 31 and 32).

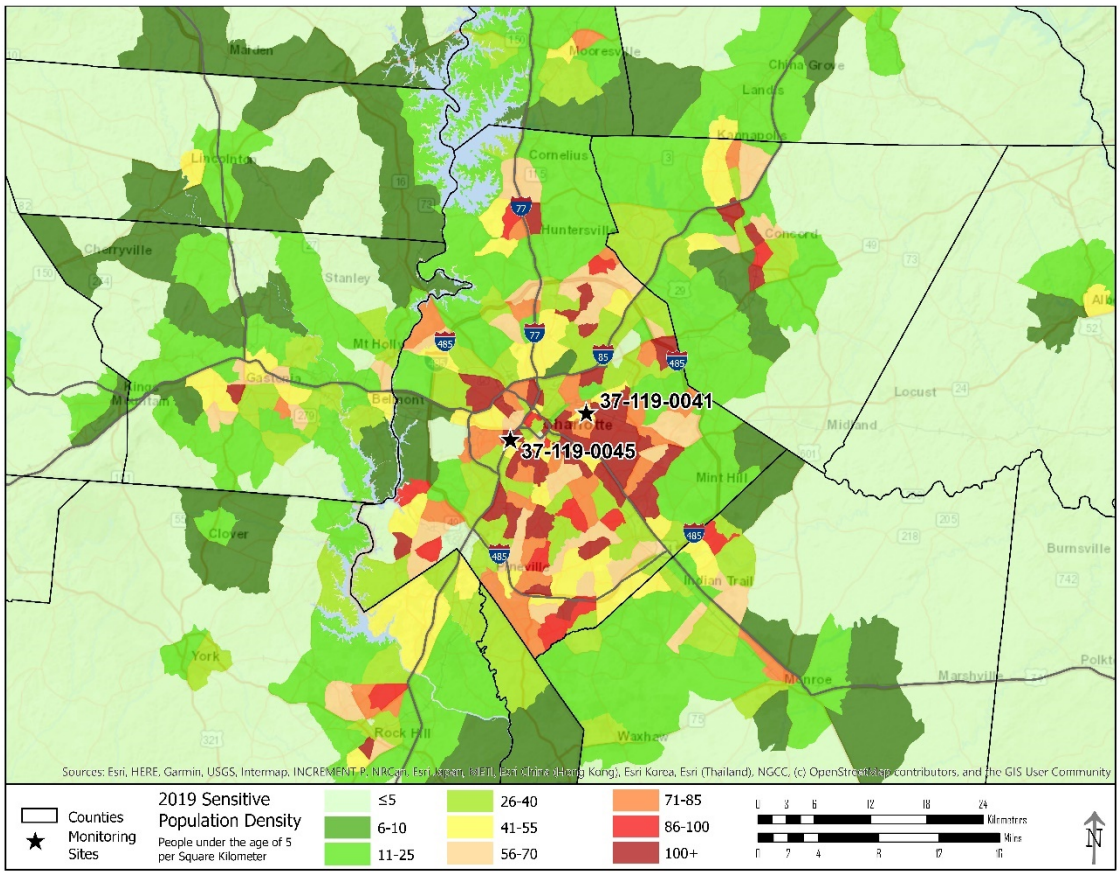

Figure 31. 2019 Census Population Projections for people under the age of 5

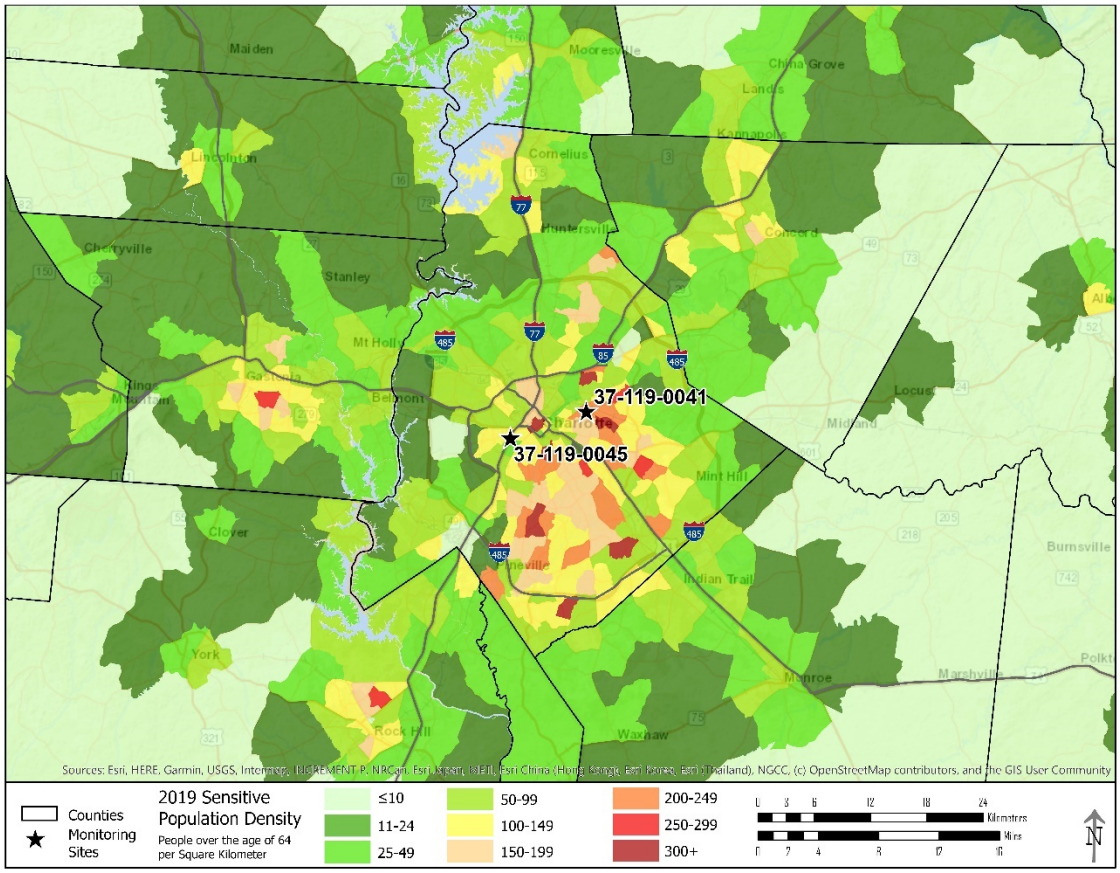

Figure 32. 2019 Census Population Projections for people over the age of 64

3.3.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of the CO monitoring sites in the network. There should be no impact on data users or health studies resulting from site discontinuance.

3.3.7 $PM_{2.5}$ Changes to Population-Oriented Sites

Not Applicable.

3.3.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.3.9. Historical Data

8-hour design values (compliance value) measured at the MCAQ monitoring station in 2019 have declined by -54.8% from year 2005 levels (Figure 33) and have remained about the same over the past five years (2015 – 2019).

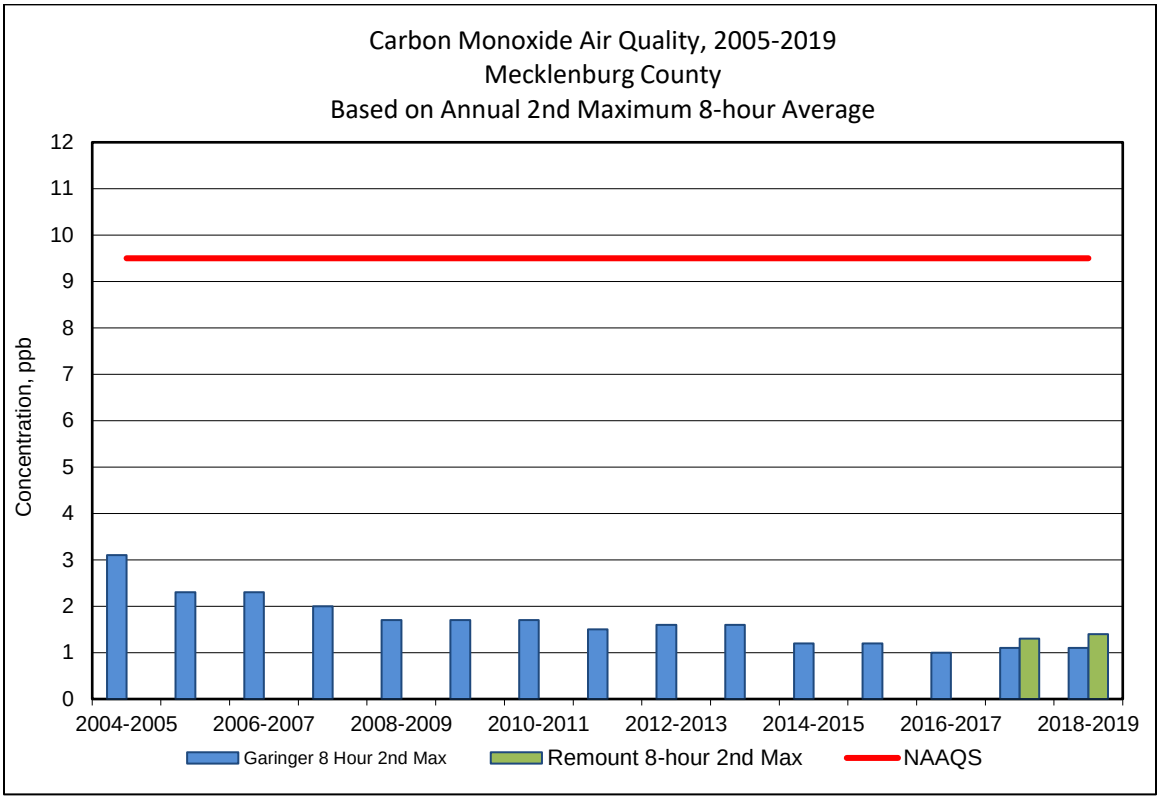

Figure 33. Carbon Monoxide Annual 2nd Maximum 8-Hr Average

3.3.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

Site 37-119-0041 (Garinger) is neighborhood scale and meets the requirements for an area-wide monitoring site for CO. The near-road monitoring station (37-119-0045) is micro-scale in accordance with 40 CFR 58 requirements.

3.3.11 Monitoring Spatial Redundancy or Gaps

Two sites are required in the network. There is no spatial redundancy in the CO monitoring network. There are no gaps in the network.

3.3.12 Programmatic Trends or Shifts in Data Needs

The near-road CO station (37-119-0045) began operation in January 2017. The station supports the near-road requirements of the program. The Garinger NCore station (37-119-0041) meets the needs of the program.

3.3.13 Carbon Monoxide Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figure 34 depicts the location of the MCAQ CO monitoring station relative to point source emissions of CO. Point sources plotted on the map represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

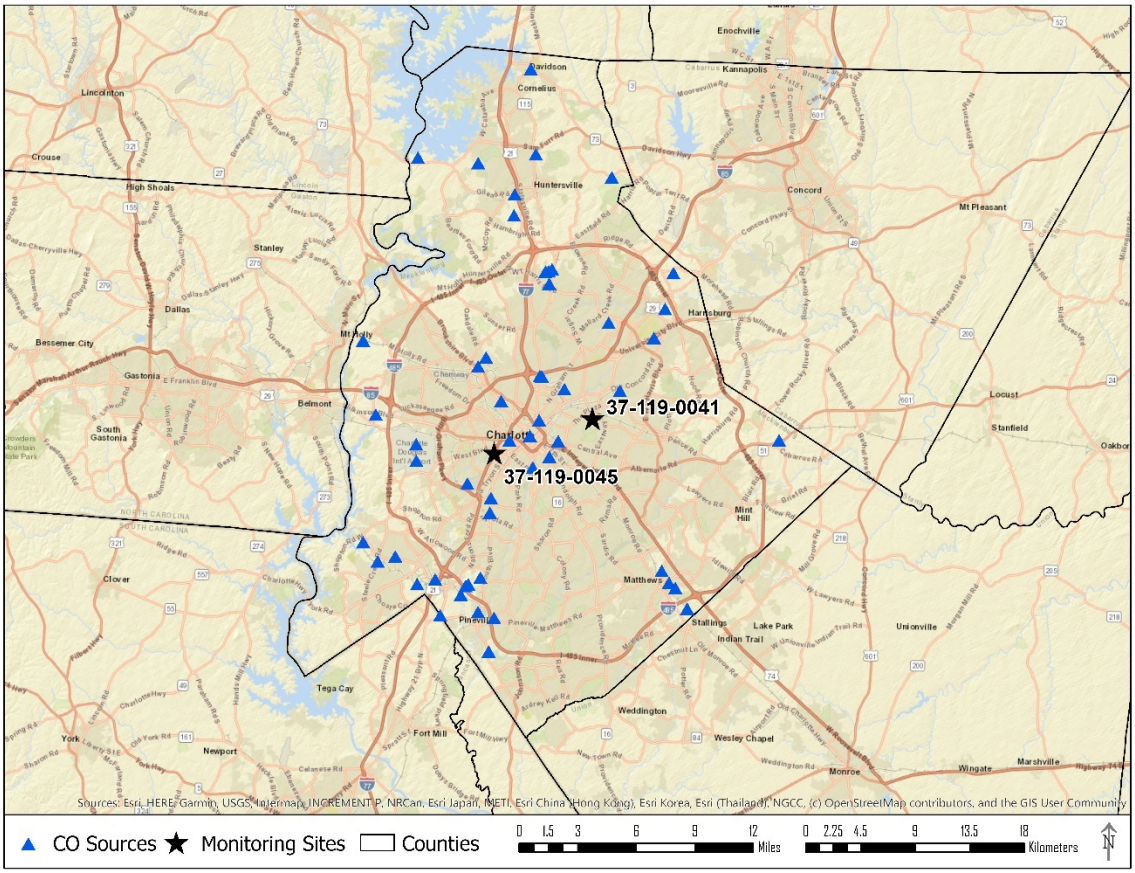

Figure 34. CO Emission Point Sources - Synthetic Minor and Title V

3.3.14 Summary of Assessment for CO

The MCAQ CO monitoring stations (37-119-0041 and 37-119-0045) as discussed above meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The station 37-119-0041 is sited in accordance with 40 CFR 58, Appendix D, §3 for NCore. It is sited to represent typical concentrations in areas of high population density. The station is neighborhood scale of representativeness. The station 37-119-0045 is sited in accordance with 40 CFR 58 Appendix D, §4.2.1 to comply with the requirement to locate a CO monitor at the near-road station.

3.4 Sulfur Dioxide (SO_2)

The required number of monitoring sites in the SO_2 network is determined by the population weighted emissions index (PWEI) for the core based statistical area (CBSA). The formula for determining the PWEI for a CBSA is found in 40 CFR 58 Appendix D § 4.4.2.

PWEI is determined by multiplying the most recent CBSA (Charlotte-Concord-Gastonia, NC-SC) population estimate (2019 estimate = 2,636,883) by the total amount of SO_2 in tons per year emitted within the CBSA (2017 National Emissions Inventory = 5903) and dividing the product by 1,000,000. The calculated PWEI for the Charlotte-Concord-Gastonia, NC-SC CBSA is 15,565.[7]

40 CFR 58 Appendix D § 4.4.2. states "…For any CBSA with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO_2 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 SO_2 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 SO_2 monitor is required within that CBSA**…" This is followed by 40 CFR 58 Appendix D § 4.4.2(1), "…The SO_2 monitoring site(s) 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 this appendix): population exposure, highest concentration, source impacts, general background, or regional transport. SO_2 monitors at NCore stations may satisfy minimum monitoring requirements if that monitor is located within a CBSA with minimally required monitors under this part…"

MCAQ is currently operating one SO_2 monitoring site in the CBSA at 37-119-0041 (Garinger, Figures 35, 36 and 37). The Garinger site is an NCore station that meets the requirements of the regulation in terms of number of stations and station type. An additional station is operated in the CBSA in York County, SC as part of the South Carolina Department of Health and Environmental Control's monitoring network (45-091-0008). This site has been placed on a rotation schedule. It will operate for 2 years from January 1, 2020-December 31, 2021. Then it will be taken out of rotation for 2 years.

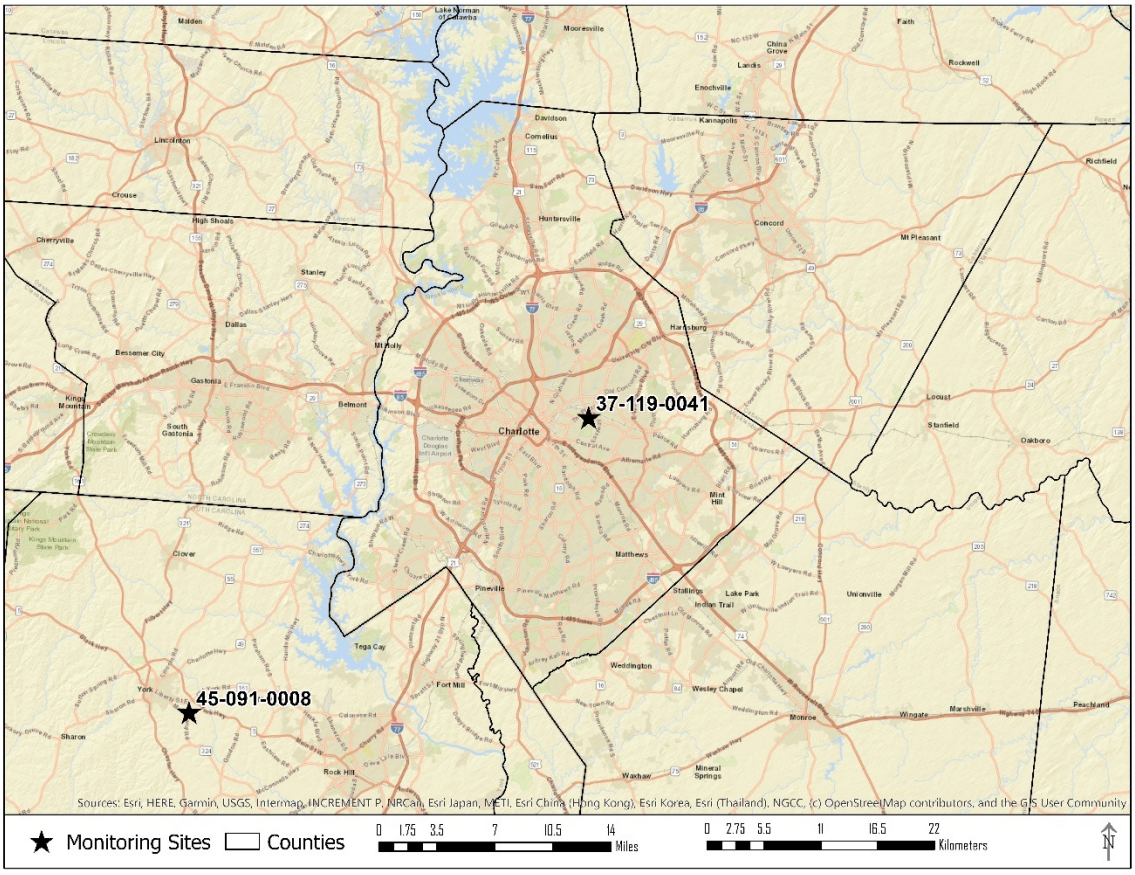

Figure 35. SO_2 monitor stations in the CBSA

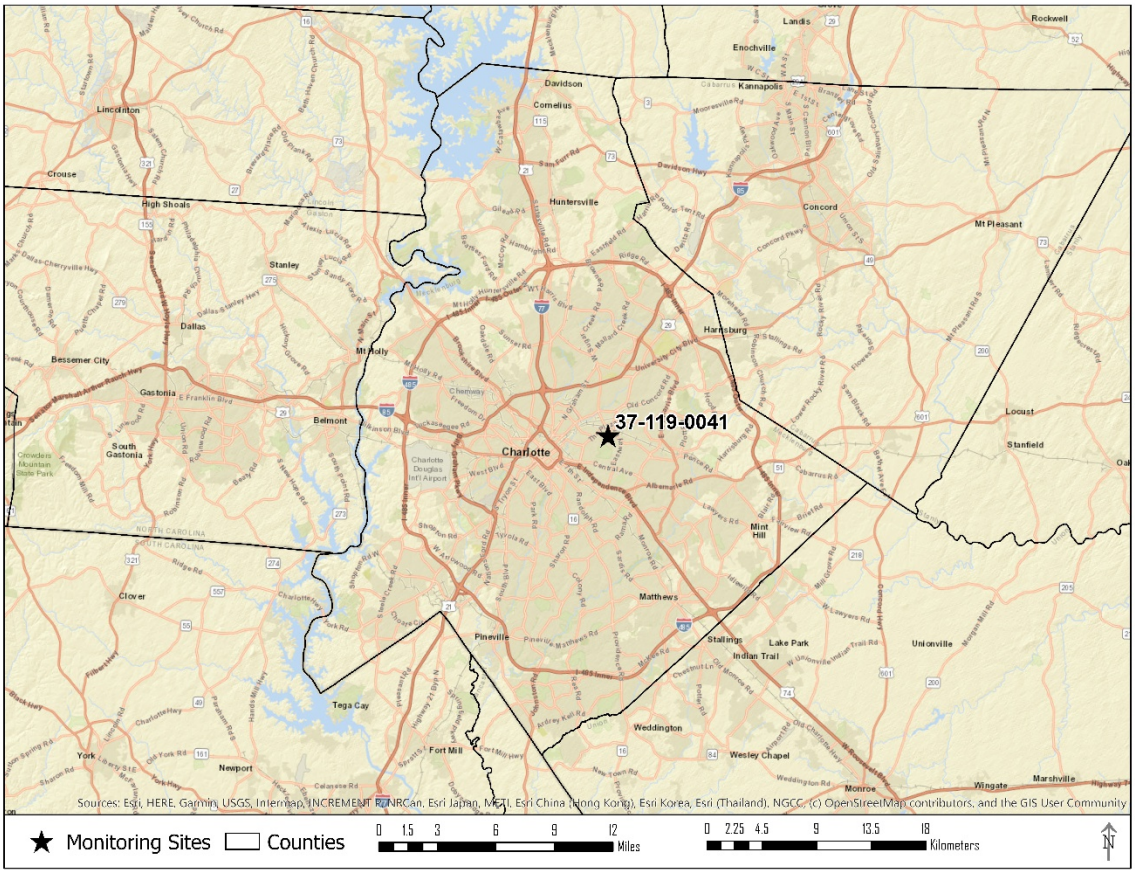

Figure 36. MCAQ SO_2 site

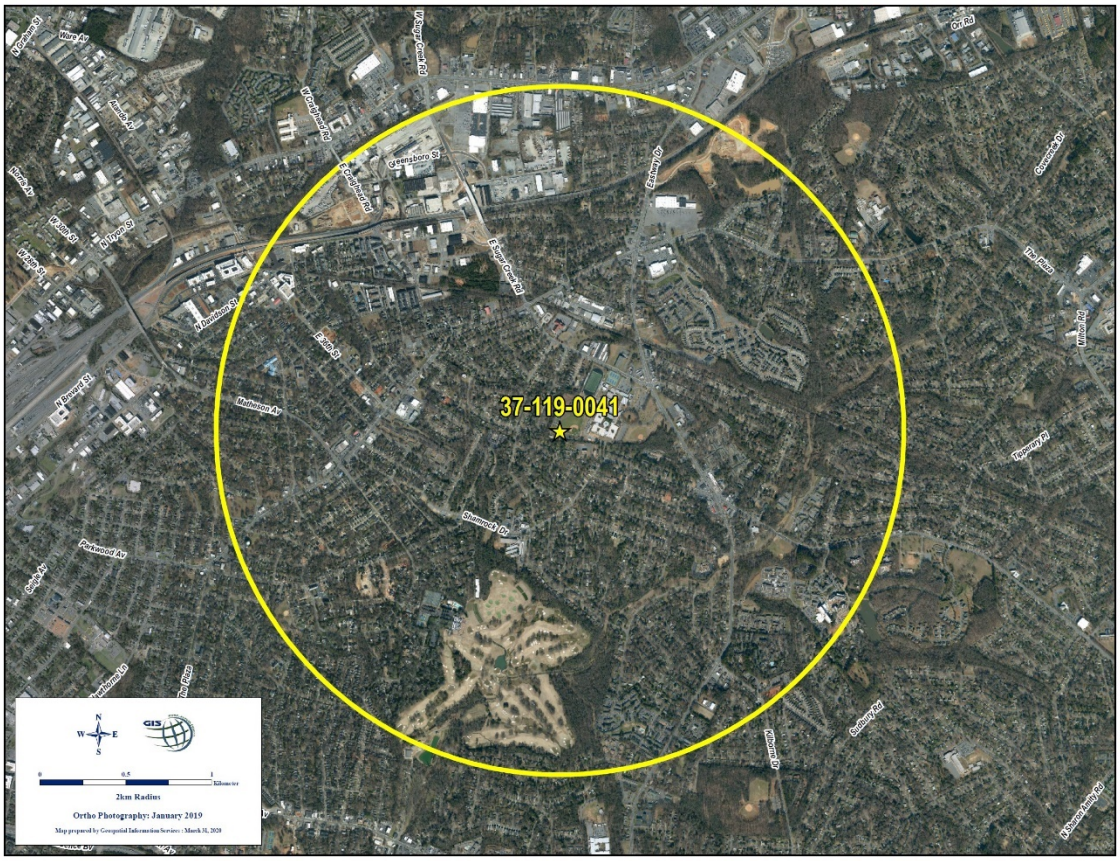

Figure 37. Garinger (37-119-0041) 4 km diameter circle

3.4.1 Compliance with 40 CFR 58 Appendix D, §1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from one (1) SO_2 monitoring site (neighborhood). Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ SO_2 data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After SO_2 data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:

Data from the MCAQ SO_2 monitoring network complies with applicable siting requirements for existing sites and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the monitoring site operated by MCAQ may be used in the development of attainment and maintenance plans. Data from the SLAMS and NCore site (37-119-0041) is available for use in the evaluation of regional air quality models used in developing emission strategies and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:

Site 37-119-0041 (Garinger) is an NCore site and may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development.

Discussion of 40 CFR 58 Appendix D§1.1.1 Types of Monitoring Sites:

One SO_2 monitoring station is required in the CBSA. The site currently in operation at the NCore location (37-119-0041, Garinger) meets siting requirements. The site is located to measure population exposure (Figure 38).

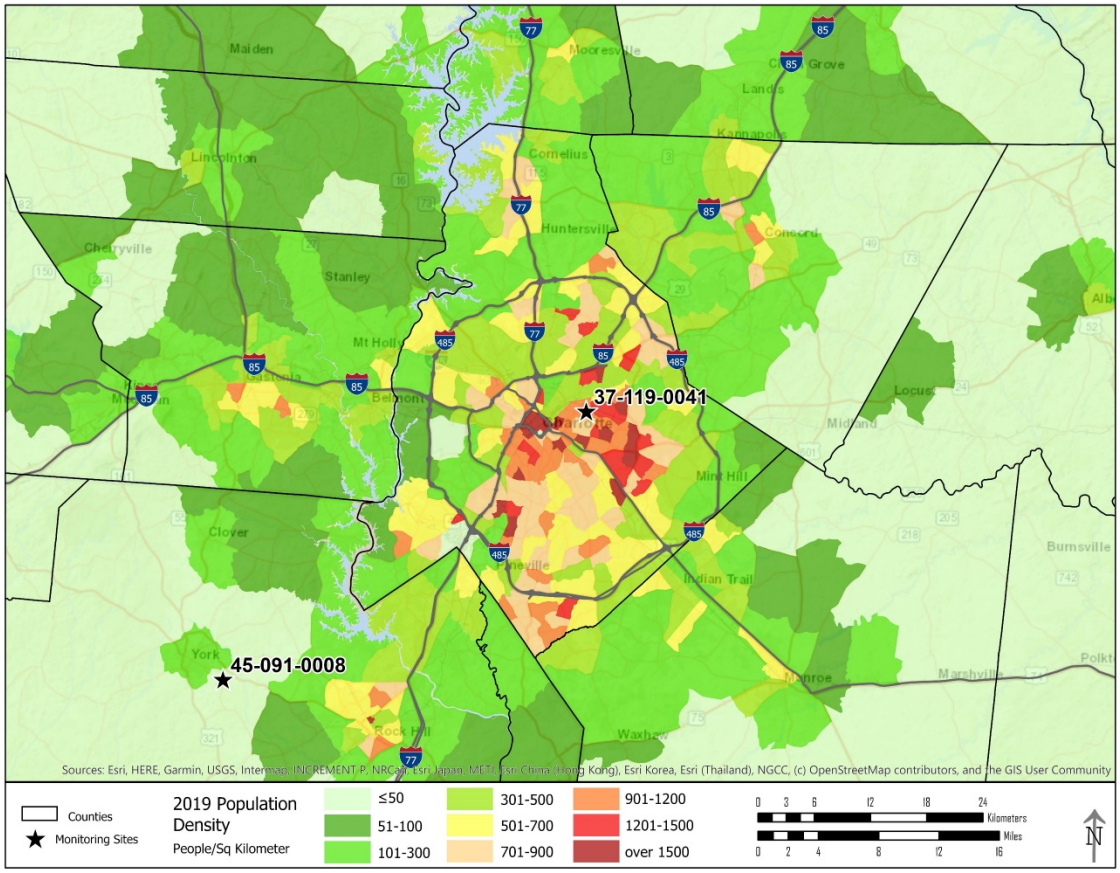

Figure 38. 2019 Census Population Projections

3.4.2 Need for New Monitoring Sites

No new monitoring stations are required as of the date of this assessment.

3.4.3 Need to Terminate Existing Sites

The existing monitoring station in the MCAQ network should continue in operation.

3.4.4 Appropriateness of New Technologies

MCAQ is currently operating the Thermoenvironmental Model 43i-TLE SO_2 analyzer at the NCore monitoring site (37-119-0041, Garinger). This instrumentation is one generation older than the most recently designated instrumentation and should be replaced as funding is available.

3.4.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Susceptible individuals in this assessment are defined as those individuals less than (<) 5 years of age and greater than (>) 64 years of age. Site 37-119-0041 is located in an area of high population density of individuals under 5 years of age and over 64 years of age. (See Figures 39 and 40).

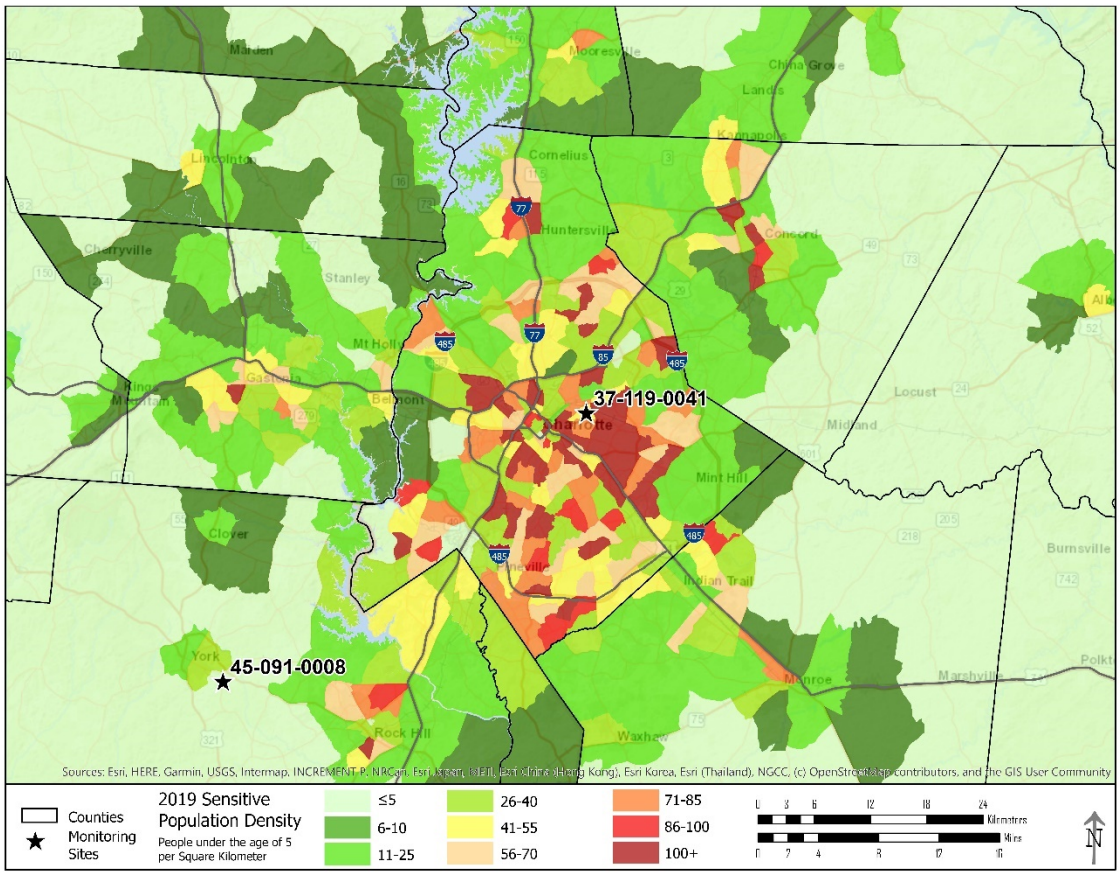

Figure 39. 2019 Census Population Projection for people under the age of 5

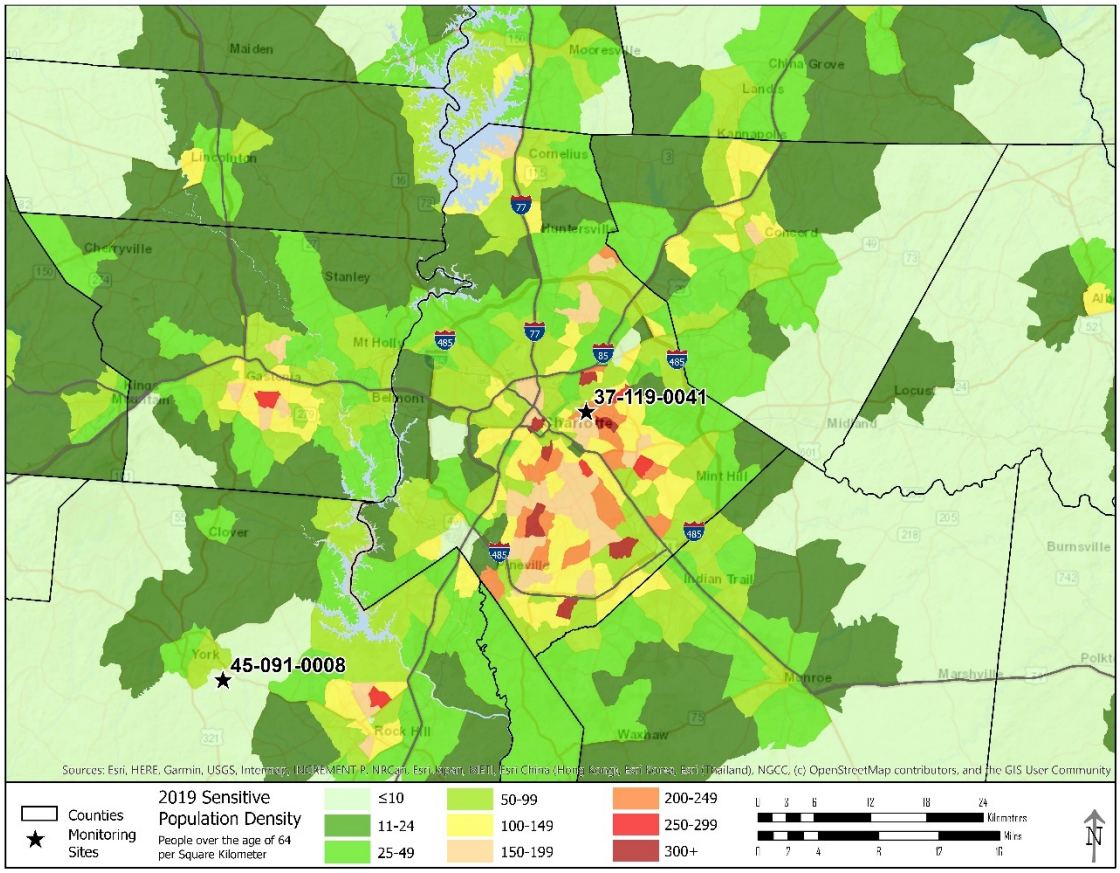

Figure 40. 2019 Census Population Projections for people over the age of 64

3.4.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of the SO_2 monitoring site located at 37-119-0041 (Garinger). There should be no impact on data users or health studies resulting from site discontinuance.

3.4.7 $PM_{2.5}$ Changes to Population-Oriented Sites

Not applicable.

3.4.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.4.9. Historical Data

1-hour design values (compliance value) measured at the MCAQ monitoring station in 2019 have declined by -42.9% from year 2015 levels (Figure 41).

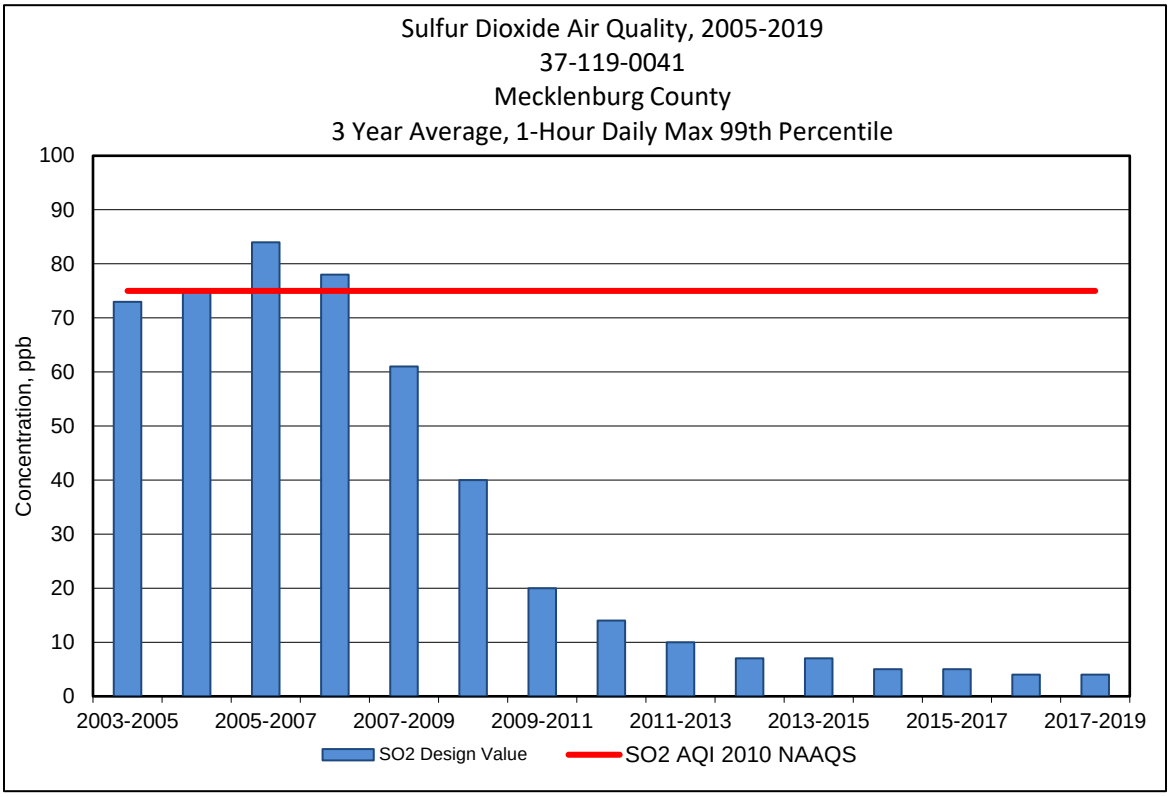

Figure 41. SO_2 3-yr average1-Hr daily Max 99th percentile.

3.4.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

Site 37-119-0041 (Garinger) is neighborhood scale and meets the requirements of 40 CFR 58 Appendix D § 4.4.2(1) for SO_2.

3.4.11 Monitoring Spatial Redundancy or Gaps

One site is required in the network. There is no spatial redundancy in the SO_2 monitoring network. MCAQ operates the NCore station (37-119-0041) and SCDHEC operates an additional site in York, SC (45-091-0008). There are no monitoring gaps per the current requirements of 40 CFR 58 Appendix D § 4.4.2.

3.4.12 Programmatic Trends or Shifts in Data Needs

The SO_2 monitoring stations operating in the CBSA meet the programmatic and data needs in the CBSA at this time.

3.4.13 Sulfur Dioxide Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figure 42 depicts the location of the MCAQ SO_2 monitoring station relative to point source emissions of SO_2. Point sources plotted on the map represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

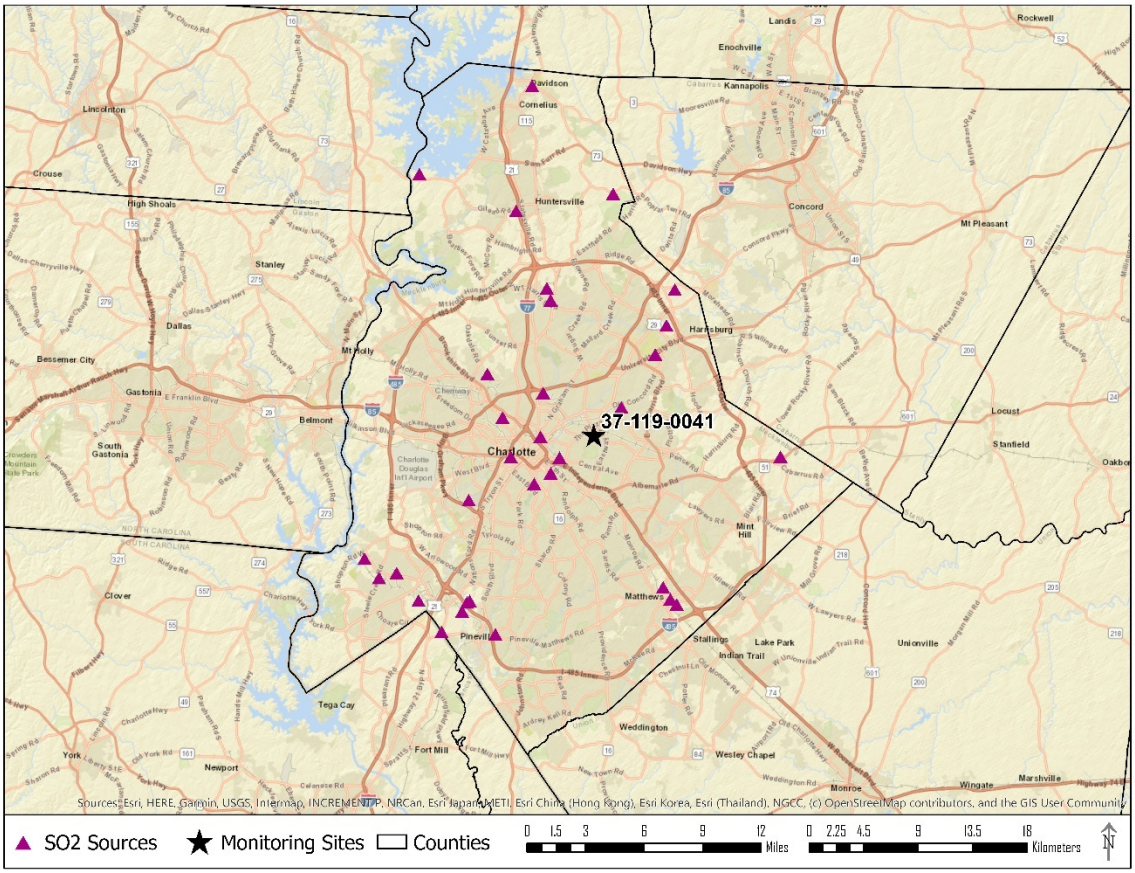

Figure 42. SO_2 Emissions Point Sources - Synthetic Minor and Title V

3.4.14 Summary of Assessment for SO_2

The MCAQ SO_2 monitoring station (37-119-0041) as discussed above meets the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The station is sited in accordance with 40 CFR 58, Appendix D, §3 for NCore. It is sited to represent typical concentrations in areas of high population density. The station is neighborhood in scale of representativeness and satisfies the requirements of 40 CFR 58 Appendix D §4.4.2.

3.5 Nitrogen Dioxide (NO_2)

Per 40 CFR 58 Appendix D §4.3.2(a): "Within the NO2 network, there must be one microscale near-road NO2 monitoring station in each 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 AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. 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. CBSA populations shall be based on the latest available census figures."

Additionally, "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. PAMS sites collecting NO2 data that are situated in an area of expected high NO2

concentrations at the neighborhood or larger spatial scale may be used to satisfy this minimum monitoring requirement when the NO2 monitor is operated year round. Emission inventories and meteorological analysis should be used 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. (40 CFR 58 Appendix D §4.3.3(a)).”

The 2019 U.S. Census population estimate for the CBSA is 2,636,883. The maximum AADT measured in the CBSA by the North Carolina Department of Transportation (NCDOT) for 2018 is 180,000 AADT (Figure 43). Based on the population information and the maximum AADT, the requirements of 40 CFR 58 Appendix D §4.3.2-4.3.3 specify a monitoring network consisting of two (2) near-road NO_2 monitoring stations and one (1) area-wide monitoring station.

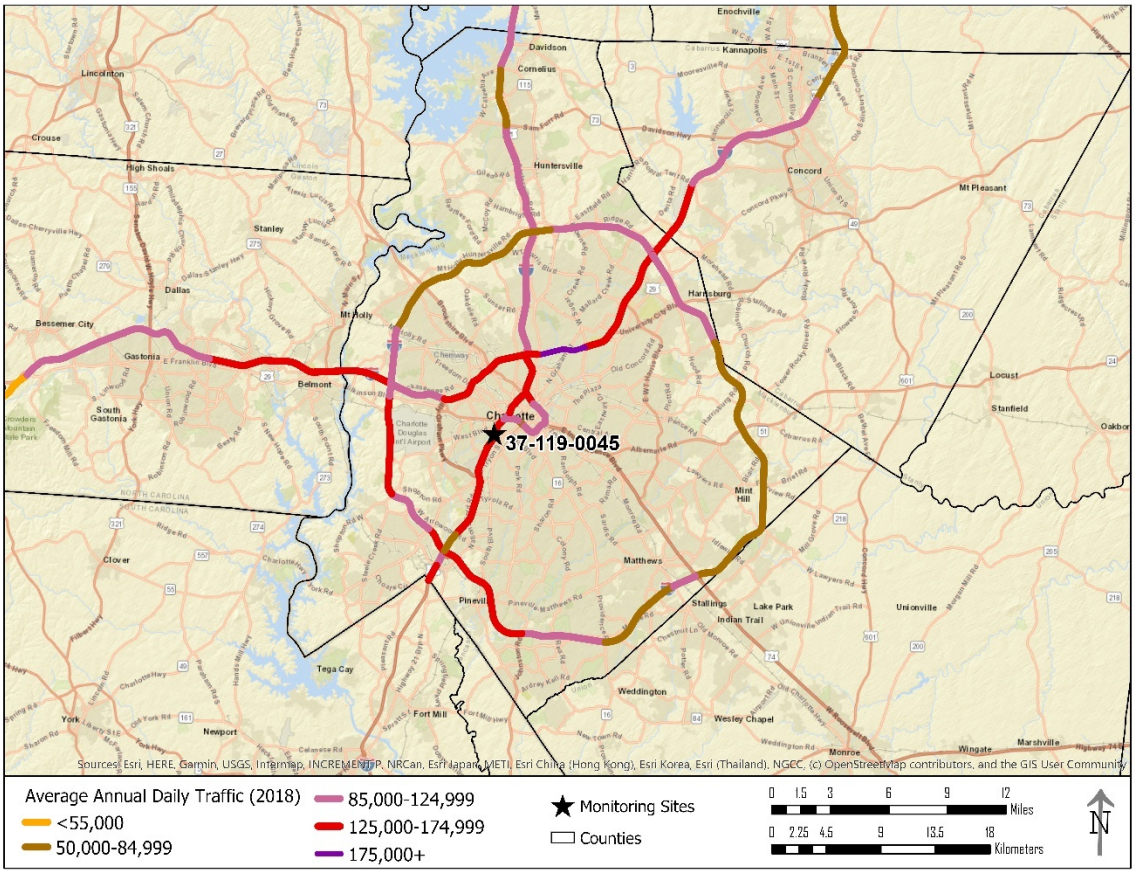

Figure 43. Most heavily trafficked roadway segments in CBSA in dark purple

Currently, MCAQ operates one (1) near-road NO_2 monitoring station (37-119-0045, Remount) and one (1) area-wide monitoring station (37-119-0041, Garinger-NCore) in areas of high population density (Figure 44).

MCAQ will work with the EPA to determine the optimal location and timing for the establishment of an additional near-road NO_2 site in Mecklenburg County. As of the submission date of the 2020 5-year assessment, EPA has not provided funding for operations, maintenance, equipment or capital expenditures in support of the operation of an additional near-road NO_2 monitoring station. As soon as practical and after EPA provided funding for implementation becomes available, MCAQ will work to install and operate an additional near-road NO_2 monitoring station in the MCAQ monitoring network.

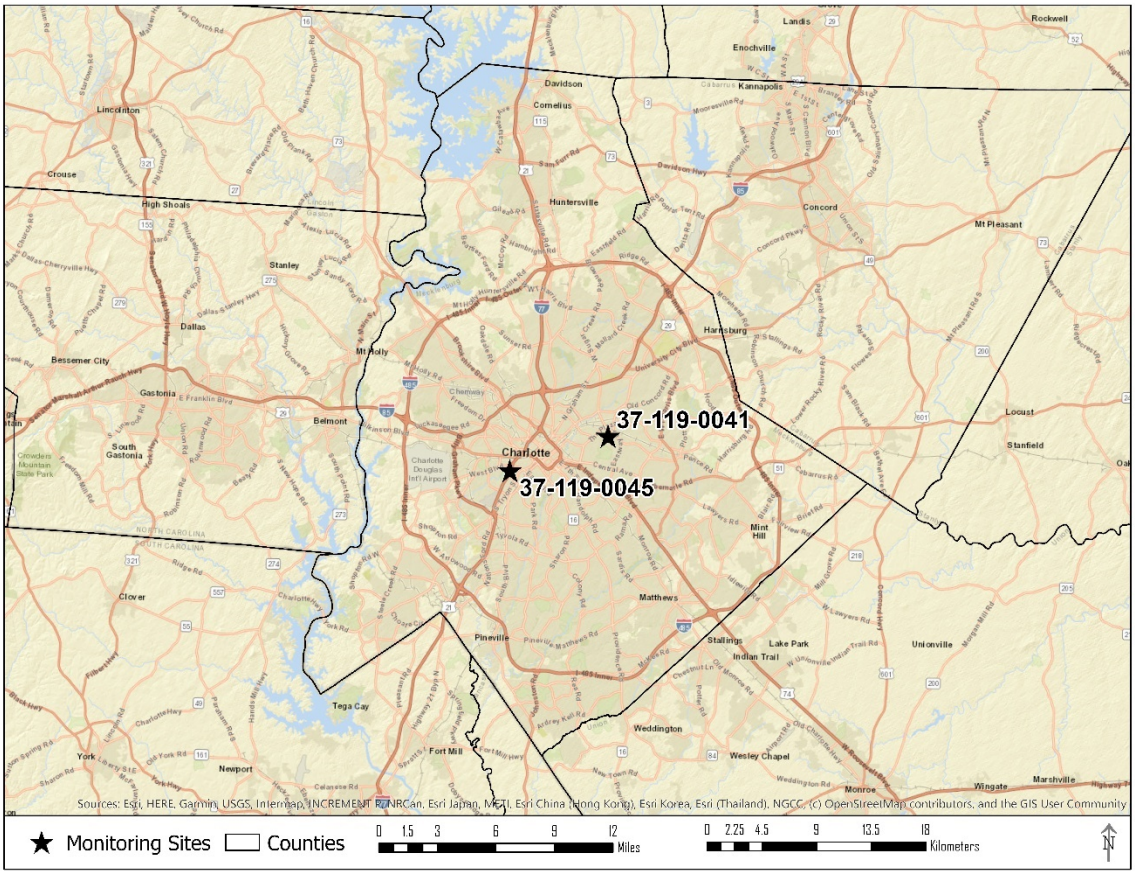

Figure 44. MCAQ NO_2 Monitoring Stations

Station 37-119-0041 (Garinger, Figure 45) is typical of urban areas within Mecklenburg County and is located to determine population exposure.

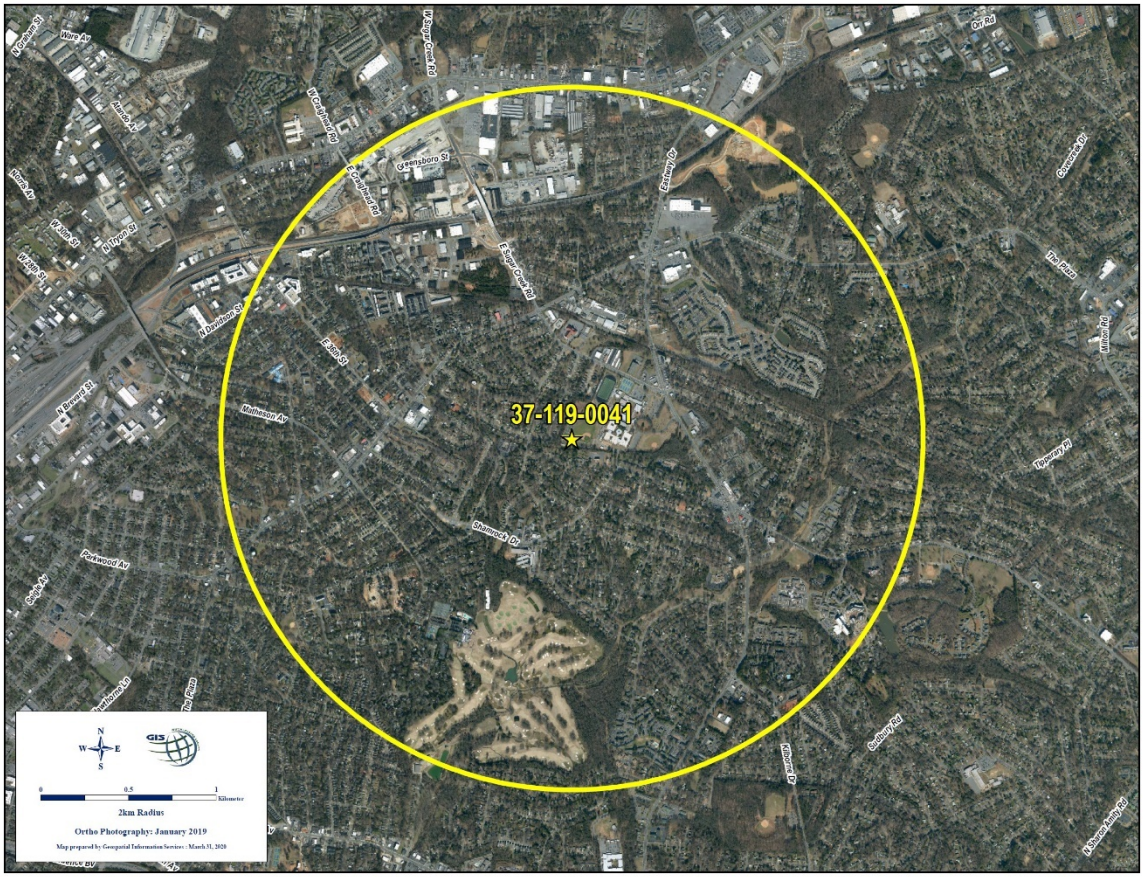

Figure 45. Garinger (37-119-0041) 4 km diameter circle

Station 37-119-0045 (Remount, Figure 46) is a microscale site located to determine the highest concentrations in the network.

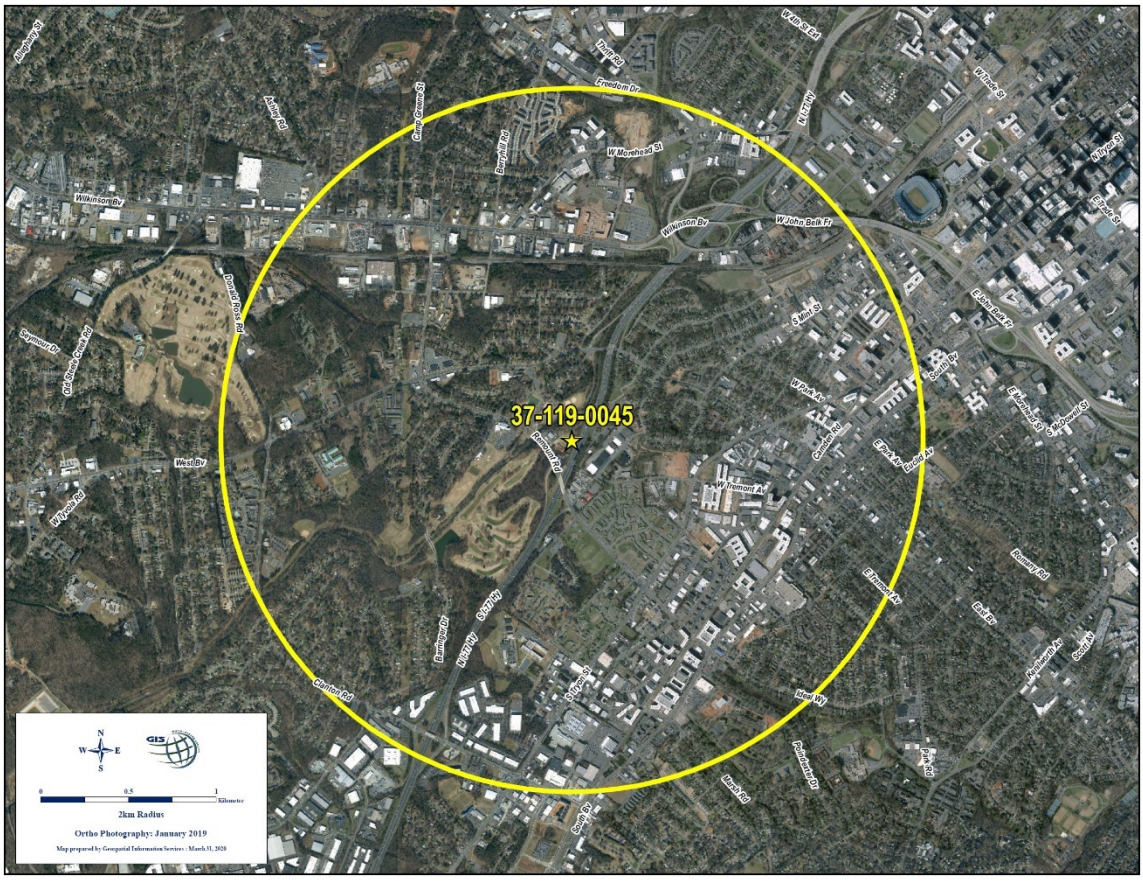

Figure 46. Remount (37-119-0045) 4 km diameter circle

3.5.1 Compliance with 40 CFR 58 Appendix D, §1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from two (2) NO_2 monitoring sites. Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ NO_2 data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After NO_2 data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:

Data from the MCAQ NO_2 monitoring network complies with applicable siting requirements for existing sites and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the monitoring stations operated by MCAQ may be used in the development of attainment and maintenance

plans. Data from the near-road station (37-119-0045) and the NCore station (37-119-0041) are available for use in the evaluation of regional air quality models used in developing emission strategies and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:
Site 37-119-0041 (Garinger) is an NCore site and may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development.

Discussion of 40 CFR 58 Appendix D§1.1.1 Types of Monitoring Sites:
The NCore location (37-119-0041, Garinger) meets the requirement for an area-wide monitoring site. The NCore monitoring site is located to measure population exposure in areas of high population density (Figure 47). 40 CFR 58 Appendix D § 4.3.2(a)(1) states the requirement for two near-road monitoring sites. The near-road station (37-119-0045) meets one of the requirements. MCAQ will implement an additional near-road site when EPA funding becomes available.

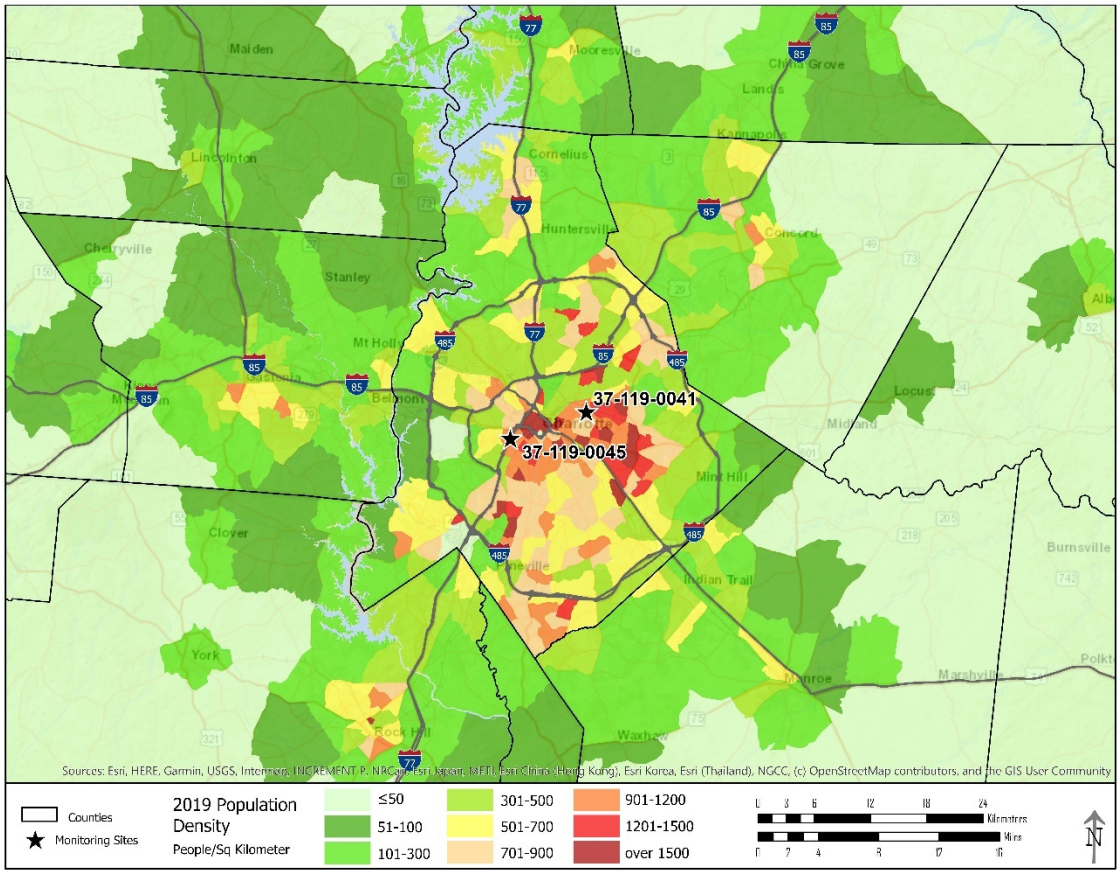

Figure 47. 2019 Census Population Projections

3.5.2 Need for New Monitoring Sites

A new near-road NO_2 station is required. The CBSA population is ≥ 2,500,000 million. 40 CFR 58 Appendix D requirements state that a second near-road monitoring station is required when this threshold is reached. As soon as practical and after EPA provided funding for implementation becomes available, MCAQ will work to install and operate an additional near-road NO_2 monitoring station in the MCAQ monitoring network.

3.5.3 Need to Terminate Existing Sites

MCAQ does not plan to terminate any of the currently operating NO_2 monitoring stations.

3.5.4 Appropriateness of New Technologies

MCAQ is currently operating a Teledyne Advanced Pollution Instrumentation Model T200U NO_2 analyzer at the area-wide monitoring site (37-119-0041, Garinger). This instrument is current generation technology and is adequate for the next five years at this station.

The near-road monitoring station (37-119-0045, Remount) is equipped with a Teledyne Advanced Pollution Instrumentation Model T200UP analyzer. This instrument is current generation technology and is adequate for the next five years at this station.

NO_2 instrumentation is rapidly evolving. Newer technologies have recently been developed that allow direct measurement of NO_2. These technologies should be investigated and implemented as necessary.

3.5.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Susceptible individuals in this assessment are defined as those individuals less than (<) 5 years of age and greater than (>) 64 years of age. Site 37-119-0041 is located in an area of high population density of individuals under 5 years of age and over 64 years of age. (See Figures 48 and 49).

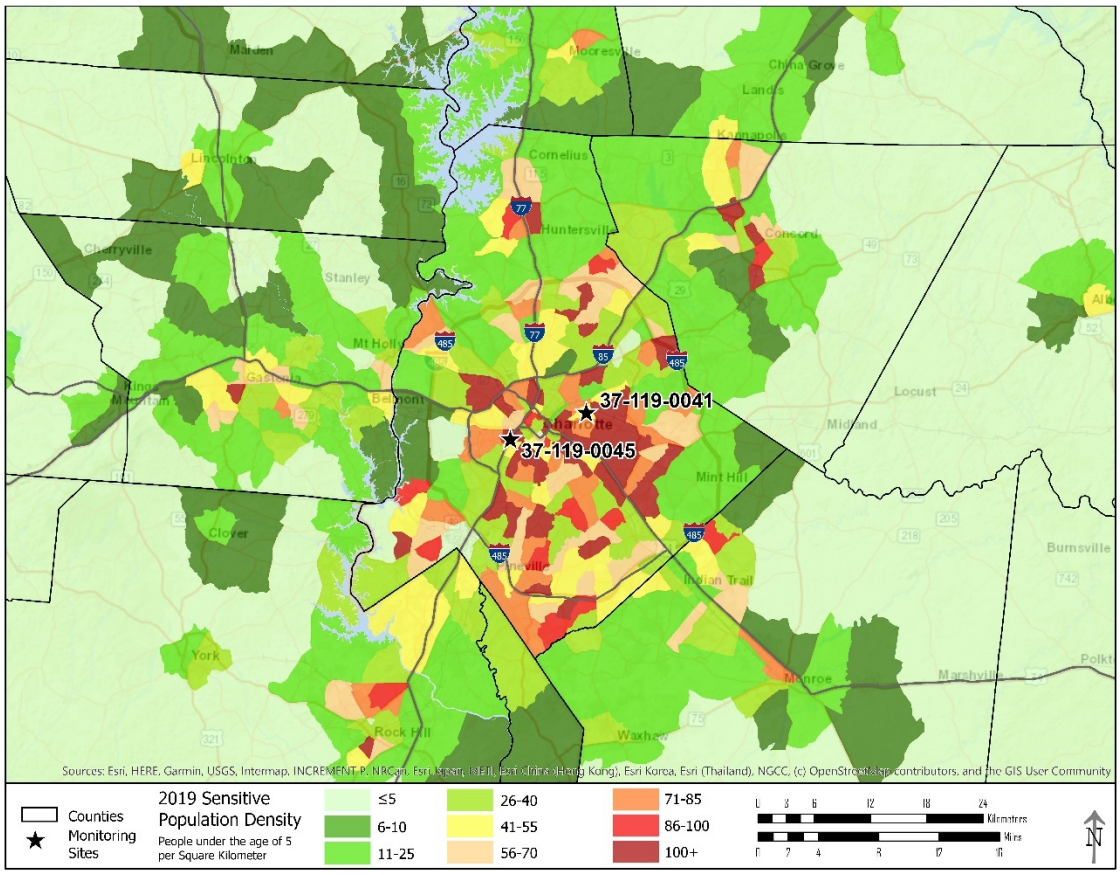

Figure 48. 2019 Census Population Projection for people under the age of 5

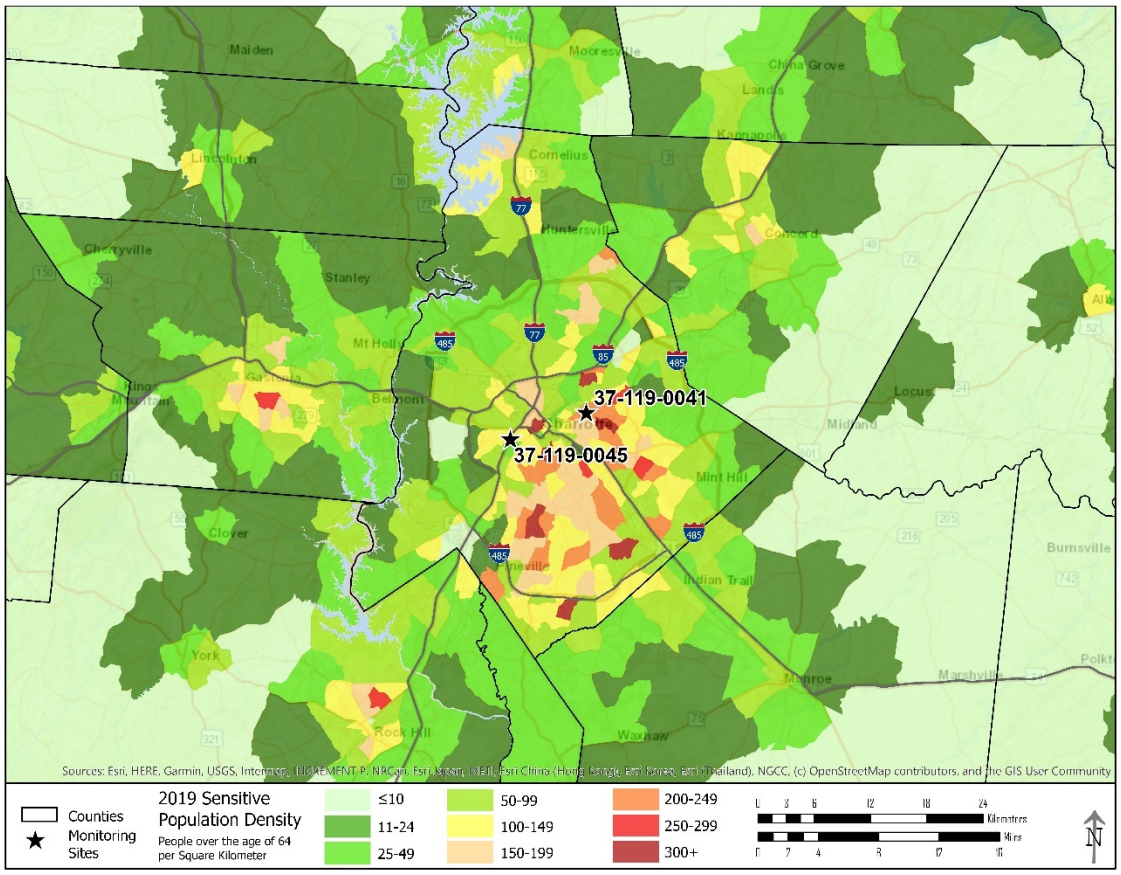

Figure 49. 2019 Census Population Projection for people over the age of 64

3.5.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of the NO_2 monitoring stations located at 37-119-0041 (Garinger) and 37-119-0045 (Remount). There should be no impact on data users or health studies resulting from site discontinuance.

3.5.7 $PM_{2.5}$ Changes to Population-Oriented Sites

Not applicable.

3.5.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.5.9. Historical Data

Historical values in the graphics of this section are reported from the area-wide monitoring station (37-119-0041). Monitoring began at the near-road NO_2 station, 37-119-0045, on July 17, 2014; therefore, trend data from the near-road station is limited.

At MCAQ's highest concentration NO_2 site, the annual design value (Figure 50) has declined -11.5% from 2015 to 2019 (37-119-0045, Remount). 1-hour design values (Figure 51) measured at the MCAQ monitoring station (37-119-0045, Remount) in 2019 have declined by -3.1% from year 2015 levels.

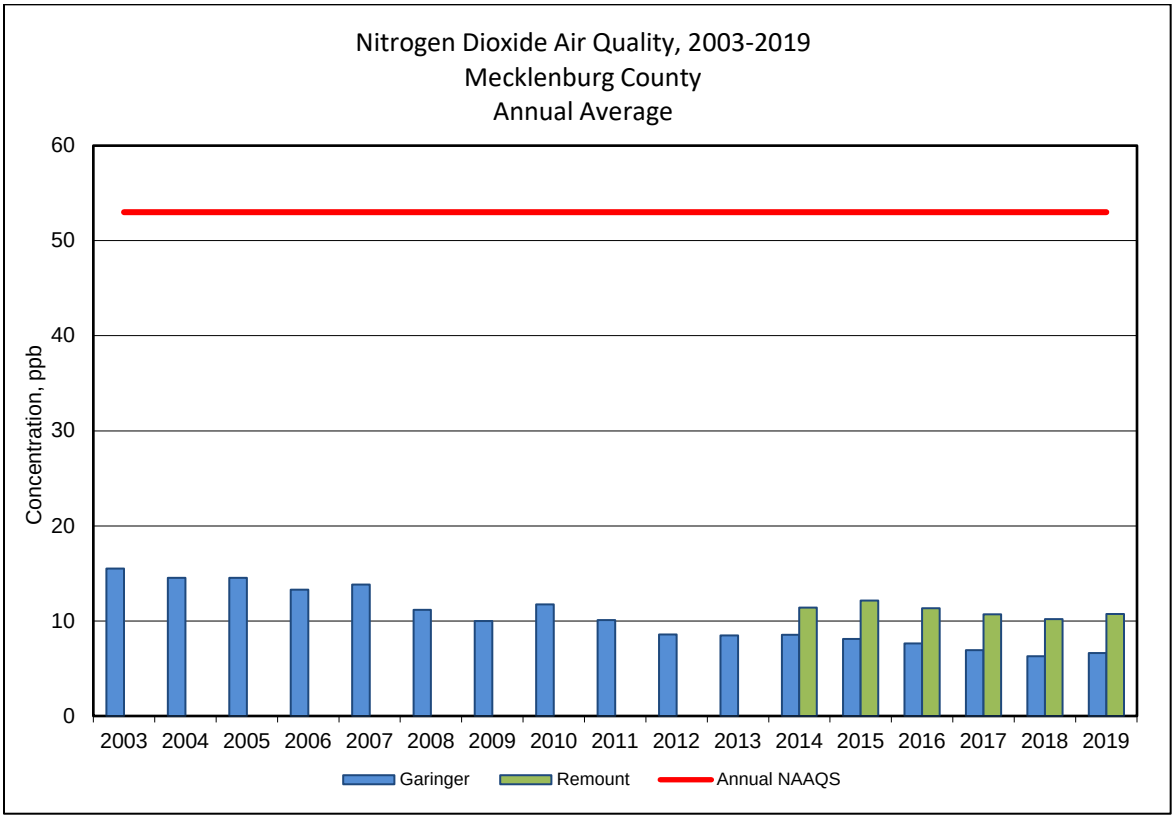

Figure 50. NO_2 Annual Average 2003-2019

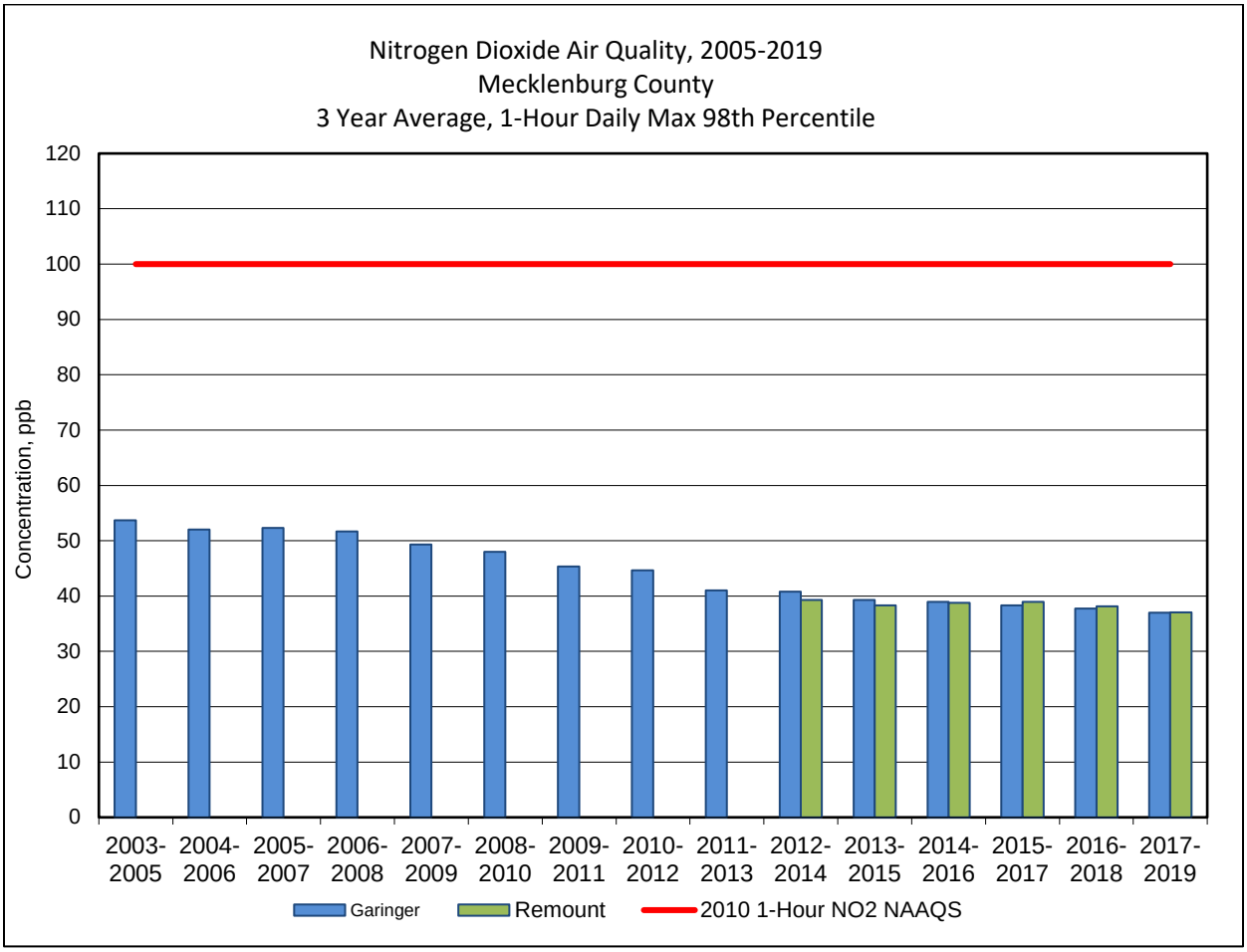

Figure 51. NO_2 3-Yr Average 1-Hr 98th Percentile 2005-2019

3.5.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

Site 37-119-0041 (Garinger) is neighborhood scale and meets the requirements for an area-wide monitoring site for NO_2. The near-road monitoring station is micro-scale in accordance with 40 CFR 58 requirements.

3.5.11 Monitoring Spatial Redundancy or Gaps

The two current sites are required in the network. There is no spatial redundancy in the NO_2 monitoring network. There are no gaps in the network.

3.5.12 Programmatic Trends or Shifts in Data Needs

The near-road NO_2 station (37-119-0045) began operation in July 2014. The station supports the near-road requirements of the program. The Garinger NCore station (37-119-0041) meets the needs of the program.

Direct measurement techniques for NO_2 measurement are rapidly developing. New techniques should be evaluated for suitability in the network.

3.5.13 Nitrogen Dioxide Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figure 52 depicts the location of the MCAQ NO_2 monitoring stations relative to point source emissions of NO_X. Point sources plotted on the map represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

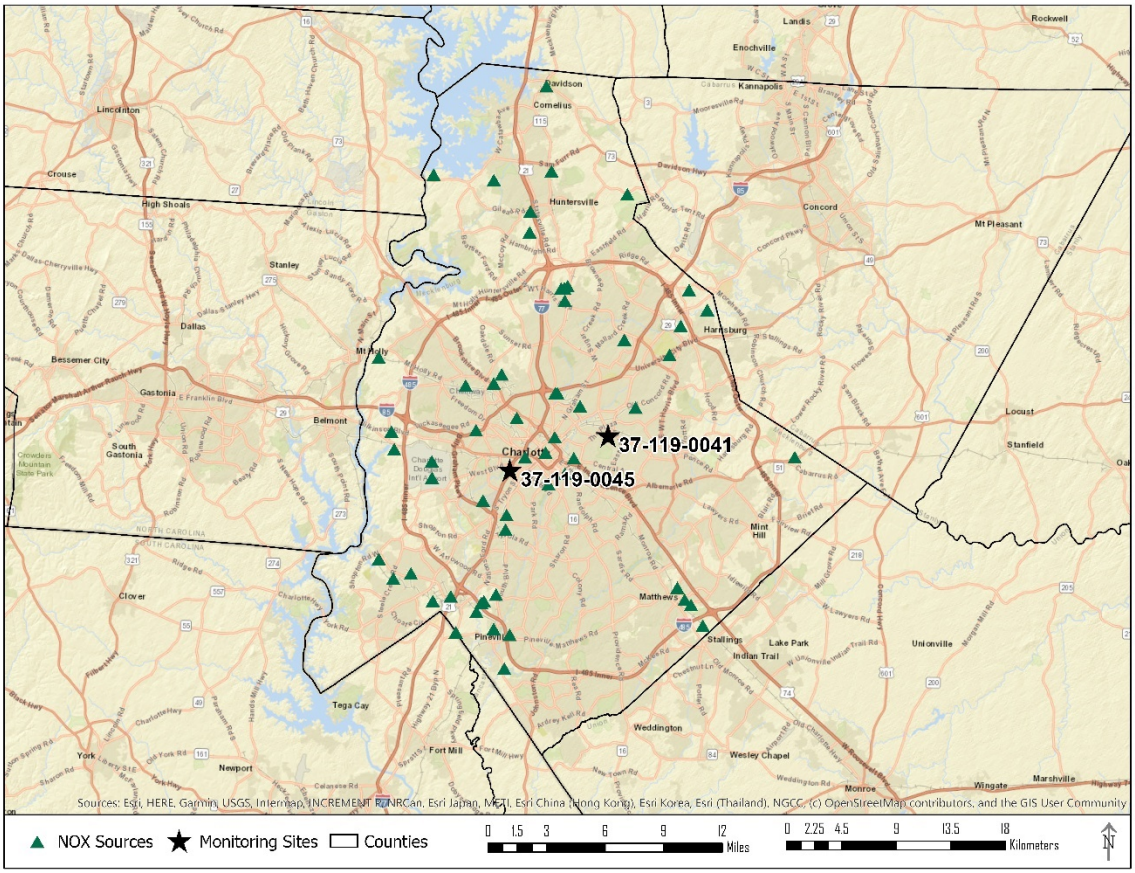

Figure 52. NO_x Emission Point Source - Synthetic Minor and Title V

3.5.14 Summary of Assessment for NO_2

The current MCAQ NO_2 monitoring stations (37-119-0041 and 37-119-0045), as discussed above, meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The stations are sited in accordance with 40 CFR 58, Appendix D, §4.3 for near-road monitoring and area-wide monitoring. They are sited to represent typical concentrations in the near-road environment (37-119-0045) and in areas of high population density (37-119-0041). The stations are micro-scale (37-119-0045) and neighborhood scale (37-119-0041) in scale of representativeness and satisfy the requirements of 40 CFR 58 Appendix D §4.3. 40 CFR 58 Appendix D, §4.3.2(a) requires implementation of an additional near-road NO_2 monitoring station in any CBSA with a population of 2,500,000 persons or more. This will be implemented as EPA funding becomes available.

3.6 Particulate Matter – PM_{10}

Table D-4 of 40 CFR 58 Appendix D § 4.6 indicates the approximate number of permanent stations required in the MSA's to characterize national and regional PM_{10} air quality trends and geographical patterns.

Table D–4 of Appendix D to Part 58—PM_{10} Minimum Monitoring Requirements (Approximate Number of Stations Per MSA)[1]

Population category	High concentration[2]	Medium concentration[3]	Low concentration[4,5]
>1,000,000	6–10	4–8	2–4
500,000–1,000,000	4–8	2–4	1–2
250,000–500,000	3–4	1–2	0–1
100,000–250,000	1–2	0–1	0

Table 7. PM_{10} Minimum Monitoring Requirement

[1]Selection of urban areas and actual numbers of stations per area will be jointly determined by EPA and the State agency.
[2]High concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding the PM_{10} NAAQS by 20 percent or more.
[3]Medium concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding 80 percent of the PM_{10} NAAQS.
[4]Low concentration areas are those for which ambient PM_{10} data show ambient concentrations less than 80 percent of the PM_{10} NAAQS.
[5]These minimum monitoring requirements apply in the absence of a design value.

The current PM_{10} NAAQS is 150 $\mu g/m^3$ 24-hour average (not to be exceeded more than once per year on average over 3 years). The population of the MSA is 2,636,883 (Charlotte-Gastonia-Concord, NC-SC, July 1, 2019 estimate). Eighty (80%) percent of the NAAQS = 120 $\mu g/m^3$. The maximum value measured in Mecklenburg County during the past 3 years is 64 $\mu g/m^3$ (See Table 8).

Year	37-119-0041-4	37-119-0042-4
2017	38 $\mu g/m^3$	51 $\mu g/m^3$
2018	64 $\mu g/m^3$	43 $\mu g/m^3$
2019	40 $\mu g/m^3$	---

Table 8. Maximum PM_{10} 24-Hr Average

Based on this information, the required number of monitoring stations is 2-4 (See Table 7 above). MCAQ is currently operating 2 continuous low-volume PM_{10} monitoring stations (Figure 53). A continuous low-volume monitor for PM coarse determination is located at 37-119-0041 (Figure 54). MCAQ operated a continuous PM_{10} monitor at Montclaire (37-119-0042), which discontinued on March 31, 2019 due to eviction from the site by the property owner. The PM_{10} monitor was relocated to Ramblewood Park (37-119-0047, Figure 55) on December 16, 2019.

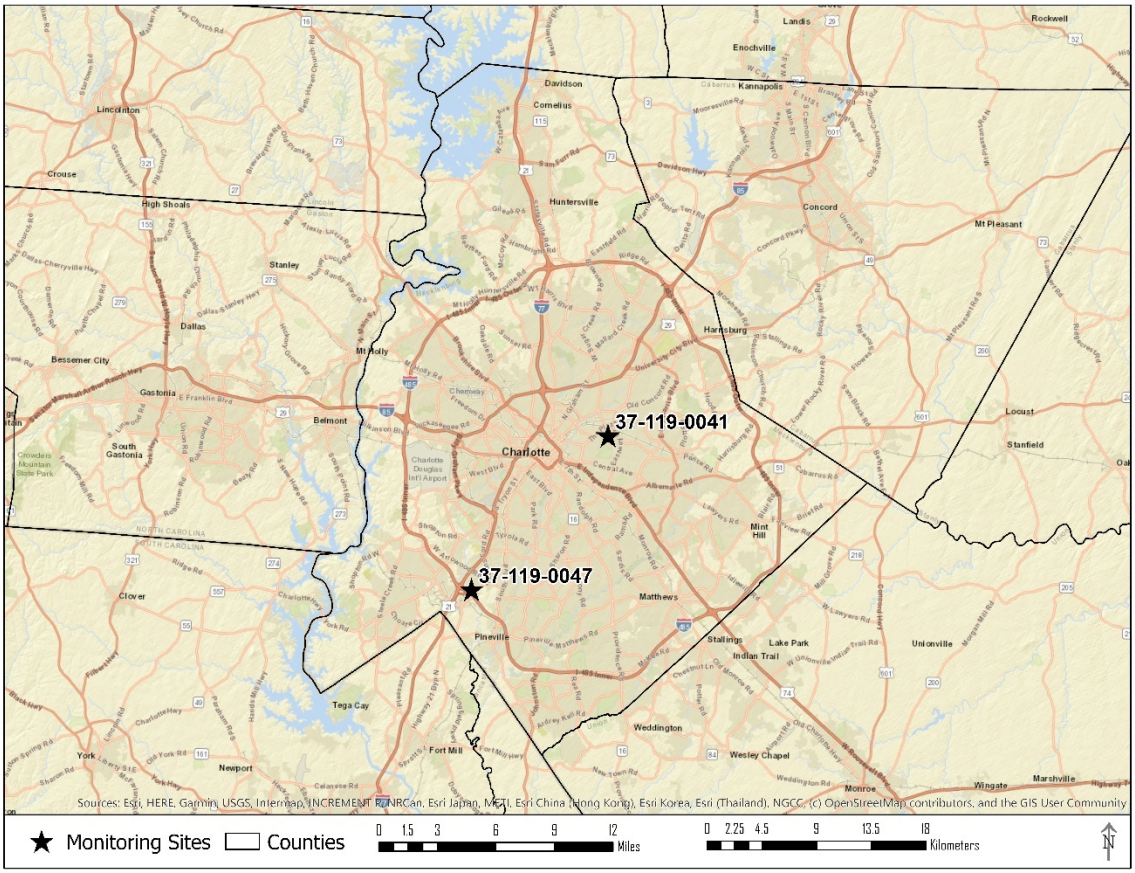

Figure 53. MCAQ PM_{10} Monitoring Stations

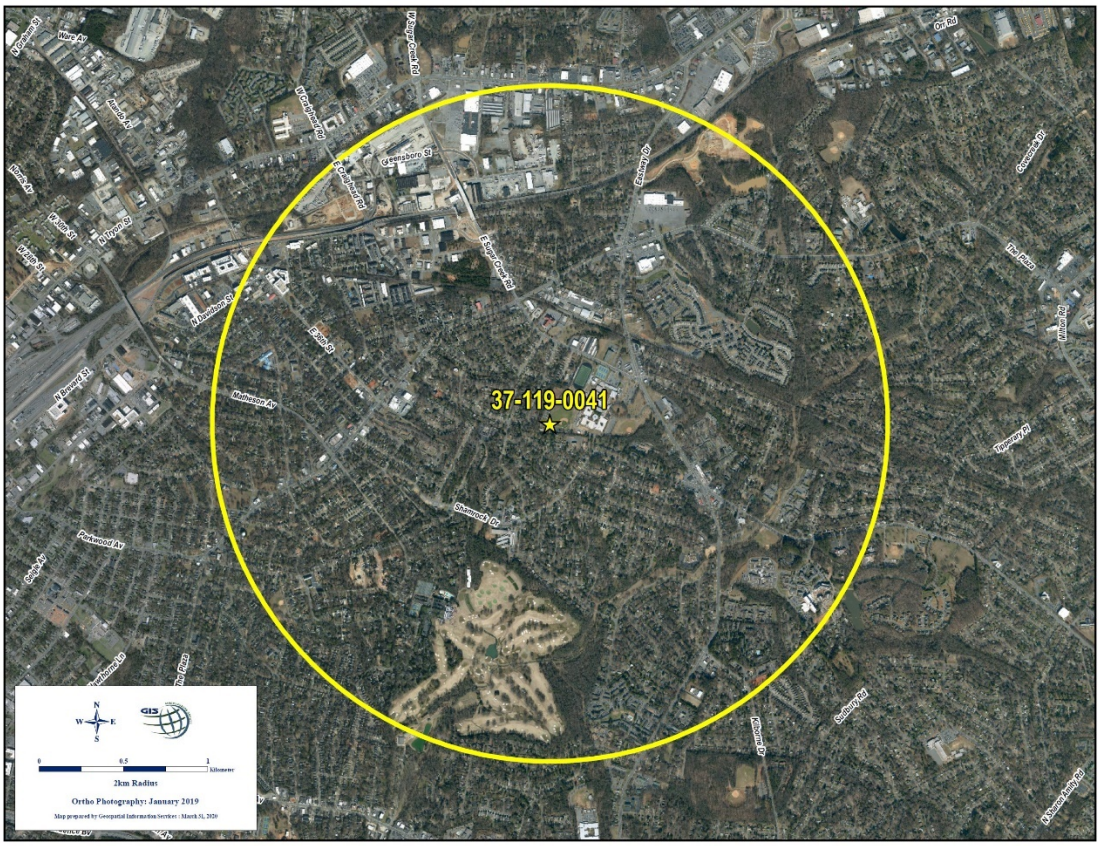

Figure 54. Garinger (37-119-0041) 4 km diameter circle

Figure 55. Ramblewood Park (37-119-0047) 4 km diameter circle

3.6.1 Compliance with 40 CFR 58 Appendix D, §1.1 Monitoring Objectives

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

The MCAQ monitoring network collects data from two (2) PM_{10} monitoring sites. Data is downloaded once per hour by TCP/IP connections to the MCAQ central computer system. Hourly data is displayed on the MCAQ website after it is downloaded.

MCAQ PM_{10} data is uploaded to the USEPA AirNow website (www.AirNow.gov) on an hourly basis for dissemination on the national air quality website.

After PM_{10} data is validated it is uploaded to the USEPA Air Quality System (AQS) on a monthly basis. AQS is the national data repository for air quality data.

Data from the monitoring sites operated by MCAQ is available to the general public in a timely manner.

(b) Support compliance with national ambient air quality standards (NAAQS) and emissions strategy development:

Data from the MCAQ PM_{10} monitoring network complies with applicable siting requirements and is available for NAAQS compliance determination and may be used for emissions strategy development. Data from the two monitoring sites operated by MCAQ may be used in the development of attainment and maintenance plans. Data from the sites is available for use in the evaluation of regional air quality models used in developing emission strategies and may be used to track trends in air pollution abatement control measures' impact on improving air quality.

(c) Support for air pollution research studies:

Data from the MCAQ PM_{10} monitoring network may be used to supplement data collected by researchers working on health effects assessments and atmospheric processes, or for monitoring methods development.

Discussion of 40 CFR 58 Appendix D§1.1.1 Types of Monitoring Sites:

PM_{10} monitoring is conducted at two sites in Mecklenburg County. Both sites are neighborhood scale. Sites 37-119-0041 and 37-119-0047 are population oriented (Figure 56).

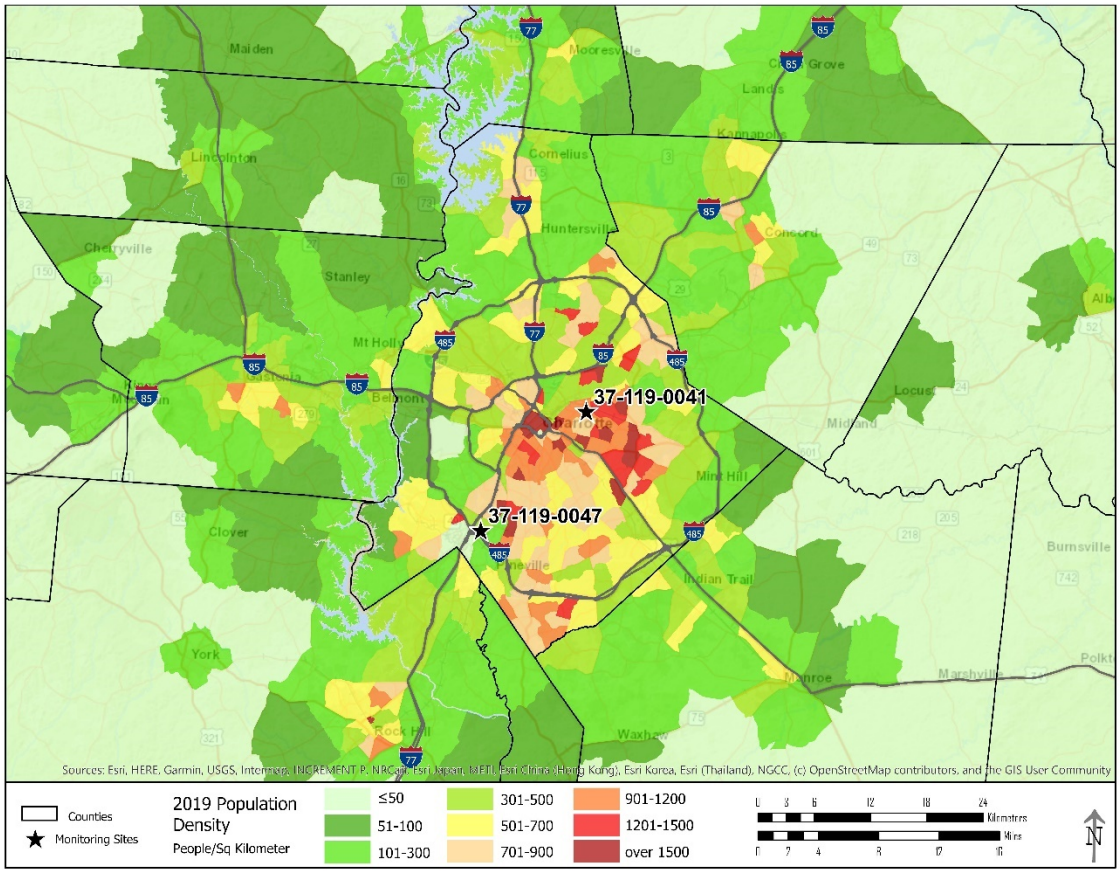

Figure 56. 2019 Census Population Projections.

Site	Measurement Scale	Site Type
37-119-0041	Neighborhood	Population Exposure
37-119-0047	Neighborhood	Highest Concentration, Population Exposure

Table 9. MCAQ PM_{10} Measurement Scale and Site Type

PM_{10} – Annual Average Concentration (not a compliance value)

Year	37-119-0041-4	37-119-0042-4
2017	14.8 µg/m^3	16.9 µg/m^3
2018	14.9 µg/m^3	15.0 µg/m^3
2019	14.8 µg/m^3	---

Table 10. PM_{10} Annual Average Concentration

3.6.2 Need for New Monitoring Sites

PM_{10} concentrations are well characterized by the existing network. Concentrations have been well below 80% of the NAAQS for many years. No new monitoring sites are planned.

3.6.3 Need to Terminate Existing Sites

MCAQ does not plan to terminate any of the currently operating PM_{10} monitoring stations. There should be minimal impact on data users or health studies resulting from the relocation of station 37-119-0042 (Montclaire).

3.6.4 Appropriateness of New Technologies

MCAQ is currently operating continuous BAM-1020 PM_{10} analyzers at both PM_{10} monitoring stations. This instrument is current generation technology and is adequate for the next five years at this station.

3.6.5 Ability of Existing and Proposed Sites to Support Air Quality Characterization in Areas with High Populations of Susceptible Individuals

Susceptible individuals in this assessment are defined as those individuals less than (<) 5 years of age and greater than (>) 64 years of age. Site 37-119-0041 is located in an area of high population density of individuals under 5 years of age and over 64 years of age. Site 37-119-0047 is also located in an area with a high density of susceptible individuals (over age 64). The maps in Figures 48 and 49 display the location of these sites in relation to the population densities of person under the age of 5 (Figure57) and over the age of 64 (Figure 58).

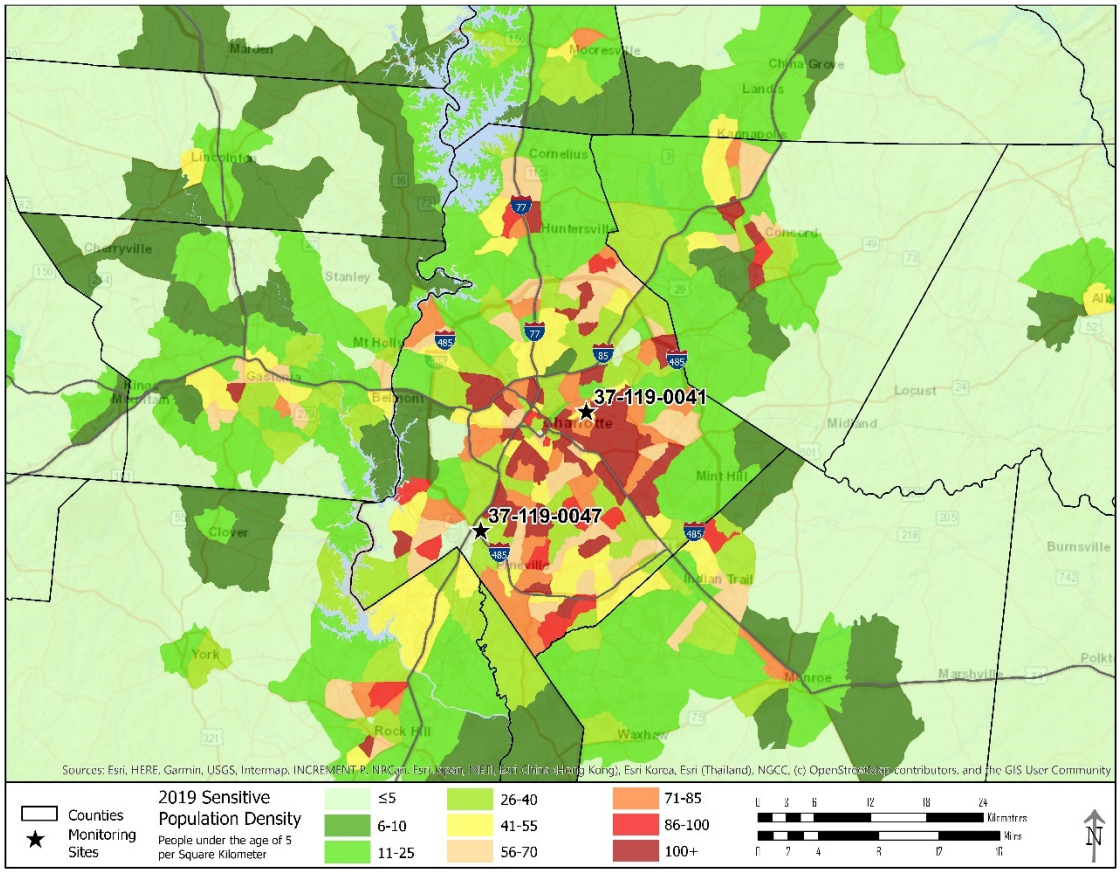

Figure 57. 2019 Census Population Projections for people under the age of 5

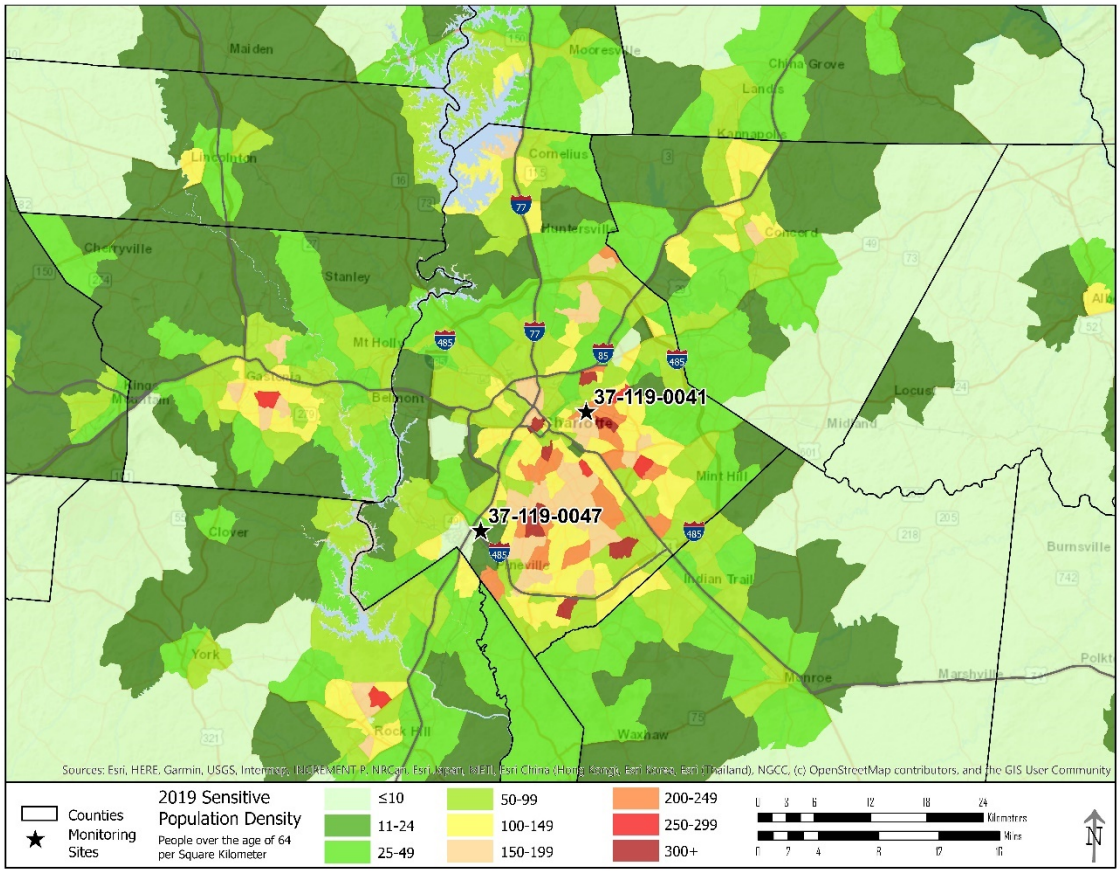

Figure 58. 2019 Census Population Projections for people over the age of 64

3.6.6 Impact of Discontinuance on Data Users or Health Studies

MCAQ plans to continue operation of the PM_{10} monitoring stations located at 37-119-0041 (Garinger) and 37-119-0047 (Ramblewood Park). There should be minimal impact on data users or health studies resulting from the relocation of station Montclaire (37-119-0042).

3.6.7 $PM_{2.5}$ Changes to Population-Oriented Sites

Not applicable.

3.6.8 Statewide and Local Level Population Statistics

See Section 5.0.

3.6.9. Historical Data

Data are well below the NAAQS compliance level of 150 $\mu g/m^3$. There have been no concentrations measured that were > 70 $\mu g/m^3$ in the past 15 years (Figure 59).

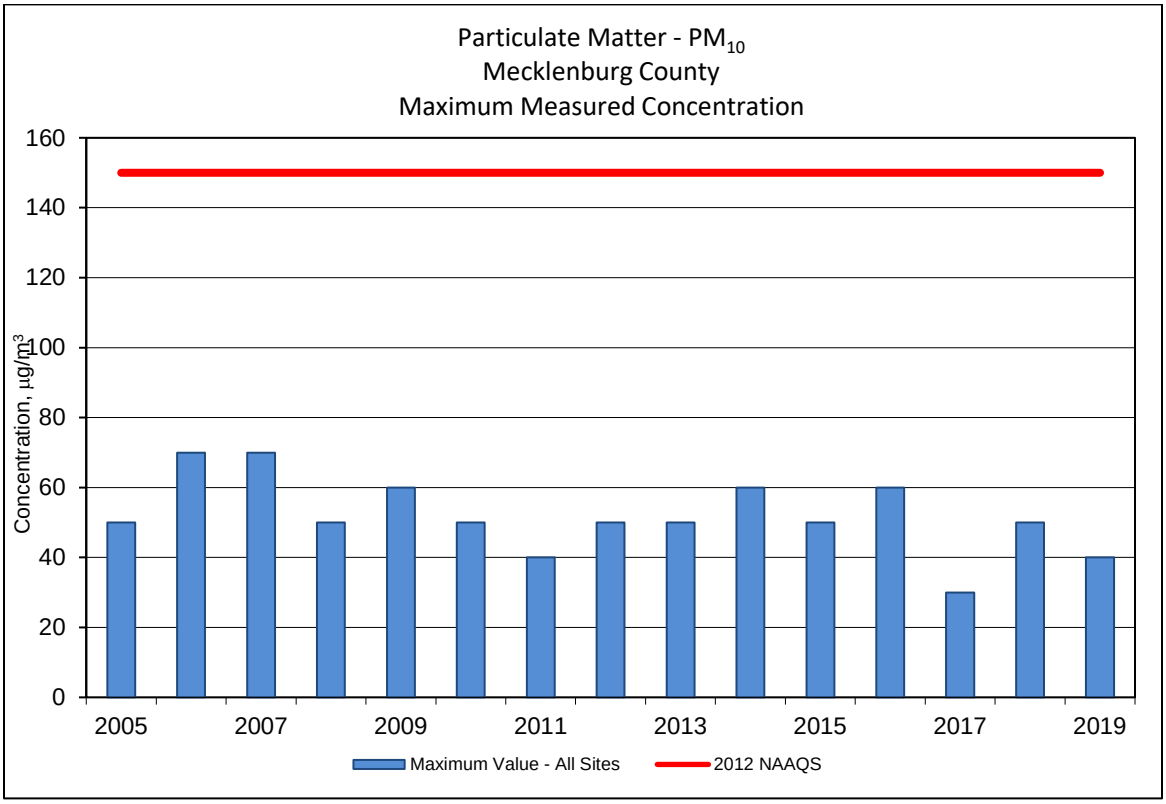

Figure 59. PM_{10} Maximum Values 2005- 2019

3.6.10 Network Suitability to Measure the Appropriate Spatial Scale of Representativeness

40 CFR 58 Appendix D § 4.6 (b) states "…the most important spatial scales to effectively characterize the emissions of PM_{10} from both mobile and stationary sources are the middle scales and neighborhood scales." 40 CFR 58 Appendix D § 4.6 (b) (3) continues "…Neighborhood scale PM_{10} sites provide information about trends and compliance with standards because they often represent conditions in areas where people commonly live and work for extended periods…"

The MCAQ monitoring sites are neighborhood scale and are located in a variety of settings that are representative of areas typically found within Mecklenburg County.

3.6.11 Monitoring Spatial Redundancy or Gaps

Two sites are required in the network. There is no spatial redundancy in the PM_{10} monitoring network. There are no gaps in the network.

3.6.12 Programmatic Trends or Shifts in Data Needs

The PM_{10} monitoring stations operating in the MSA meet the programmatic and data needs in the MSA at this time.

3.6.13 PM_{10} and $PM_{2.5}$ Emission Point Sources in Mecklenburg County (Synthetic Minor and Title V)

Figure 60 depicts the location of the MCAQ PM_{10} monitoring stations relative to point source emissions of $PM_{2.5}$ and PM_{10}. Point sources plotted on the map represent synthetic minor and Title V sources. Title V point sources are defined as sources with a potential to emit >100 tons per year (tpy) of a regulated NAAQS pollutant, >10 tpy of at

least one hazardous air pollutant (HAP) or >25 tpy of all HAPs combined. Synthetic minor point sources are sources whose potential would normally classify them as a Title V facility except that their potential emissions are reduced below the threshold by a limitation on the capacity of the facility to emit an air pollutant.

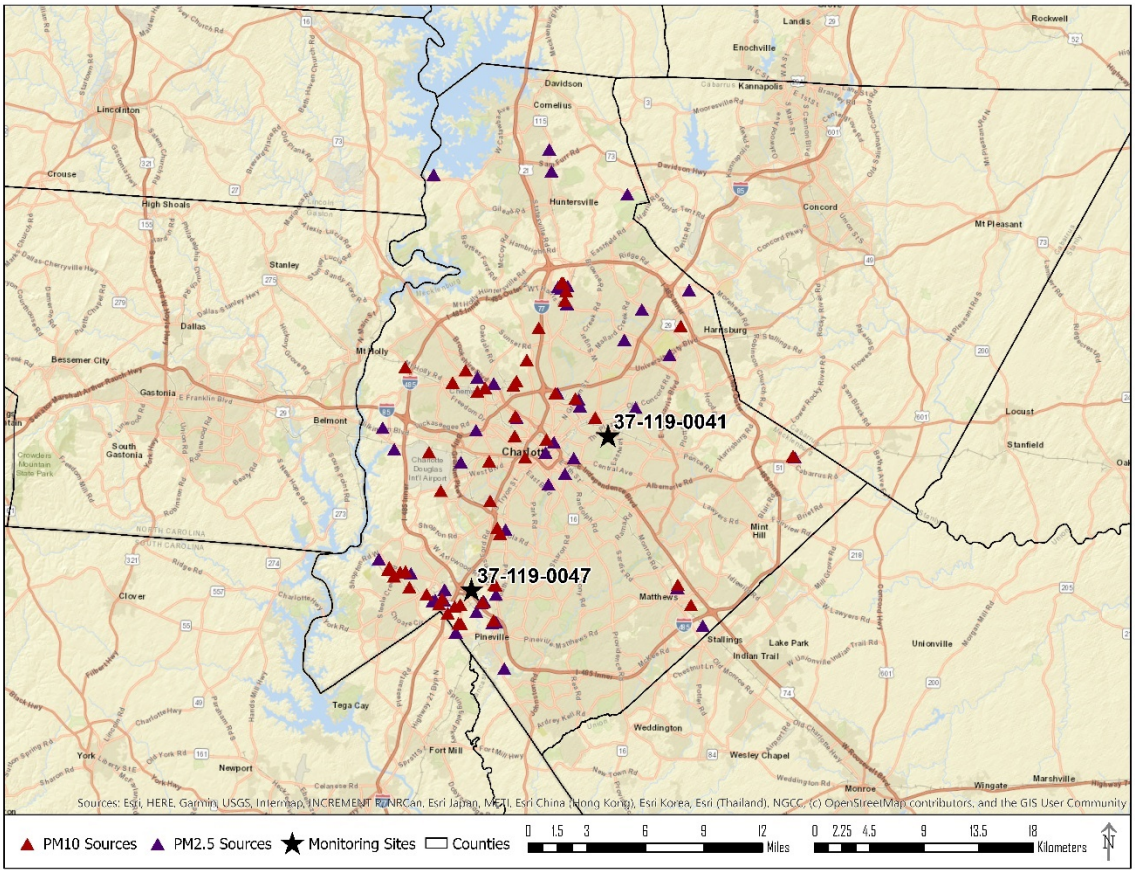

Figure 60. $PM_{2.5}$ and PM_{10} Emissions Point Source - Synthetic Minor and Title V

3.6.14 Summary of Assessment for PM_{10}

PM_{10} is a lower priority because measured concentrations in the MCAQ network have been below 80% of the NAAQS. Two to four stations are required. MCAQ is operating 2 stations. The MCAQ monitoring stations (37-119-0041 and 37-119-0047) as discussed above meet the requirements of 40 CFR 58, Appendix D, §1.1 for monitoring objectives and 40 CFR 58 Appendix D, §1.1.1 for monitor site types. The stations are sited in accordance with 40 CFR 58, Appendix D, §4.7. They are sited to represent area-wide air quality at the neighborhood scale of representativeness in areas of expected maximum concentration.

3.7 Lead (Pb)

A revised NAAQS for lead (Pb) was published on October 15, 2008. The level of the NAAQS was effectively lowered by an order of magnitude from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. The new NAAQS requires two types of monitoring: source-oriented monitoring (near sources with emissions > 0.5 tpy) and NCore stations (40 CFR 58 §3). A review of permit records and examination of the 2017 National Emissions Inventory (NEI) records indicate there are no sources within the boundaries of Mecklenburg County that would require source-oriented monitoring under the current emissions threshold.

MCAQ currently does not operate any lead monitors. MCAQ shut down the lead monitor located at the Garinger NCore monitoring site on April 30, 2016 in accordance with revisions to 40 CFR 58, Appendix D (3). Concentrations of Pb measured at the station were well below the NAAQS (0.15 µg/m3). The maximum rolling three (3) month average for the period January 1, 2012 through December 31, 2015 was 0.003 µg/m3, approximately 2% of the NAAQS.

4.0 Waiver Requests

MCAQ makes requests for the following waivers from the specific minimum requirements for meteorological monitoring at NCore sites and near-road NO_2 monitoring sites:

Wind Speed / Wind Direction Obstructions: "…EPA recognizes that, in some cases, the physical location of the NCore site may not be suitable for representative meteorological measurements due to the site's physical surroundings…."[7]

1) MCAQ has been measuring meteorological parameters at site 37-119-0041 for more than 20 years. Site terrain characteristics influence the wind speed / wind direction sensor at this site. Given this knowledge and taking into consideration the difficulty in Mecklenburg County with meeting the 10x siting criteria in the EPA Volume 4 Meteorological guidance document (EPA-454/B-08-002), MCAQ maintains that wind speed / wind direction (WS/WD) measurements at this site are adequate when considered with full knowledge of the site terrain. MCAQ requests renewal of the previously approved waiver of 10x standard exposure siting criteria for WS/WD meteorological sensors located at 37-119-0041, thus allowing continued monitoring of meteorological parameters (wind speed / wind direction) at the station.

5.0 Population Summary

USEPA's EJScreen mapping tool was used to evaluate whether Mecklenburg County's network provides adequate coverage in vulnerable communities. USEPA uses demographic information as an indicator of a community's potential susceptibility to environmental pollution.

The EJScreen Demographic Index, which is a composite of percent minority and percent low-income, was mapped for Mecklenburg County (Figure 61). The data was stratified based on comparison to other census blocks in North Carolina. A higher percentile indicates a higher proportion of minority and low-income people in that census block compared to other census blocks in the state. According to USEPA, it also means the people living in the census block are more susceptible to air pollution.

Figure 61 displays the location of MCAQ sites in relation to the demographic index. MCAQ sites are located in areas of high demographic indices, providing coverage for populations with increased susceptibility to air pollution.

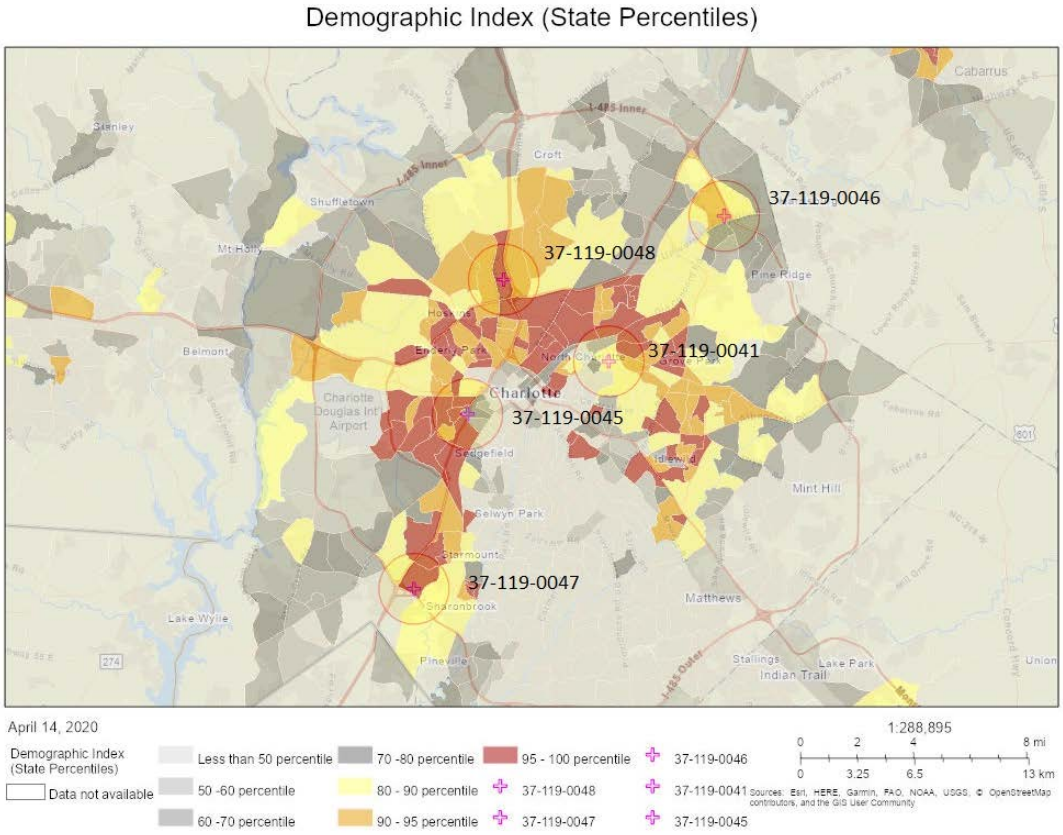

Figure 61 Demographic Index

Core Base Statistical Area (CBSA (MSA))	
16740	Charlotte-Concord-Gastonia, NC-SC
July 1, 2015	2,447,898
July 1, 2016	2,499,697
July 1, 2017	2,550,373
July 1, 2018	2,592,950
July 1, 2019	2,636,883

Table 11. CBSA Populations

(https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk)

Census QuickFacts

People QuickFacts	**Mecklenburg County**	**North Carolina**
Population, 2019 estimate	1,110,356	10,488,084
Population, 2018 estimate	1,093,901	10,383,620
Census Population, 2010	919,628	9,535,691
Population, percent change – 2010 to 2019 estimate	20.7%	10.0%
Persons under 5 years, percent, 2018	6.6%	5.9%
Persons under 18 years, percent, 2018	23.6%	22.2%
Persons 65 years and over, percent, 2018	11.2%	16.3%
Geography QuickFacts	**Mecklenburg County**	**North Carolina**
Land area in square miles, 2010	523.84 (1356.7 km^2)	48,617.91
Persons per square mile, 2010	1,755.50 (677.9 km^2)	196.1

Table 12. Population Facts

6.0 Emission Trends in Mecklenburg County

6.1 Stationary Source Emission Trends in Mecklenburg County

Stationary source emissions from facilities operating in Mecklenburg County have declined for the period 2000 to 2018 (Figure 62). Similar reductions have occurred in other nearby areas that influence air quality in our region.

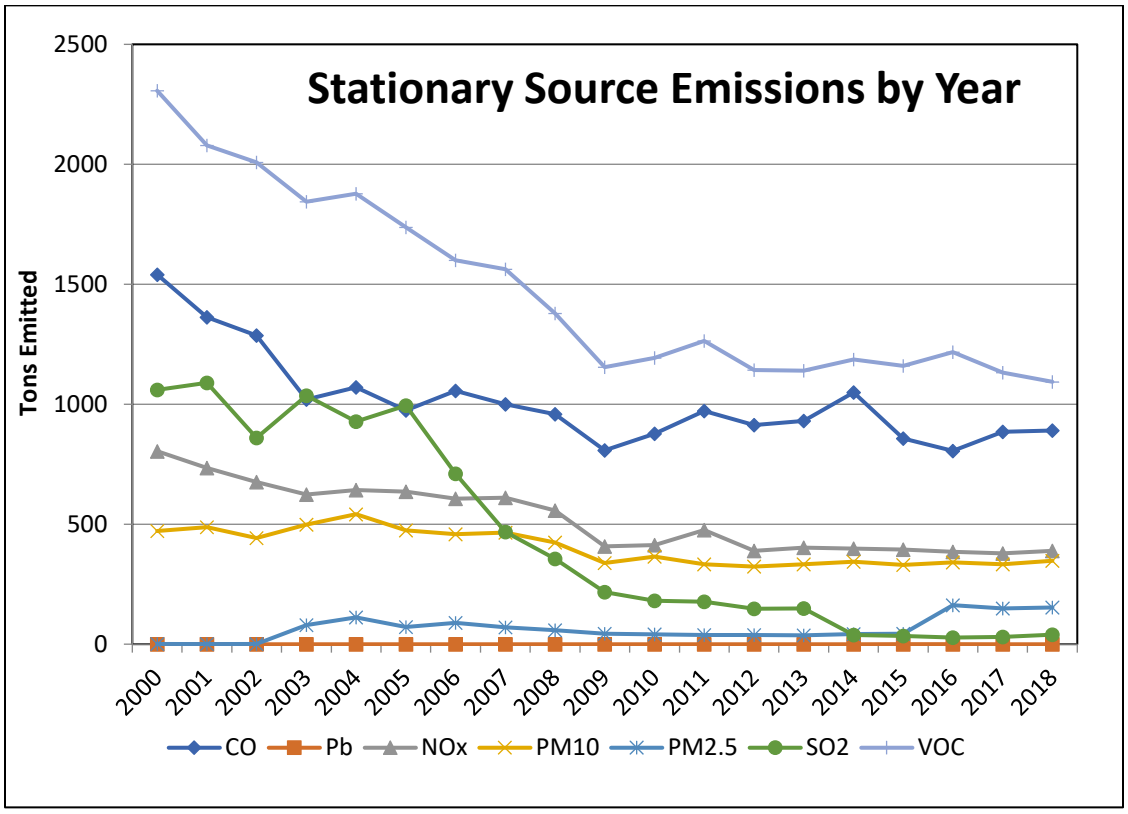

Figure 62. Station Source Emissions by Year

7.0 General Meteorological Characteristics

The following narrative is the description of Charlotte, North Carolina offered by the National Oceanographic and Atmospheric Administration in the *"2018 Local Climatological Data – Annual Summary with Comparative Data"*:

"Charlotte is located in the Piedmont of the Carolinas, a transitional area of rolling country between the mountains to the west and the Coastal Plain to the east. The mountains are to the northwest about 80 miles from Charlotte. The general elevation of the area around Charlotte is about 730 feet. The Atlantic Ocean is about 160 miles southeast.

The mountains have a moderating effect on winter temperatures, causing appreciable warming of cold air from the northwest winds. The ocean is too far away to have any immediate effect on summer temperatures but in winter an occasional general and sustained flow of air from the warm ocean waters results in considerable warming.

Charlotte enjoys a moderate climate, characterized by cool winters and quite warm summers. Temperatures fall as low as the freezing point on a little over one-half of the days in the winter months. Winter weather is changeable, with occasional cold periods, but extreme cold in rare. Snow is infrequent, and the first snowfall of the season usually comes in late November or December. Heavy snowfalls have occurred, but any appreciable accumulation of snow on the ground for more than a day or two is rare.

Summers are long and quite warm, with afternoon temperatures frequently in the low 90's. The growing season is also long, the average length of the freeze-free period being 216 days. On the average, the last occurrence in spring with a temperature of 32 degrees is early April. In the fall the average first occurrence of 32 degrees is early November.

Rainfall is generally rather evenly distributed throughout the year, the driest weather usually coming in the fall. Summer rainfall comes principally from thunderstorms with occasional dry spells of one to three weeks duration.

Hurricanes which strike the Carolina coast may produce heavy rain but seldom cause dangerous winds."

8.0 References

1. Title 40 Code of Federal Regulations Part 58, Appendix D – Network Design Criteria Ambient Air Quality Monitoring, March 20, 2020.

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