

# **Base Year (2011) Emissions Inventory and Emissions Statements**

## **State Implementation Plan**

**for the  
Charlotte-Gastonia-Salisbury, North Carolina  
2008 Ozone Marginal Nonattainment Area**



**Prepared by  
North Carolina Department of Environment and Natural Resources  
Division of Air Quality**

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**Preface:** This document contains the base year (2011) emission inventory for the Charlotte-Gastonia-Salisbury 2008 8-hour ozone marginal nonattainment area pursuant to §182(a)(1) of the Clean Air Act, as amended (CAA). The document also addresses §182(a)(3)(B) of the CAA which requires states with areas designated nonattainment for the ozone standard (under subpart 2) to submit a SIP revision to require sources within that nonattainment area to submit annual emissions statements to the state.

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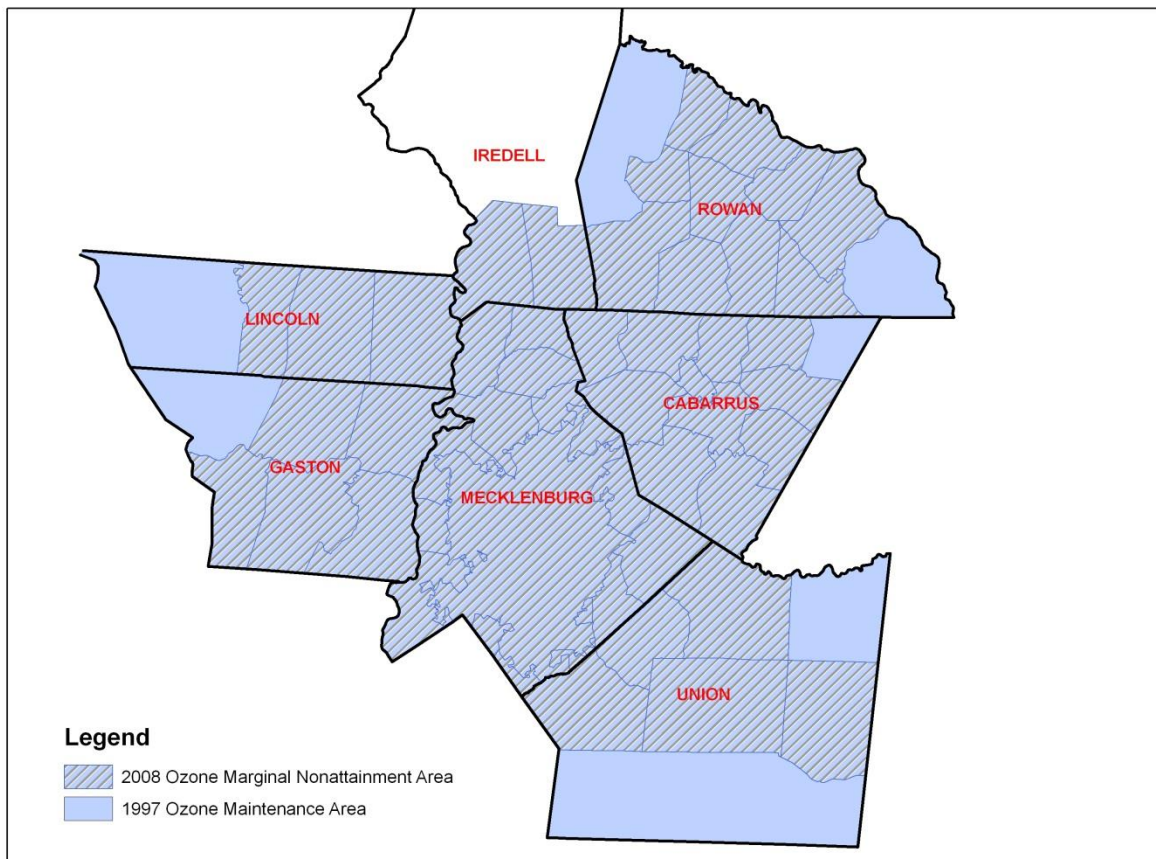
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# BASE YEAR EMISSIONS INVENTORY AND EMISSIONS STATEMENTS

## 1.0 Introduction

On April 30, 2012, the United States Environmental Protection Agency (EPA) designated areas as nonattainment for the 2008 8-hour ozone National Ambient Air Quality Standard or NAAQS (77 FR 30088). The final ozone designations were based primarily on certified air quality monitoring data from calendar years 2008-2010. The Charlotte-Gastonia-Salisbury, North Carolina area (referred to as the Charlotte nonattainment area) was designated marginal nonattainment for the 2008 8-hour ozone NAAQS by the EPA, effective on July 20, 2012. In accordance with section 182(a)(1) of the Clean Air Act, the State of North Carolina is required to submit a base year inventory for emissions of nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) in this nonattainment area within 24 months of designation. Also within 24 months of designation, CAA section 182(a)(3)(B) requires the state to ensure adequate provisions are in place that require the owner or operator of each stationary source of NO<sub>x</sub> and VOC emissions to provide the state with a statement showing actual emissions.

The Charlotte nonattainment area includes the entire county of Mecklenburg and parts of Cabarrus, Gaston, Iredell, Lincoln, Rowan and Union Counties (see Figure 1-1). The partial counties include the townships listed in Table 1-1. Note that the EPA also designated the portion of York County, South Carolina that is adjacent to the Charlotte-Gastonia-Salisbury, North Carolina as marginal nonattainment for the 2008 8-hour ozone NAAQS. The South Carolina Department of Health & Environmental Control is responsible for submitting a plan that documents the base year inventory for emissions of NO<sub>x</sub> and VOC and includes emissions statements requirements for the South Carolina portion of the nonattainment area.



**Figure 1-1. Charlotte Nonattainment Area Boundary**

**Table 1-1. Counties and Townships within the Charlotte Nonattainment Area**

<b>Cabarrus County Townships</b>					
Central Cabarrus	Concord*	Georgeville	Harrisburg	Kannapolis	Midland
Mount Pleasant	Odell	Poplar Tent	New Gilead	Rimertown	
<b>Gaston County Townships</b>					
Dallas	Crowders Mountain	Gastonia	Riverbend	South Point	
<b>Iredell County Townships</b>					
Coddle Creek	Davidson				
<b>Lincoln County Townships</b>					
Catawba Springs	Lincolnton	Ironton			
<b>Rowan County Townships</b>					
Atwell	China Grove	Franklin	Gold Hill*	Litaker	Locke
Providence	Salisbury	Steele	Unity		
<b>Union County Townships</b>					
Goose Creek	Marshville	Monroe	Sandy Ridge	Vance	

\*Note: Concord Township in Cabarrus County and Gold Hill Township in Rowan County were inadvertently left out of North Carolina’s recommendation and EPA’s final designations. In a letter dated January 28, 2014, the North Carolina Division of Air Quality (DAQ) requested EPA to add the missing townships in the state’s 2008 marginal ozone nonattainment area definition.

Table 1-2 displays the population percentages per county that were used to determine the nonattainment portion for each county except Mecklenburg. The population percentages were obtained by determining the population density in each township using geographic information system (GIS) mapping. The population percentages are based on 2010 census data. The total county emissions were multiplied by the population percentages to calculate the emissions for the nonattainment portion only for each county. This methodology was applied to the emissions for the on-road mobile, nonroad mobile, and area source sectors. For point sources, the location coordinates were mapped using a GIS to identify the facilities located within the nonattainment portion of each county. For Mecklenburg County, the emissions associated with all emission sources are included in this SIP because the nonattainment area includes all of Mecklenburg County.

**Table 1-2. Population Percentages per County**

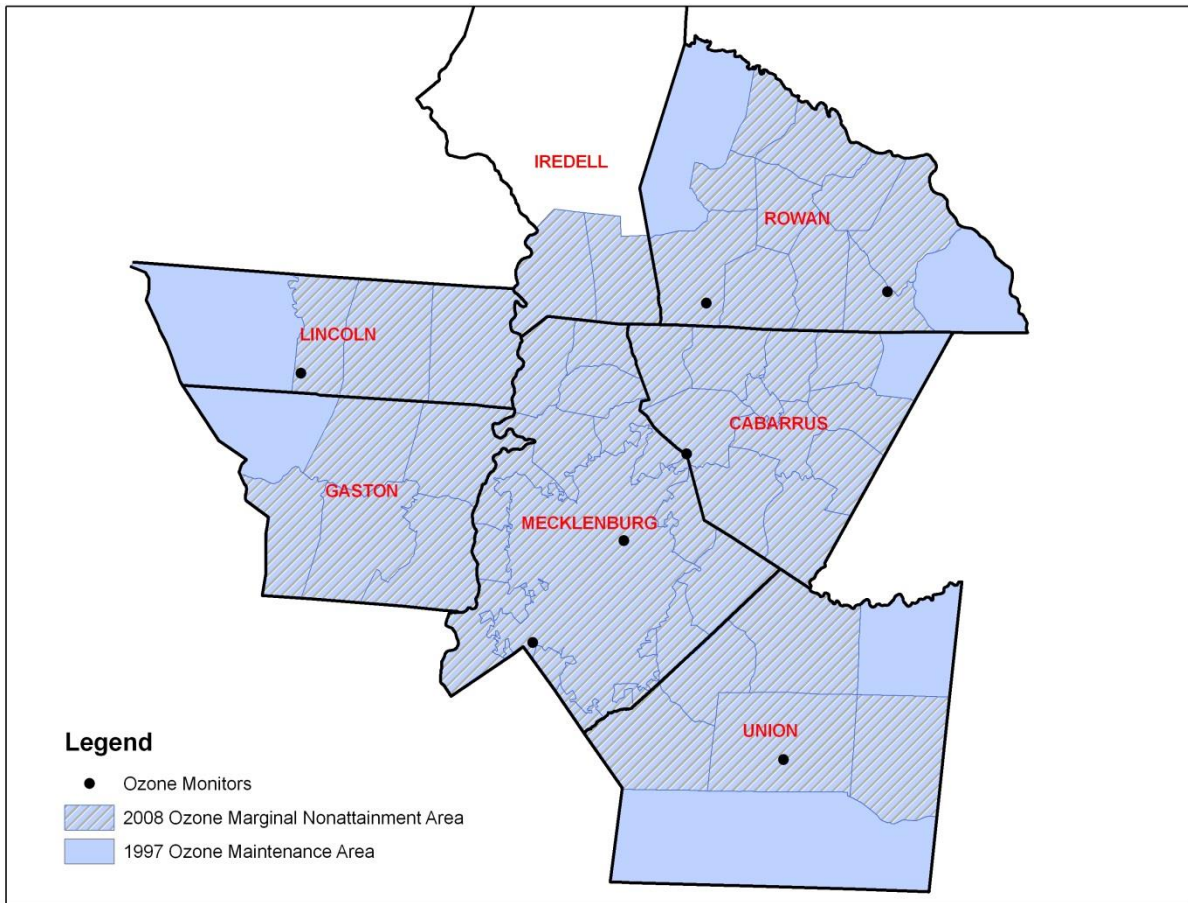
<b>County</b>	<b>Population Percentage</b>
Cabarrus	99.2%
Gaston	92.2%
Iredell	39.9%
Lincoln	80.2%
Rowan	92.9%
Union	86.9%

## **2.0 Current Air Quality**

The North Carolina Division of Air Quality (DAQ) and the Mecklenburg County Air Quality (MCAQ) have collected ambient monitoring data for the Charlotte area since the late seventies. At the time of the 2008 8-hour ozone designations, there were seven ozone monitors located throughout the Charlotte nonattainment area. These monitors were installed in accordance with the procedures specified in the Code of Federal Regulations (CFR) 40 CFR 58.

Figure 2-1 displays the location of ozone monitors in the counties affected by the Charlotte nonattainment area designation.





**Figure 2-1. Ozone Monitor Locations in the Charlotte Nonattainment Area**

Tables 2-1 and 2-2 show the ozone measurements data and corresponding design values for the monitors in the Charlotte nonattainment area, respectively, from 2002 to 2013.

**Table 2-1. Charlotte Nonattainment Area's Historic 4<sup>th</sup> Highest 8-hour Ozone Values (2002-2013)**

Monitor	4 <sup>th</sup> Highest 8-hour Ozone Values (ppm)											
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013*
Crouse	0.095	0.089	0.074	0.082	0.082	0.085	0.079	0.065	0.072	0.077	0.076	0.064
AIRS ID #												
37-109-0004												
Lincoln County	0.103	0.086	0.085	0.088	0.091	0.093	0.085	0.069	0.082	0.088	0.080	0.067
Garinger												
AIRS ID #												
37-119-0041	0.094	0.073	0.077	0.085	0.078	0.087	0.073	0.068	0.078	0.082	0.073	0.062
Mecklenburg County												
Arrowood												
AIRS ID #	0.107	0.088	0.083	0.090	0.093	0.096	0.093	0.071	0.082	0.083	0.085	0.066
37-119-1005												
Mecklenburg County												
County Line	0.106	0.098	0.080	0.086	0.085	0.096	0.084	0.071	0.077	0.077	0.080	0.063
AIRS ID #												
37-159-0021												
Rowan County	0.108	0.087	0.080	0.088	0.089	0.095	0.082	0.073	0.078	0.078	0.077	0.064
Enochville												
AIRS ID #												
37-159-0022	0.100	0.083	0.074	0.082	0.080	0.082	0.08	0.067	0.071	0.073	0.075	0.063
Rowan County												
Monroe												
AIRS ID #	0.100	0.083	0.074	0.082	0.080	0.082	0.08	0.067	0.071	0.073	0.075	0.063
37-179-0003												
Union County												

\* 2013 monitoring data has not yet been submitted to the EPA for certification purposes.

**Table 2-2. Charlotte Nonattainment Area's Historic Design Values (2002-2013)**

Monitor	Design Value (ppm)									
	02-04	03-05	04-06	05-07	06-08	07-09	08-10	09-11	10-12	11-13*
Crouse AIRS ID # 37-109-0004 Lincoln County	<b>0.086</b>	<b>0.081</b>	<b>0.079</b>	<b>0.083</b>	<b>0.082</b>	<b>0.076</b>	0.072	0.071	0.075	0.072
Garinger AIRS ID # 37-119-0041 Mecklenburg County	<b>0.091</b>	<b>0.086</b>	<b>0.088</b>	<b>0.090</b>	<b>0.089</b>	<b>0.082</b>	<b>0.078</b>	<b>0.079</b>	<b>0.083</b>	<b>0.078</b>
Arrowood AIRS ID # 37-119-1005 Mecklenburg County	<b>0.081</b>	<b>0.078</b>	<b>0.080</b>	<b>0.083</b>	<b>0.079</b>	<b>0.076</b>	0.073	<b>0.076</b>	<b>0.077</b>	0.072
County Line AIRS ID # 37-119-1009 Mecklenburg County	<b>0.092</b>	<b>0.087</b>	<b>0.088</b>	<b>0.093</b>	<b>0.094</b>	<b>0.086</b>	<b>0.082</b>	<b>0.078</b>	<b>0.083</b>	<b>0.078</b>
Rockwell AIRS ID # 37-159-0021 Rowan County	<b>0.094</b>	<b>0.088</b>	<b>0.083</b>	<b>0.089</b>	<b>0.088</b>	<b>0.083</b>	<b>0.077</b>	0.075	<b>0.078</b>	0.073
Enochville AIRS ID # 37-159-0022 Rowan County	<b>0.091</b>	<b>0.085</b>	<b>0.085</b>	<b>0.090</b>	<b>0.088</b>	<b>0.083</b>	<b>0.077</b>	<b>0.076</b>	<b>0.077</b>	0.073
Monroe AIRS ID # 37-179-0003 Union County	<b>0.085</b>	<b>0.079</b>	<b>0.078</b>	<b>0.081</b>	<b>0.080</b>	<b>0.076</b>	0.072	0.070	0.073	0.070

Note: Bolded values represent violations of the 2008 8-hour ozone standard.

\* 2013 monitoring data has not been submitted to EPA at this time.

### 3.0 Emissions Inventories

There are four different man-made emission inventory source classifications: (1) stationary point, (2) area, (3) on-road mobile, and (4) nonroad mobile sources. The emissions for each source classification are calculated on a ton per summer day basis. All emissions are reported for the 2011 base year representing typical (average) day emissions for the month of July. The emissions reported for Cabarrus, Gaston, Iredell, Lincoln, Rowan, and Union Counties reflect the emissions for the nonattainment portion only. The nonattainment portion emissions, except for point sources, were determined based on the population of the nonattainment townships for each partial county. For point source emissions, the nonattainment portion was based on whether the

facility is located inside the nonattainment area by utilizing GIS mapping. For Mecklenburg County, the emissions for the entire county are provided.

The point source inventory consists of emissions from individual facilities (permitted point sources, aircraft and related ground support equipment at airports and locomotives at rail yards). In general, the point source emissions inventory includes stationary sources with air permits that have the potential to emit more than 5 tons per year of a criteria pollutant or its precursors from a single facility.<sup>1</sup> These facilities report source-specific emissions data to the DAQ and MCAQ according to each agency's emissions reporting rules. Their emissions are tabulated from data collected through direct on-site emissions measurements systems or mass balance calculations utilizing emission factors from the EPA's *AP-42* or stack test results.<sup>2</sup> The DAQ and MCAQ submitted facility-specific emissions data to the EPA as part of the agency's triennial National Emissions Inventory (NEI) development efforts. As such, the base year 2011 point source emissions inventory for the Charlotte nonattainment area is identical to the 2011 NEI version 1.0.

Airports and rail yards are not required to have air quality permits for construction and operation, although they could have equipment such as a boiler or generator that require an operating permit. These source types have fixed and known locations and their emissions quantities can be comparable to industrial sources. Therefore, for purposes of the EPA's NEI, they are reported as industrial point sources. In the past, these sources were reported with nonroad mobile sources. In order to be consistent with the NEI, the base year 2011 airports and rail yards are summarized with the point sources emissions inventory.

Although both the DAQ and MCAQ inventory includes all of the criteria air pollutants and a large number of toxic pollutants, only the NO<sub>x</sub> and VOC emissions are reported since they are the precursor pollutants for ozone formation.

For detailed discussion on how the point sources emission inventory was developed, see Appendix B.1. A summary of the point source NO<sub>x</sub> and VOC emissions is presented in Table 3-1 and Table 3-2, respectively.

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<sup>1</sup> Stationary point sources with the potential-to-emit 5 tons per year or less are included in the area source emissions inventory.

<sup>2</sup> Continuous emissions monitoring (CEM) data were available for all three electricity generating stations (G.G. Allen, Buck, and Riverbend) located in the nonattainment area; therefore, the CEM data for July 2011 were used to calculate typical summer day emissions for NO<sub>x</sub>.

**Table 3-1. 2011 Point Source NOx Emissions (tons/day)**

County	Point	Airport	Rail Yard	Total
Cabarrus*	1.09	0.01	0.00	1.1
Gaston*	26.43	0.01	0.00	26.44
Iredell*	4.63	0.00	0.00	4.63
Lincoln*	0.43	0.00	0.00	0.43
Mecklenburg	0.50	6.68	0.58	7.76
Rowan*	5.94	0.00	0.27	6.21
Union*	0.49	0.01	0.10	0.6
<b>Total</b>	<b>39.51</b>	<b>6.71</b>	<b>0.95</b>	<b>47.17</b>

Note: \* indicates emissions for nonattainment portion only.

**Table 3-2. 2011 Point Source VOC Emissions (tons/day)**

County	Point	Airport	Rail Yard	Total
Cabarrus*	0.87	0.02	0.00	0.89
Gaston*	1.73	0.01	0.00	1.74
Iredell*	0.97	0.00	0.00	0.97
Lincoln*	1.22	0.01	0.00	1.23
Mecklenburg	0.51	0.98	0.04	1.53
Rowan*	3.77	0.01	0.03	3.81
Union*	1.17	0.02	0.01	1.2
<b>Total</b>	<b>10.24</b>	<b>1.05</b>	<b>0.08</b>	<b>11.37</b>

Note: \* indicates emissions for nonattainment portion only.

Area sources are those stationary sources whose emissions are relatively small but due to the large number of these sources, the collective emissions could be significant (e.g., dry cleaners, service stations). For area sources, emissions are estimated by multiplying an emission factor by some indicator of collective emissions activity such as production, number of employees, or population. These types of emissions are estimated at the county level. For detailed discussion on how the area source emission inventory was developed, see Appendix B.2. A summary of the area source emissions is presented in Table 3-3.

**Table 3-3. 2011 Area Source Emissions (tons/day)**

County	NOx Emissions	VOC Emissions
Cabarrus*	0.44	4.53
Gaston*	0.55	4.94
Iredell*	0.22	1.95
Lincoln*	0.12	1.72
Mecklenburg	4.48	23.47
Rowan*	0.40	3.95
Union*	0.47	6.13
<b>Total</b>	<b>6.68</b>	<b>46.69</b>

Note: \* indicates emissions for nonattainment portion only.

On-road mobile sources are defined as those vehicles that travel on public roadways. Emissions from motor vehicles occur throughout the day while the vehicle is in motion, at idle, parked and during refueling. All of these emissions processes need to be estimated in order to properly reflect the total emissions from this source category. For on-road mobile sources, the EPA's MOtor Vehicle Emissions Simulator (MOVES) mobile model is run to generate emissions. Note that the EPA 2011 NEI version 1.0 used a representative county approach to estimate emissions for all counties contained in a given state. As part of the DAQ's official comments on EPA's version 1.0, it was determined that county level on-road modeling using county-specific vehicle population, mix, and other local data are the best method for creating an emissions inventory. The base year 2011 on-road emissions inventory presented here represents results from the DAQ's MOVES modeling for each ozone nonattainment county. For a detailed discussion on how the on-road mobile emission inventory was developed, see Appendix B.3. A summary of the on-road mobile source emissions is presented in Table 3-4.

**Table 3-4. 2011 On-road Mobile Source Emissions (tons/day)**

<b>County</b>	<b>NOx Emissions</b>	<b>VOC Emissions</b>
Cabarrus*	11.85	6.32
Gaston*	13.39	6.93
Iredell*	5.45	2.62
Lincoln*	4.33	2.49
Mecklenburg	57.01	26.06
Rowan*	10.78	5.74
Union*	9.32	5.19
<b>Total</b>	<b>112.13</b>	<b>55.35</b>

Note: \* indicates emissions for nonattainment portion only.

Nonroad mobile sources are equipment that can move but do not use the roadways ( e.g., lawn mowers, construction equipment, railroad locomotives, aircraft). The emissions from most of the nonroad mobile sources are calculated using the EPA's NONROAD model. The railroad locomotive emissions are calculated with fuel use data, track miles and emission factors. Nonroad mobile sources also include commercial marine vessels but no commercial marine vessels operate in the Charlotte area. For detailed discussion on how the nonroad mobile emissions inventory was developed, see Appendix B.4. A summary of the nonroad mobile source emissions is presented in Table 3-5.

**Table 3-5. 2011 Nonroad Mobile Source Emissions (tons/day)**

<b>County</b>	<b>NOx Emissions</b>	<b>VOC Emissions</b>
Cabarrus*	2.43	1.62
Gaston*	2.30	1.83
Iredell*	0.96	0.84
Lincoln*	0.88	0.83
Mecklenburg	16.31	14.76
Rowan*	1.94	1.96
Union*	3.93	2.56
<b>Total</b>	<b>28.75</b>	<b>24.40</b>

Note: \* indicates emissions for nonattainment portion only.

Table 3-6 summarizes the total anthropogenic NOx and VOC emissions (tons per day) for the Charlotte nonattainment area. Biogenic or naturally occurring emissions of VOC are not included here based on guidance given by the EPA's Region 4 office.

**Table 3-6. 2011 Total Emissions (tons/day)**

<b>County</b>	<b>NOx Emissions</b>	<b>VOC Emissions</b>
Cabarrus*	15.82	13.36
Gaston*	42.68	15.44
Iredell*	11.26	6.38
Lincoln*	5.76	6.27
Mecklenburg	85.56	65.82
Rowan*	19.33	15.46
Union*	14.32	15.08
<b>Total</b>	<b>194.73</b>	<b>137.81</b>

Note: \* indicates emissions for nonattainment portion only.

#### **4.0 Emissions Statements**

Section 182(a)(3)(B) of the CAA and subsequent EPA rules and memoranda require stationary source facilities located within marginal and above nonattainment areas to submit an emissions statement within 2 years of ozone nonattainment designation. Specifically, an owner or operator of each stationary source of NOx and VOC emissions must provide the state with a statement showing the actual emissions from that source.

North Carolina already has an emissions statement program due to a previous nonattainment designation. North Carolina's last SIP revision related to meeting the emissions statement requirement for the Charlotte area was approved through a direct final action taken by EPA on April 24, 2012 (77 FR 24382). The EPA rule approved North Carolina's annual emissions reporting requirements into the SIP on June 25, 2012. North Carolina continues to operate under

the provisions approved under this action. As such, no further action is required to satisfy emissions statements requirements for the 2008 ozone marginal nonattainment area.