

US EPA ARCHIVE DOCUMENT

## North Carolina Area Designations for the 2008 Ozone National Ambient Air Quality Standards

The table below identifies the areas and associated counties or parts of counties in North Carolina that EPA intends to designate as nonattainment for the 2008 ozone national ambient air quality standards (2008 ozone NAAQS). In accordance with section 107(d) of the Clean Air Act, EPA must designate an area (county or part of a county) “nonattainment” if it is violating the 2008 ozone NAAQS or if it is contributing to a violation of the 2008 ozone NAAQS in a nearby area. The technical analyses supporting the boundaries for the individual nonattainment areas are provided below.

### Intended Nonattainment Areas in North Carolina

Area	North Carolina’s Recommended Nonattainment Counties	EPA’s Intended Nonattainment Counties
Charlotte-Gastonia-Salisbury, NC-SC *	Cabarrus Gaston Iredell (partial) Lincoln Mecklenburg Rowan Union	Cabarrus Gaston Iredell (partial) Lincoln Mecklenburg Rowan Union

\* Charlotte-Gastonia-Salisbury, NC-SC is a multi-jurisdictional nonattainment area that includes Indian Country. Table 1 below identifies the counties in the other state and for the area of Indian country that EPA intends to designate as part of the nonattainment area.

EPA intends to designate the remaining counties in North Carolina that are not listed in the table above as “unclassifiable/attainment” for the 2008 ozone NAAQS.

The analysis below provides the basis for intended nonattainment area boundaries. It relies on our analysis of whether and which monitors are violating the 2008 ozone NAAQS, based on certified air quality monitoring data from 2008-2010 and an evaluation of whether nearby areas are contributing to such violations. EPA has evaluated contributions from nearby areas based on a weight of evidence analysis considering the factors identified below.

EPA issued guidance on December 4, 2008 that identified these factors as ones EPA would consider in determining nonattainment area boundaries and recommended that states consider these factors in making their designations recommendations to EPA.<sup>1</sup>

1. Air quality data (including the design value calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitors in the area);
2. Emissions and emissions-related data (including location of sources and population, amount of emissions and emissions controls, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography and topography (mountain ranges or other basin boundaries);

<sup>1</sup> The December 4, 2008 guidance memorandum “Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards” refers to 9 factors. In this technical support document we have grouped the emissions-related factors together under the heading of “Emissions and Emissions-Related Data,” which results in 5 categories of factors.

5. Jurisdictional boundaries (e.g., counties, air districts, existing nonattainment areas, Indian country, metropolitan planning organizations (MPOs))

Ground-level ozone generally is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) in the presence of sunlight. Because NO<sub>x</sub> and VOC emissions from a broad range of sources over a wide area typically contribute to violations of the ozone standards, EPA believes it is important to consider whether there are contributing emissions from a broad geographic area. Accordingly, EPA chose to examine the 5 factors with respect to the larger of the Combined Statistical Area (CSA) or Core Based Statistical Area (CBSA) associated with the violating monitor(s).<sup>2</sup> All data and information used by EPA in this evaluation are the latest available to EPA and/or provided to EPA by states or tribes.

In EPA's designations guidance for the 2008 ozone NAAQS EPA recommended examining CSA/CBSAs because certain factors used to establish CSAs and CBSAs are similar to the factors EPA is using in this technical analysis to determine if a nearby area is contributing to a violation of the 2008 ozone NAAQS. Congress required a similar approach in 1990 for areas classified as serious or above for the 1-hour ozone standard and EPA used the same basic approach in the designation process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CSA or CBSA, EPA's guidance recommended using the boundary of the county containing the violating monitor as the starting point for considering the nonattainment area's boundary.

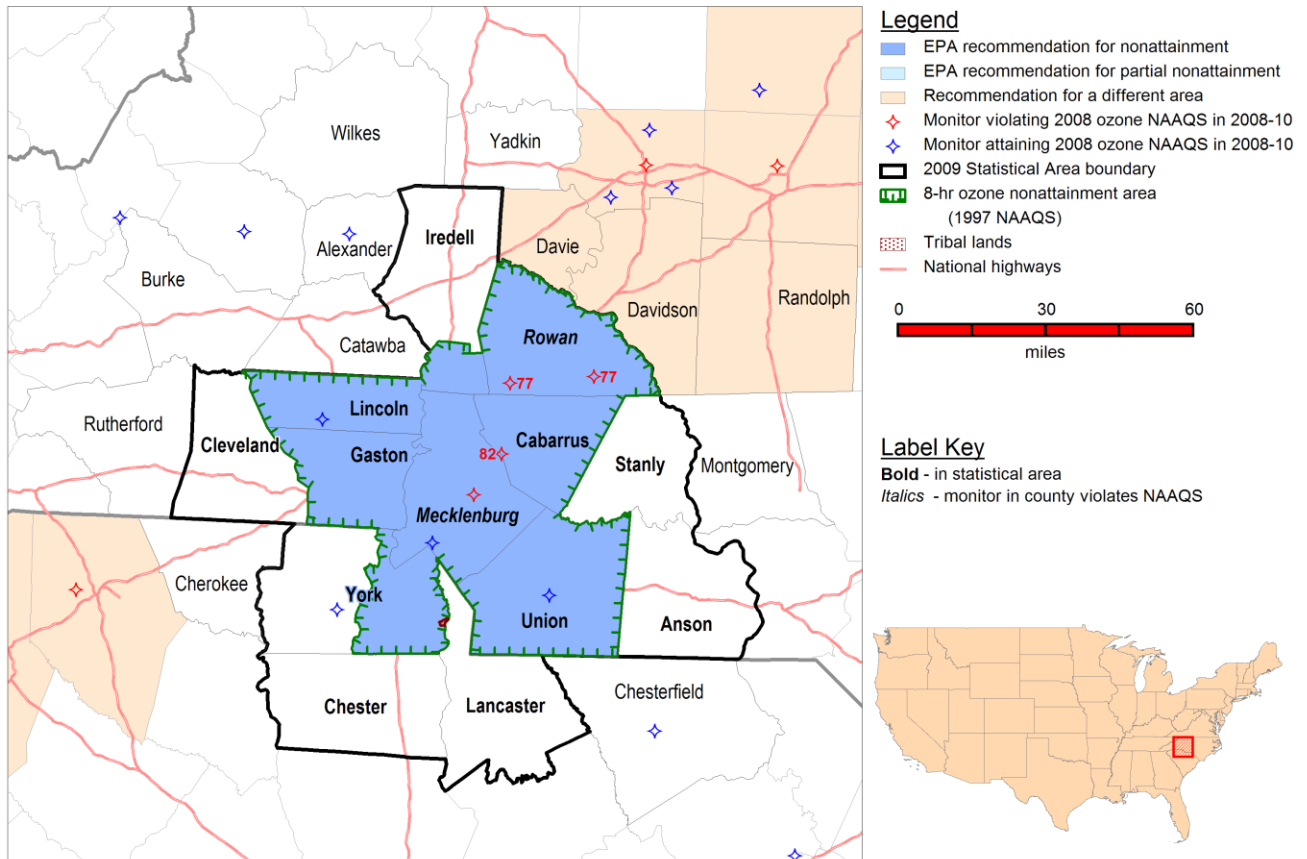
---

<sup>2</sup> Lists of CBSAs and CSAs and their geographic components are provided at [www.census.gov/population/www/metroareas/metrodef.html](http://www.census.gov/population/www/metroareas/metrodef.html). The lists are periodically updated by the Office of Management and Budget. EPA used the most recent update, based on 2008 population estimates, issued on December 1, 2009 (OMB Bulletin No. 10-02).

**Technical Analysis for Charlotte-Gastonia-Salisbury, NC-SC**

Figure 1 is a map of the Charlotte-Gastonia-Salisbury, NC-SC intended nonattainment area. The map provides other relevant information including the locations and design values of air quality monitors, county and other jurisdictional boundaries, the CSA boundary, and national highways.

**Charlotte-Gastonia-Salisbury, NC-SC**



For purposes of the 1997 8-hour ozone NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union Counties, in their entireties, and a portion of Iredell County in North Carolina; the Catawba Indian Nation Reservation<sup>3</sup>; and a portion of York County, in South Carolina.

In March 2009, North Carolina recommended that the counties of Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan, Union, and a portion of Iredell (Davidson and Coddle Creek Townships) be designated as “nonattainment” for the 2008 8-hour ozone standard based on air quality data from 2006-

<sup>3</sup> The Catawba Indian Nation Reservation is located within the South Carolina portion of the bi-state Charlotte nonattainment area. Generally air quality State Implementation Plans (SIPs) do not apply in Indian country throughout the United States. However, for purposes of the Catawba Indian Nation Reservation in Rock Hill, the South Carolina SIP does apply within the Reservation. Pursuant to the Catawba Indian Claims Settlement Act, S.C. Code Ann. 27-16-120, “all state and local environmental laws and regulations apply to the [Catawba Indian Nation] and Reservation and are fully enforceable by all relevant state and local agencies and authorities.”

US EPA ARCHIVE DOCUMENT

2008. Additionally, in March 2009, South Carolina recommended that the portion of York County encompassed by the boundaries of the Rock Hill-Fort Mill Area Transportation Study (RFATS) Metropolitan Planning Organization (MPO) and the contiguous area encompassing the York ozone monitoring station (45-091-0006) be designated as “nonattainment” for the 2008 8-hour ozone standard based on air quality data from 2006-2008. In October 2011, North Carolina submitted an update to their 2009 recommendation and did not make revisions to their previous recommendation. Additionally, in October 2011, South Carolina submitted an amendment to their 2009 recommendation, and based on preliminary air quality data from 2009-2011, revised their recommendation to “attainment” designations for each county in the State, including York County, for the 2008 8-hour ozone standard. These data are from Federal Reference Method (FRM) monitors or Federal Equivalent Method (FEM) monitors sited and operated in accordance with 40 CFR Part 58. (Letters from Dee Freeman, North Carolina Environmental Secretary to A. Stanley Meiburg, Acting Regional Administrator-EPA Region 4 and Gwendolyn Keyes Fleming, Regional Administrator-EPA Region 4 regarding the initial and updated nonattainment boundary recommendations for the 2008 8-hour ozone standard for North Carolina (October 28, 2011 and March 12, 2009, respectively); Letter from Mark Sanford, South Carolina Governor to A. Stanley Meiburg, Acting Regional Administrator-EPA Region 4 regarding initial nonattainment boundary recommendations for the 2008 8-hour ozone standard for South Carolina (March 12, 2009); Letter from Robert W. King, Jr., Deputy Commissioner of the South Carolina Environmental Quality Control to Gwendolyn Keyes Fleming, Regional Administrator-EPA Region 4 regarding updated nonattainment boundary recommendations for the 2008 8-hour ozone standard for South Carolina (October 11, 2011)).

After considering these recommendations and based on EPA's technical analysis described below, EPA intends to designate six whole counties and one partial county in North Carolina; the Catawba Indian Nation Reservation, and one partial county in South Carolina (identified in Table 1 below) as “nonattainment” for the 2008 ozone NAAQS as part of the Charlotte-Gastonia-Salisbury nonattainment area.

Table 1. State's Recommended, Tribe's Recommended and EPA's Intended Designated Nonattainment Counties for Charlotte-Gastonia-Salisbury, NC-SC

Charlotte-Gastonia-Salisbury, NC-SC	State- or Tribe-Recommended Nonattainment Counties	EPA Intended Nonattainment Counties
Catawba Indian Nation	None	Catawba Indian Nation Reservation
North Carolina	Cabarrus Gaston Iredell (partial) Lincoln Mecklenburg Rowan Union	Cabarrus Gaston Iredell (partial) Lincoln Mecklenburg Rowan Union
South Carolina	None	York (partial)

**Factor Assessment**

***Factor 1: Air Quality Data***

For this factor, we considered 8-hour ozone design values (in parts per billion (ppb)) for air quality monitors in counties in the Charlotte-Gastonia-Salisbury, NC-SC area based on data for the 2008-2010 period (i.e., the 2010 design value, or DV), which are the most recent years with fully-certified air quality data. A monitor’s DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 75 ppb or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

The 2010 DVs for the ozone NAAQS for counties in the Charlotte-Gastonia-Salisbury, NC-SC CSA and nearby surrounding area are shown in Table 2.

Table 2. Air Quality Data.\*\*

County	State Recommended Nonattainment?	2008-2010 Design Value (ppb)
<b>Mecklenburg, NC</b>	<b>Yes</b>	<b>82</b>
Lincoln, NC	Yes	72
<b>Rowan, NC</b>	<b>Yes</b>	<b>77</b>
Union, NC	Yes	72
York, SC	No	67

\*\*Bolded counties are those violating the 2008 ozone NAAQS.

Mecklenburg and Rowan Counties in North Carolina show violations of the 2008 ozone NAAQS, therefore these counties are included in the nonattainment area. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Each county without a violating monitor that is located near a county with a violating monitor has been evaluated, as discussed below, based on the five factors and other relevant information to determine whether it contributes to the nearby violation.

***Factor 2: Emissions and Emissions-Related Data***

EPA evaluated emissions of ozone precursors (NOx and VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

**Emissions Data**

EPA evaluated county-level emission data for NOx and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See <http://www.epa.gov/ttn/chief/net/2008inventory.html>) Significant emissions levels in a nearby area indicate the potential for the area to contribute to observed violations. We will also consider any additional information we receive on changes to emissions levels that are not reflected in recent inventories. These changes include emissions reductions due to permanent and enforceable emissions controls that will be in place before final designations are issued and emissions increases due to new sources. The precursor emission source-category percentages used below and throughout the document were derived from emissions data from the 2008 NEI version 1.5 referenced above.

Table 3 shows emissions of NOx and VOC (given in tons per year (tpy)) for violating and nearby counties that we considered for inclusion in the Charlotte-Gastonia-Salisbury, NC-SC area.



Table 3. Total 2008 NOx and VOC Emissions.

County	State Recommended Nonattainment?	NOx (tpy)	VOC (tpy)
Anson, NC	No	1,241	1,123
Cabarrus, NC	Yes	5,361	9,074
Chester, SC	No	2,652	1,780
Cleveland, NC	No	3,393	4,799
Gaston, NC	Yes	13,002	7,326
Iredell, NC	Yes (partial)	10,261	10,815
Lancaster, SC	No	1,626	2,744
Lincoln, NC	Yes	2,097	3,320
Mecklenburg, NC	Yes	27,275	33,412
Rowan, NC	Yes	7,117	9,834
Stanly, NC	No	1,935	2,986
Union, NC	Yes	5,190	7,748
York, SC	No	7,031	11,840
	Areawide:	88,179	106,802

VOCs and NOx are the primary contributors to ozone formation. Source category emissions data indicate that mobile sources, area sources and point sources are all contributors to NOx emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area; mobile sources and area sources are the primary contributors to VOC emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area. Thus, significant increases in population, vehicles miles traveled would indicate a county with contribution in the Area. The emissions profile for this area indicates that population-related factors are a driver for ozone formation in this area.

NOx Emissions: The profile reveals that mobile emissions make up 55 percent of the total NOx emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area and area sources make up nine percent. The total of both mobile and area sources makes up 64 percent of the total NOx emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area. Point source emissions make up 20 percent of the total NOx emissions for the Charlotte-Gastonia-Salisbury, NC-SC Area.

Mecklenburg, Gaston, Iredell, Rowan, and York Counties have the largest amounts of total NOx emissions in the CSA with 31 percent, 15 percent, 12 percent, and 8 percent, (for both Rowan and York) respectively. The highest percentage of NOx emissions for Mecklenburg, Iredell, and Rowan and York are from mobile sources, with 19 percent, 8 percent, and 4 percent of their total NOx emissions, respectively. For Gaston, the highest percentage of NOx emissions comes from point sources, with 9 percent of their total NOx emissions, respectively.

VOC Emissions: The profile reveals that mobile emissions make up 42 percent of the total VOC emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area and area sources make up 38 percent. The total of both mobile and area sources makes up 80 percent of the total VOC emissions in the Charlotte-Gastonia-Salisbury, NC-SC Area.

Mecklenburg, York, Iredell, Rowan, and Cabarrus counties have the largest amounts of total VOC emissions in the CSA with 31 percent, 11 percent, 10 percent, 9 percent, and 8 percent, respectively.

The highest percentage of VOC emissions for Mecklenburg comes from Area sources with 14 percent of their total VOC emissions. The highest percentage of VOC emissions for Iredell, Cabarrus, and Rowan is comes from mobile sources with 6 percent for Iredell and 5 percent for both Cabarrus and Rowan. Mecklenburg County's VOC emissions for mobile sources are 13 percent. York County, emissions primarily are from point and area sources.

Mecklenburg, Iredell, Rowan, Cabarrus, Gaston, and York Counties indicate contribution to nonattainment in the Charlotte-Gastonia-Salisbury, NC-SC Area based on emissions data.

### **Population density and degree of urbanization**

EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NOx and VOC emissions that may contribute to ozone formation. Rapid population or vehicle miles travelled (VMT) growth (see below) in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the area associated with the area source and mobile source emissions as part of the nonattainment area. Table 4 shows the population, population density, and population growth information for each county in the area.

Table 4. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Anson, NC	No	26,948	0.05	1,637	+6%
Cabarrus, NC	Yes	178,011	0.49	45,793	+35%
Chester, SC	No	33,140	0.06	(968)	-3%
Cleveland, NC	No	98,078	0.21	1,607	+2%
Gaston, NC	Yes	206,086	0.57	15,310	+8%
Iredell, NC	Yes (partial)	159,437	0.27	35,828	+29%
Lancaster, SC	No	76,652	0.14	15,259	+25%
Lincoln, NC	Yes	78,265	0.25	14,176	+22%
Mecklenburg, NC	Yes	919,628	1.67	218,914	+31%
Rowan, NC	Yes	138,428	0.26	7,753	+6%
Stanly, NC	No	60,585	0.15	2,339	+4%
Union, NC	Yes	201,292	0.31	75,733	+60%
York, SC	No	226,073	0.32	60,368	+36%
	Areawide:	2,402,623	0.36	493,749	+26%



Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011  
[http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC\\_10\\_PL\\_GCTP\\_L2.STO5&prodType=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_PL_GCTP_L2.STO5&prodType=table)

Mecklenburg County has the largest population and is the most densely populated of all CSA counties with a population of 919,628 and 1,670 people/square mile. All counties previously designated counties for the 1997 8-hour Charlotte nonattainment area have population densities above 250 people/square mile (Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Union, and York Counties). Additionally, the population growth for these same counties is 22 percent and above.

Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, and Union Counties in North Carolina and York County in South Carolina indicate contribution to nonattainment in the Charlotte-Gastonia-Salisbury, NC-SC Area based on population and population density.

**Traffic VMT data and commuting patterns**

EPA evaluated the total VMT for each county in the area. In combination with the population/population density data and the location of main transportation arteries (see above), this information helps identify the probable location of non-point source emissions. A county with high VMT is generally an integral part of an urban area and indicates the presence of motor vehicle emissions that may contribute to ozone formation that contributes to nonattainment in the area. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 5 shows traffic data, including total 2008 VMT data. .

Table 5. Traffic and VMT Data.

County	State Recommended Nonattainment?	2008 VMT (million miles)
Anson, NC	No	287
Cabarrus, NC	Yes	1,982
Chester, SC	No	562
Cleveland, NC	No	1,230
Gaston, NC	Yes	2,347
Iredell, NC	Yes (partial)	2,558
Lancaster, SC	No	656
Lincoln, NC	Yes	805
Mecklenburg, NC	Yes	11,315
Rowan, NC	Yes	1,816
Stanly, NC	No	605
Union, NC	Yes	1,791
York, SC	No	2,002
Areawide:		27,956

\*\*\* MOBILE model VMT are those inputs into the NEI version 1.5.

Cabarrus, Gaston, Iredell, Mecklenburg, Rowan, Union, and York Counties VMT are the highest where each county have VMT greater than 1,790 million miles. These traffic data support a preliminary conclusion that Cabarrus, Gaston, Iredell, Mecklenburg, Rowan, Union, and York Counties contribute to nonattainment in the Charlotte-Gastonia-Salisbury, NC-SC.

### ***Factor 3: Meteorology (weather/transport patterns)***

For this factor, EPA analyzed 30-years of National Weather Service (NWS) wind speed and wind direction data collected at the Charlotte/Douglas International Airport (NWS Station 13881) to help determine transport patterns and source contributions. EPA assessed wind direction and speed for the 2008-2010 “ozone season” (March through October) in the Charlotte CSA. These analyses were conducted to better understand the fate and transport of precursor emissions contributing to ozone formation. EPA’s analysis of the NWS data indicate predominate south, north, and south-southwest component for the Charlotte CSA.

### ***Factor 4: Geography/topography (mountain ranges or other air basin boundaries)***

The geography/topography analysis evaluates the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area.

The Charlotte-Gastonia-Salisbury, NC-SC area does not have any geographical or topographical barriers significantly limiting air pollution transport within its air shed. Therefore, this factor did not play a significant role in this evaluation.

### ***Factor 5: Jurisdictional boundaries***

Once we identified the general areas we anticipated we would recommend should be included in the nonattainment area, we then considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and to help identify the areas appropriate for carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment area boundaries for ozone or other urban-scale pollutants, county lines, air district boundaries, township boundaries, area covered by a MPOs, state lines, Reservation boundaries, and urban growth boundary. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The Charlotte-Gastonia-Salisbury, NC-SC area has previously established nonattainment boundaries associated with the both the 1-hour ozone and 1997 8-hour ozone NAAQS. The Charlotte nonattainment boundary for the 1-hour ozone NAAQS included Mecklenburg County, North Carolina in its entirety. Whereas the Charlotte nonattainment boundary for the 1997 8-hour ozone NAAQS included Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan and Union Counties in North Carolina in their entireties, a portion of Iredell County, North Carolina, a portion of York County, South Carolina, and the Catawba Indian Nation Reservation. The States have recommended a different boundary for the 2008 ozone NAAQS. In South Carolina’s October 2011 letter, they revised their boundary recommendations to attainment statewide as a result of the most current air quality data which indicates attainment of the 2008 8-hour ozone standard. The presence of a violating monitor is not the only factor considered in nonattainment boundaries. However, a consideration of the other factors was not presented in their October 2011 letter.

The Charlotte-Gastonia-Salisbury area also includes an area of Indian country. As defined at 18 U.S.C. 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." EPA recognizes the sovereignty of tribal governments, and has attempted to take the desires of the tribes into account in establishing appropriate nonattainment area boundaries. As mentioned earlier, The Catawba Indian Nation Reservation is located within the South Carolina portion of the bi-state Charlotte nonattainment area. Generally air quality State Implementation Plans (SIPs) do not apply in Indian country throughout the United States. However, for purposes of the Catawba Indian Nation Reservation in Rock Hill, the South Carolina SIP does apply within the Reservation. Pursuant to the Catawba Indian Claims Settlement Act, S.C. Code Ann. 27-16-120, "all state and local environmental laws and regulations apply to the [Catawba Indian Nation] and Reservation and are fully enforceable by all relevant state and local agencies and authorities."

## **Conclusion**

Based on the assessment of factors described above, EPA has preliminarily concluded that the following counties should be included as part of the Charlotte-Gastonia-Salisbury, NC-SC nonattainment area because they are either violating the 2008 ozone NAAQS or contributing to a violation in a nearby area: Cabarrus, Gaston, Lincoln, Mecklenburg, Rowan and Union Counties in North Carolina in their entirety, a portion of Iredell County, North Carolina, a portion of York County, South Carolina, and the Catawba Indian Nation Reservation. All of these counties and the Catawba Indian Nation Reservation are included in the Charlotte nonattainment area for the 1997 ozone NAAQS. The air quality monitors in Mecklenburg and Rowan Counties, North Carolina indicate violations of the 2008 ozone NAAQS based on 2010 DVs, therefore these counties are preliminarily included in the nonattainment area. Cabarrus, Gaston, Lincoln, and Union Counties in North Carolina in their entirety, a portion of Iredell County, North Carolina, a portion of York County, South Carolina, and the Catawba Indian Nation Reservation are nearby counties that do not have violating monitors, but EPA has preliminarily concluded that these areas contribute to the ozone concentrations in violation of the 2008 ozone NAAQS through emissions from point sources and non-point sources (e.g., vehicles and other small area sources). Gaston, Iredell, Mecklenburg, Rowan, and York have the highest NO<sub>x</sub> emissions in the area. Cabarrus, Iredell, Mecklenburg, Rowan, and York have among the highest VOC emissions in the area. Lincoln and Union ranked relatively high for emissions-related data such as population, and population density; commuting; meteorology, and jurisdictional boundaries.