# Supplement to
# Section 110(a)(1) Maintenance Plan
# for the
# 1997 8-Hour Ozone Standard

# For

# Greensboro/Winston-Salem/High Point
# 1-Hour Ozone Maintenance Area

**April 12, 2013**

**Prepared by:**

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

## PREFACE

This document serves as a supplement to the February 4, 2008 110(a)(1) Maintenance Plan for the Greensboro/Winston-Salem/High Point ozone maintenance area. This supplement serves as the technical support document to request relaxation of current summertime gasoline requirement of 7.8 pounds per square inch.

# INTRODUCTION

This document supplements the 110(a)(1) 1997 8-hour Ozone Standard Maintenance Plan for the Greensboro, Winston-Salem, and High Point 1-hour Ozone Maintenance Area (Triad area) that was submitted to the United States Environmental Protection Agency (USEPA) on April 13, 2011. This supplement documents the revisions of the on-road mobile, non-road mobile, and area source emissions resulting from the proposed modification of the Reid Vapor Pressure (RVP) summertime gasoline requirement from 7.8 pounds per square inch (psi) to 9.0 psi. Section 211(h)(1) of the Clean Air Act specifies that during high ozone season, the gasoline volatility standard is a maximum of 9.0 psi for ozone attainment areas, and 7.8 psi for ozone nonattainment areas. The volatility standard is codified in 40 CFR 80.27(a)(2).

The RVP is a federal control measure intended to lower air emissions of volatile organic compounds (VOC), a precursor to ozone formation. In the mid-to late- 1990s, the discovery that a significant amount of VOC emissions comes from natural sources began to change the understanding of the atmospheric chemistry, particularly in the southeastern United States. Statewide, natural sources account for 90 percent of total VOC emissions. Today, we know that controlling ozone throughout North Carolina and much of the southeast is more effectively done through emissions reductions of nitrogen oxides (NOx). With this scientific understanding in mind, the North Carolina Division of Air Quality (NCDAQ) is requesting the relaxation of the 7.8 psi RVP requirement in the affected Triad counties.

This supplement shows that North Carolina can implement the 9.0 psi gasoline without interfering with the attainment of the National Ambient Air Quality Standards (NAAQS). The NCDAQ's analysis indicates that increasing the RVP from 7.8 psi to 9.0 psi does not negatively impact the redesignation and maintenance demonstration. Therefore, the NCDAQ requests the USEPA relax the 7.8 psi RVP requirement and specify 9.0 psi as the applicable gasoline volatility standard for the entire maintenance area year round. This action would provide significant economic relief to North Carolina consumers and businesses as a result of reduced fuel costs.

In addition to the revisions to the RVP, there were also some minor revisions to the on-road mobile and area source emissions. In the original 110(a)(1) maintenance plan, the on-road mobile emissions in Appendix B.3, Table 4.3-1 were incorrect. The on-road mobile emissions were not generated with the latest version of the MOtor Vehicle Emissions Simulator (MOVES) mobile model available at that time, which was MOVES2010a. For this supplement, the MOVES2010a was used to generate the on-road mobile emissions for all years – 2007, 2011, and 2018. For the area sources, the emissions estimate method used to calculate the underground tank breathing and emptying emissions was revised, in addition to the revision to the RVP,

resulting in changes to the 2007 and 2011 VOC emissions in addition to the 2018 emissions. All of these changes are included in this supplement.

## REVISED SECTIONS

Attached are the revisions to the 8-hour Ozone Standard 110(a)(1) Maintenance Plan for the Greensboro, Winston-Salem, and High Point 1-hour Ozone Maintenance Area. The RVP revisions are only applicable to the area, nonroad mobile and on-road mobile sources. To appropriately revise the original package, replace the Narrative, Appendix B.2, Appendix B.3 and Appendix B.4.

# EXECUTIVE SUMMARY

## Introduction

Ozone is formed by a complex set of chemical reactions involving VOCs, NOx and to a lesser extent carbon monoxide (CO). These gases are generated by combustion processes, certain industrial processes and even by natural sources such as trees. Tailpipe emissions from on-road mobile sources (vehicles) are also significant sources. Even the emissions from such sources as boat engines, lawn mowers and construction equipment contribute to the formation of ozone. Ozone formation is promoted by strong sunlight, warm temperatures and light winds resulting in a problem only during the hot summer months.

The 1997 8-hour ozone National Ambient Air Quality Standard (NAAQS) is 0.08 parts per million (ppm). An exceedance of the 8-hour ozone NAAQS occurs when a monitor measures ozone above 0.084 ppm on average for an eight-hour period. A violation of this NAAQS occurs when the average of the annual fourth highest daily maximum 8-hour ozone values over three consecutive years is greater than or equal to 0.085 ppm. This three-year average is termed the "design value" for the monitor. The design value for a nonattainment area is the highest monitor design value in the area. On March 27, 2008, the United States Environmental Protection Agency (USEPA) revised the 8-hour ozone NAAQS to 0.075 ppm (73 Federal Register 16436).

## Greensboro/Winston-Salem/High Point Air Quality History

The Greensboro/Winston-Salem/High Point area (referred to as the Triad area) was designated as moderate nonattainment for the 1-hour ozone National Ambient Air Quality Standard in November 1991. In November 1993, this area was redesignated to attainment/maintenance for the 1-hour ozone standard.

In December 2002, the Triad area signed an Early Action Compact (EAC) with the North Carolina Department of Environment and Natural Resources and the USEPA for the 1997 8-hour ozone standard. The EAC gave the area an opportunity to develop local control strategies to meet the 1997 8-hour ozone standard earlier than required by the Clean Air Act. In turn, the USEPA agreed to defer the effective date of the nonattainment designation for the EAC areas. If an EAC area attained the 1997 8-hour ozone standard by December 31, 2007 and met all of its EAC milestones, the USEPA agreed to designate the area as attainment.

In April 2004, the USEPA deferred the effective date of the nonattainment designation of the Triad area for the 1997 8-hour ozone standard. The Triad EAC area met all of their milestones and attained the 1997 8-hour ozone standard by the December 2007 deadline. The USEPA designated the Triad area as attainment/unclassifiable in April 2008.

The Triad area continues to be in compliance with the 1997 8-hour ozone standard. As a result of continued improvement in air quality, the USEPA designated the area attainment of the more stringent 2008 8-hour ozone NAAQS. However, due to the extreme heat events that affected most of the country during a two week period in the summer of 2012, ozone monitors in the Triad area measured exceedances of the 2008 8-hour ozone NAAQS.

There are presently three monitors in the Triad area that are violating the 2008 8-hour ozone NAAQS based on preliminary 2010-2012 monitoring data. However, all monitors are measuring below the current NAAQS for carbon monoxide, fine particulate matter, sulfur dioxide and lead.

**Section 110(a)(1) Maintenance Plan Requirements**

Section 110(a)(1) of the Clean Air Act requires that each state adopt and submit to the USEPA a plan which provides for implementation, maintenance and enforcement of primary standards for all areas within the state. The USEPA stated that a 110(a)(1) maintenance plan is required for those areas that are designated as attainment/unclassifiable for the 1997 8-hour ozone standard and are designated as attainment for the 1-hour ozone standard with an approved maintenance plan. The Triad area meets these conditions; therefore, North Carolina is required to submit a 110(a)(1) maintenance plan for the area. The requirements of the maintenance plan include an attainment emissions inventory, a maintenance demonstration with a future inventory year, a commitment to continue ambient air quality monitoring, a contingency plan to ensure that any violations of the 1997 8-hour ozone standard is promptly corrected and verification of a continued attainment tracking mechanism.

Section 110(l) of the Clean Air requires a demonstration that "a revision of an [implementation] plan would not interfere with any applicable requirement concerning attainment." The NCDAQ conducted an emissions inventory evaluation for NOx and VOC to examine the rate of change in each pollutant in future years. The NCDAQ also completed an in-depth photochemical modeling exercise to examine the impact of these emissions changes on expected ozone levels. The results are summarized below in section 2.3.

**Conclusion**

The emissions inventory comparison between the 7.8 psi and 9.0 psi Reid Vapor Pressure (RVP) indicates that the estimated future year emissions are slightly higher for NOx and VOC. By 2018, the effect of relaxing the RVP and other corrections results in an emissions increase of 0.16 tons NOx per day and 1.43 tons VOC per day from all emission sources. This is equivalent to a 0.28% and 1.34% increase in total man-made emissions of NOx and VOC, respectively. When biogenic VOC emissions from natural sources (117.15 tons per day using USEPA Mercury Air Toxics rule modeling) are added to the man-made emissions, the actual VOC emissions increase is only 0.64%.

Despite this small increase, the safety margin for the Triad area remains relatively unchanged. The differences in NOx and VOC emissions from 2007 through 2018 are -64.34 tons per day and -14.34 tons per day, respectively, which demonstrates a downward trend in the emissions. The NCDAQ believes these small increases are within the uncertainty of the emissions inventory analysis.

The NCDAQ utilized the USEPA Mercury and Air Toxics (MATS) modeling platform to model changes in ozone and particle pollution. The MATS modeling platform was chosen because it is fairly recent, has undergone full model performance, and used the MOtor Vehicle Emissions Simulator (MOVES) mobile model to generate on-road mobile emissions. The analysis incorporated several layers of conservative estimates to determine the maximum impact of the RVP relaxation. This includes: (1) selecting the most populous county to represent other counties, (2) applying the maximum emissions increase for a given hour to the entire summertime period, (3) using the highest emissions increase for a given pollutant to represent VOC emissions, and (4) the liberal application of the grid masking.

The change in ozone concentration at monitors in and near the Triad area caused by the change in RVP in the 2016 future year showed no change in ozone concentrations at any of the area monitors. Additionally, the planned retirement and conversion of coal-fired electric generating units at Buck, Dan River, and Riverbend to natural gas would easily offset NOx emissions changes due to the RVP relaxation and reduce ozone levels in the Triad area. A similar modeling analysis was conducted for fine particulate matter, and it also showed no potential interference.

The NCDAQ concludes that relaxation of the Federal standard does not interfere with the attainment and maintenance of the NAAQS. The NCDAQ has developed a contingency plan based on a number of triggers and tracking mechanisms that will ensure that the Triad area continues to maintain the 1997 8-hour ozone NAAQS. Therefore, with this submission, the NCDAQ believes the requirements of the Section 110(a)(1) maintenance plan for the 1997 8-hour ozone standard have been met.

**TABLE OF CONTENTS**

# 1.0INTRODUCTION

## 1.1 WHAT IS TROPOSPHERIC OZONE

Ozone, a strong chemical oxidant, is the pollutant of main concern. It adversely impacts human health through effects on respiratory function and can also damage forests and crops. Ozone is not emitted directly by industrial sources or motor vehicles but instead is formed in the lower atmosphere, the troposphere, by a complex series of chemical reactions involving nitrogen oxides (NOx), the result of combustion processes, and reactive organic gases. Organic gases, also termed volatile organic compounds (VOCs), include many industrial solvents, toluene, xylene and hexane as well as the various hydrocarbons that are evaporated from the gasoline used by motor vehicles or emitted through the tailpipe following combustion.

Ozone formation is promoted by strong sunlight, warm temperatures, and light winds. High concentrations tend to be a problem in the eastern United States only during the hot summer months when these conditions frequently occur. Therefore, the U. S. Environmental Protection Agency (USEPA) mandates seasonal monitoring of ambient ozone concentrations in North Carolina only from April 1 through October 31 as described in Title 40 of the Code of Federal Regulations Part 58 (40 CFR 58).

In 1997, the USEPA revised the primary (health) and secondary (welfare) National Ambient Air Quality Standards (NAAQS) for ozone by establishing 8-hour standards. An exceedance of the 8-hour ozone NAAQS occurs when a monitor measures ozone above 0.084 ppm on average for an 8-hour period. A violation of this NAAQS occurs when the average of the annual fourth highest daily maximum 8-hour ozone values over three consecutive years is greater than or equal to 0.085 ppm. This three-year average is termed the "design value" for the monitor. The design value for a nonattainment area is the highest monitor's design value in the area.

On March 26, 2008, the USEPA promulgated a new 8-hour ozone standard. The revised standard sets the annual fourth-highest daily maximum 8-hour ozone concentration (averaged over 3 years) to 0.075 ppm.

## 1.2 GREENSBORO/WINSTON-SALEM/HIGH POINT AIR QUALITY HISTORY

Since the 1977 amendments to the Clean Air Act, areas of the country that had not attained the ambient standard for a particular pollutant were formally designated as nonattainment for that pollutant. This formal designation concept was retained in the 1990 Amendments.

The Greensboro/Winston-Salem/High Point area (referred to as the Triad area) was designated by the USEPA as "moderate" nonattainment for the 1-hour ozone standard in November 1991. The nonattainment area included Davidson, Forsyth and Guilford Counties and a portion of Davie County (Figure 1.2-1). The design value was 0.151 ppm for the Triad area, based mainly on air quality data from the unusually severe summer of 1988. In November 1992, the State of North Carolina submitted a request to redesignate this area to maintenance status, based upon three years of clean air quality data (1990 through 1992). The State submitted supplemental information to the USEPA in June 1993, and the Triad area was redesignated to attainement/maintenance status on November 8, 1993.

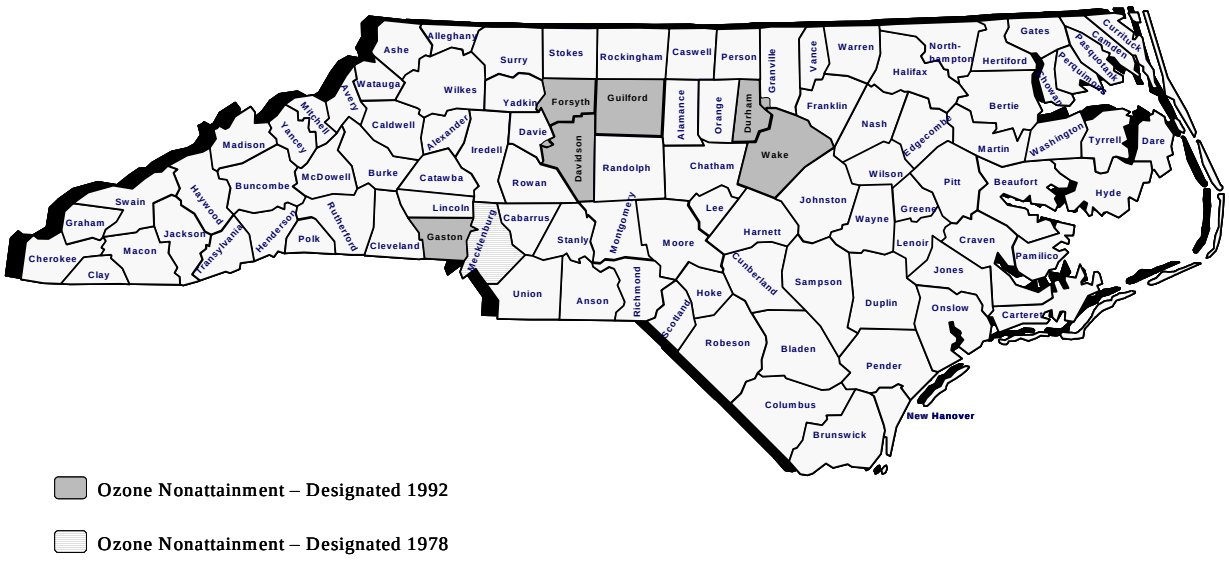


**Figure 1.2-1 North Carolina 1-Hour Ozone Nonattainment Areas**

For the 1997 8-hour ozone standard, the Triad area signed an Early Action Compact (EAC) with the North Carolina Department of Environment and Natural Resources and the USEPA. The EAC, signed in December 2002, gave areas the opportunity to develop local control strategies to meet the 1997 8-hour ozone NAAQS earlier than required by the Clean Air Act. In turn, the USEPA agreed to defer the effective date of the nonattainment designation for these areas. If an EAC area attained the 1997 8-hour ozone NAAQS by December 31, 2007 and met all of its EAC milestones, the USEPA agreed to designate the area as attainment.

In April 2004, the USEPA designated the Triad area as nonattainment for the 1997 8-hour ozone standard and deferred the effective date. The designated area included Alamance, Caswell, Davidson, Davie, Forsyth, Guilford, Randolph, and Rockingham Counties (Figure 1.2-2). The Triad EAC area met all of their EAC milestones and attained the 1997 8-hour ozone standard by

December 2007. The USEPA designated the Triad area as attainment/unclassifiable in April 2008.

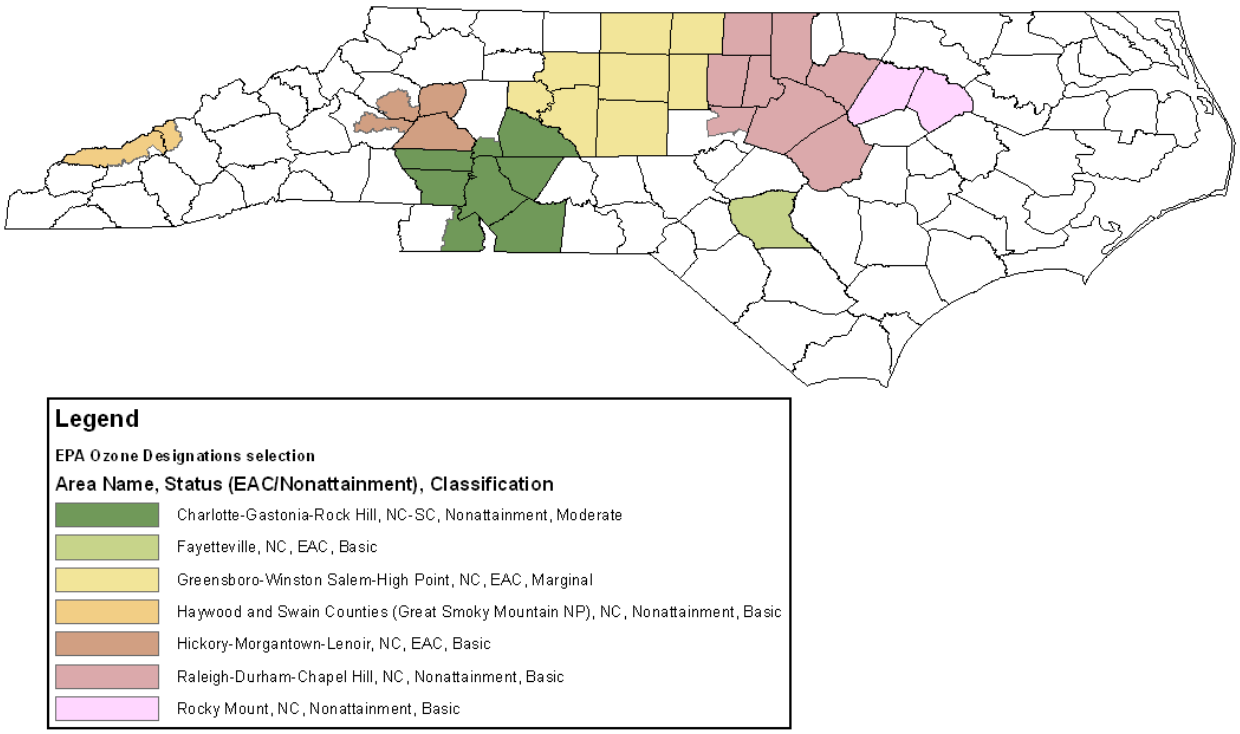


**Figure 1.2-2 North Carolina 8-Hour Ozone Nonattainment Areas in 2004**

## 1.3 CLEAN AIR ACT SECTION 110(a)(1) MAINTENANCE PLAN REQUIREMENTS

Section 110(a)(1) of the Clean Air Act requires that each state adopt and submit to the USEPA a plan which provides for implementation, maintenance and enforcement of primary standards for all areas within the state. The USEPA guidance (Appendix A) stated that the 110(a)(1) maintenance plan is required for those areas that are designated as attainment/unclassifiable for the 1997 8-hour ozone standard and are designated as attainment for the 1-hour ozone standard with an approved maintenance plan. Therefore, a 110(a)(1) maintenance plan is required for the Triad 1-hour ozone maintenance counties.

The requirements for the maintenance plan include the following:

- Attainment Emissions Inventory: The attainment emissions inventory should be based on actual "typical summer day" emissions of VOCs and NOx. The attainment inventory year may be one of any of the three years on which the 8-hour attainment designation was based.

- Maintenance Demonstration: The maintenance plan demonstrates how the area will remain in compliance with the 8-hour ozone standard for the 10-year period following the effective date of designation as attainment/unclassifiable. The future inventory year is 10 years from the effective date of the attainment designation. The maintenance plan compares the emissions for the future inventory year to the attainment inventory year. If the future inventory year emissions do not exceed the attainment year emissions then maintenance is demonstrated.

- Ambient Air Quality Monitoring: The state should continue to operate air quality monitors in accordance with 40 CFR 58 to verify maintenance of the 1997 8-hour ozone standard in the area. Any modification to the ambient air monitoring network should be accomplished through close consultation with the USEPA Regional Office.

- Contingency Plan: The state must develop a contingency plan that, at a minimum, will ensure that any violation of the 1997 8-hour ozone NAAQS is promptly corrected.

- Verification of Continued Attainment: The submittal should indicate how the state will track the progress of the maintenance plan. States should develop interim emission projection year(s) to show a trend analysis for maintenance of the standard.

In the sections that follow, the North Carolina Division of Air Quality (NCDAQ) will provide the technical data necessary to show that the Greensboro/Winston-Salem/High Point area is expected to maintain the 1997 8-hour ozone standard and has met the requirements of the 110(a)(1) maintenance plan.

## 1.4 CLEAN AIR ACT SECTION 110(l) DEMONSTRATION REQUIREMENTS

Section 110(l) of the Clean Air Act allows for the revision of an implementation plan:

- After reasonable notice and public hearing;

- After the USEPA Administrator has concluded that said implementation plan revision will not interfere with attainment and reasonable further progress in emissions reductions.

While all Triad area monitors are in attainment of the 1997 8-hour ozone NAAQS and 1-hour ozone NAAQS, three monitors are presently in violation of the 2008 8-hour ozone NAAQS. To fully satisfy the requirements of section 110(l), emissions inventory analysis with the proposed RVP change implemented is documented in Sections 2.1 and 2.2, which show reasonable further progress as defined in Section 175, Subpart 1. Additionally, a photochemical modeling exercise with updated emissions based on the proposed RVP relaxation in the affected counties was conducted, and the findings of this exercise are given in section 2.3.

# 2.0 MAINTENANCE PLAN

## 2.1 EMISSION INVENTORIES

The 110(a)(1) maintenance plan requires the development of an attainment inventory and a future year inventory for VOC and NOx emissions for those areas that were designated as attainment for the 1997 8-hour ozone standard and have an approved maintenance plan for the 1-hour ozone standard. The Triad 1-hour maintenance area, consisting of Davidson, Forsyth and Guilford Counties and a part of Davie County, meet the conditions that require the 110(a)(1) maintenance plan.

The attainment inventory year must be one of the three years on which the 8-hour ozone attainment designation was based. The USEPA designated the Triad area as attainment in April 2008 based on the 2005 through 2007 design value. Therefore, the attainment inventory year may be 2005, 2006 or 2007. The NCDAQ chose 2007 as the attainment inventory year since an emissions inventory had already been developed for this year. The future inventory year is 10 years from the effective date of the attainment designation. Since the Triad area was designated as attainment in 2008, the future inventory year selected was 2018. Finally, the USEPA guidance suggested developing an emission inventory for interim years to show a trend analysis. The Triad area is an EAC area and the NCDAQ had already submitted modeling demonstrating continued maintenance of the 1997 8-hour ozone standard for the years 2012 and 2017, therefore only one interim year emission inventory was developed.

Since the USEPA's Air Emissions Reporting Requirements (AERR) Rule requires a full emissions inventory to be submitted for 2011, the NCDAQ chose 2011 as the interim inventory year for this maintenance plan. This will allow the NCDAQ to compare the AERR inventory submittal to the estimates in this plan to ensure the area is on track to continue maintenance of the 1997 8-hour ozone standard.

As stated earlier, the Triad 1-hour ozone maintenance area consists of Davidson, Forsyth, and Guilford Counties and a portion of Davie County. For the purpose of this maintenance plan, an emission inventory for all of Davie County will be included.

The emissions inventories are comprised of four major types of sources: point, area, on-road mobile and nonroad mobile. The projected emissions inventories have been estimated using projected rates of growth in population, traffic, economic activity, and other parameters. Naturally occurring, or biogenic, emissions are not included in the emissions inventory comparison, as these emissions are outside the State's span of control.

Point sources are those stationary sources that require an air permit to operate. In general, these sources have a potential to emit more than 5 tons per year of a criteria pollutant or its precursors from a single facility. The source emissions are tabulated from data collected by direct on-site measurements of emissions or mass balance calculations utilizing emission factors from the USEPA's AP-42 or stack test results. There are usually several emission sources for each facility. Emission data is collected for each point source at a facility and the data is entered into an in-house database system. For the projected years' inventory, point sources are adjusted by growth factors based on Standard Industrial Classification codes. The growth factors are generated using the USEPA's Economic Growth Analysis System version 5.0 (E-GAS 5.0) program or using growth patterns obtained from County Business Patterns. For detailed discussion on how the point sources emission inventory was developed, see Appendix B.1. A summary of the point source emissions are presented in Table 2.1-1. No changes to point sources emissions are required due to the relaxation of the RVP standard.

**Table 2.1-1. Point Source Emissions (tons/day)**

| County | NOx Emissions | | | VOC Emissions | | |
|---|---|---|---|---|---|---|
| | 2007 | 2011 | 2018 | 2007 | 2011 | 2018 |
| Davidson | 2.73 | 2.89 | 3.20 | 3.83 | 3.85 | 3.94 |
| Davie | 0.06 | 0.06 | 0.06 | 0.19 | 0.19 | 0.19 |
| Forsyth | 2.22 | 2.18 | 2.15 | 4.03 | 4.03 | 4.03 |
| Guilford | 1.06 | 1.06 | 1.06 | 9.68 | 9.68 | 9.64 |
| **Triad Total** | 6.07 | 6.19 | 6.47 | 17.73 | 17.75 | 17.80 |

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 (i.e., dry cleaners, service stations, etc.). For area sources, emissions are estimated by multiplying an emission factor by some known indicator of collective activity such as production, number of employees, or population. These types of emissions are estimated on the county level. For the projected years' inventory, area source emissions are changed by population growth, projected production growth, or when applicable, by E-GAS 5.0 growth factors or using growth patterns obtained from County Business Patterns. For detailed discussion on how the area source emission inventory was developed, see Appendix B.2. A summary of the area source emissions are presented in Table 2.1-2.

**Table 2.1-2. Area Source Emissions (tons/day)**

| County | Current 7.8 psi RVP | | | | | | 9.0 psi RVP |
|---|---|---|---|---|---|---|---|
| | NOx Emissions | | | VOC Emissions | | | VOC Emissions |
| | 2007 | 2011 | 2018 | 2007 | 2011 | 2018 | 2018 |
| Davidson | 0.62 | 0.60 | 0.55 | 6.83 | 7.10 | 6.91 | 7.03 |
| Davie | 0.21 | 0.22 | 0.23 | 4.68 | 5.03 | 6.51 | 6.51 |
| Forsyth | 0.99 | 1.04 | 1.11 | 16.53 | 18.63 | 22.31 | 22.62 |
| Guilford | 2.01 | 2.01 | 1.99 | 22.62 | 24.20 | 28.80 | 29.19 |
| **Triad Total** | 3.83 | 3.87 | 3.88 | 50.66 | 54.96 | 64.53 | 65.35 |

For on-road mobile sources, the USEPA's MOVES mobile model is run to generate emissions. The MOVES model includes the road class vehicle miles traveled (VMT) as an input file and can directly output the estimated emissions. For the projected years' inventories, the on-road mobile sources emissions are calculated by running the MOVES mobile model for the future year with the projected VMT to generate emissions that take into consideration expected Federal tailpipe standards, fleet turnover and new fuels. For 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 are presented in Table 2.1-3.

**Table 2.1-3. On-road Mobile Source Emissions (tons/day)**

| | Current 7.8 psi RVP | | | | | | 9.0 psi RVP | |
|---|---|---|---|---|---|---|---|---|
| | NOx Emissions | | | VOC Emissions | | | NOx Emissions | VOC Emissions |
| | 2007 | 2011 | 2018 | 2007 | 2011 | 2018 | 2018 | 2018 |
| Davidson | 15.08 | 11.70 | 4.24 | 6.60 | 5.03 | 2.42 | 4.27 | 2.48 |
| Davie | 5.03 | 3.50 | 2.08 | 1.85 | 1.41 | 0.90 | 2.08 | 0.90 |
| Forsyth | 27.73 | 17.26 | 10.84 | 12.05 | 6.75 | 4.23 | 10.88 | 4.34 |
| Guilford | 42.78 | 32.10 | 18.84 | 17.41 | 12.97 | 7.82 | 18.93 | 8.04 |
| **Triad Total** | **90.62** | **64.56** | **36.00** | **37.91** | **26.16** | **15.37** | **36.16** | **15.76** |
| Net Change in Total Future Year Emissions Due to RVP Change | | | | | | | **0.16** | **0.39** |
| % Change in Total Future Year Emissions Due to RVP Change | | | | | | | **0.45%** | **2.54%** |

The MOVES mobile model estimates a NOx increase of 0.16 tons/day and VOC increase of 0.39 tons/day in future year 2018 due to RVP relaxation. The NCDAQ is uncertain of the technical reason behind the model predicted NOx emissions increases. A discussion of the dependency between NOx emissions changes and gasoline RVP was not found in the model documentation, and a specific correlation equation could not be identified.

Nonroad mobile sources are equipment that can move but do not use the roadways (i.e., lawn mowers, construction equipment, railroad locomotives, aircraft). The emissions from this category are calculated using the USEPA's NONROAD2008a nonroad model, with the exception of the railroad locomotives and aircraft engine. The railroad locomotive and aircraft engine emissions are estimated by taking an activity and multiplying it by an emission factor. These emissions are also estimated at the county level. For the projected years' inventories, the emissions are estimated using the USEPA's NONROAD2008a nonroad model, E-GAS 5.0 growth factors or projected landing and takeoff data for aircraft. A complete description of how these inventories were developed is discussed in detail in Appendix B.4. A summary of the nonroad mobile source emissions are presented in Table 2.1-4. The relaxation of the RVP standard only affects VOC emissions from nonroad mobile sources as shown in the table below.

**Table 2.1-4. Nonroad Mobile Source Emissions (tons/day)**

| | Current 7.8 psi RVP | | | | | | 9.0 psi RVP | |
|---|---|---|---|---|---|---|---|---|
| | NOx Emissions | | | VOC Emissions | | | NOx Emissions | VOC Emissions |
| | 2007 | 2011 | 2018 | 2007 | 2011 | 2018 | 2018 | 2018 |
| Davidson | 3.56 | 2.75 | 1.89 | 1.97 | 1.52 | 1.02 | 1.89 | 1.05 |
| Davie | 0.78 | 0.63 | 0.38 | 1.32 | 1.16 | 0.83 | 0.38 | 0.83 |
| Forsyth | 4.94 | 3.99 | 2.40 | 3.79 | 2.93 | 2.12 | 2.40 | 2.19 |
| Guilford | 11.83 | 9.59 | 6.11 | 8.33 | 6.50 | 4.84 | 6.11 | 4.96 |
| **Triad Total** | 21.11 | 16.96 | 10.78 | 15.41 | 12.11 | 8.81 | 10.78 | 9.03 |

## 2.2 MAINTENANCE DEMONSTRATION

Maintenance is demonstrated when the future year's total man-made emissions are less than the 2007 attainment inventory emissions. The 2018 values include the change to the RVP from 7.8 psi to 9.0 psi. Table 2.2-1 summarizes the total man-made emissions for the Triad maintenance area. The RVP change slightly increases the on-road mobile future year (2018) NOx emissions by 0.16 tons/day and VOC emissions by 0.39 tons/day based on the MOVES model (see Table 2.1-3). For the nonroad mobile sector, there is no change to NOx emissions due to the RVP change; however, the VOC emissions increase by 0.22 tons/day. Collectively, the total future year man-made NOx and VOC emissions increase by 0.16 tons/day and 1.43 tons/day, respectively. This is equivalent to a 0.28% and 1.34% increase in total man-made NOx and VOC emissions, respectively. When biogenic VOC emissions from natural sources (117.15 tons/day using USEPA Mercury Air Toxics rule modeling) are added to the man-made emissions, actual VOC emissions increase is only 0.64%.

**Table 2.2-1. Total Man-Made Emissions (tons/day) for the Triad Area**

| County | NOx Emissions | | | | VOC Emissions | | | |
|---|---|---|---|---|---|---|---|---|
| | Current 7.8 psi RVP | | | 9.0 psi RVP | Current 7.8 psi RVP | | | 9.0 psi RVP |
| | 2007 | 2011 | 2018 | 2018 | 2007 | 2011 | 2018 | 2018 |
| Davidson | 21.99 | 17.94 | 9.88 | 9.91 | 19.31 | 17.60 | 14.29 | 14.50 |
| Davie | 6.08 | 4.41 | 2.75 | 2.75 | 8.04 | 7.79 | 8.43 | 8.43 |
| Forsyth | 35.88 | 24.47 | 16.50 | 16.54 | 36.62 | 32.63 | 32.69 | 33.18 |
| Guilford | 57.68 | 44.76 | 28.00 | 28.09 | 58.31 | 53.71 | 51.10 | 51.83 |
| **Triad Total** | 121.63 | 91.58 | 57.13 | 57.29 | 122.28 | 111.73 | 106.51 | 107.94 |

Table 2.2-2 summarizes the NOx and VOC emissions for the entire Triad maintenance area and the difference between the attainment and future inventory year. The difference in total man-made NOx emissions from 2007 to 2018 due to the RVP relaxation is a slight increase of -64.50 tons/day to -64.34 tons/day. Similarly, the difference in VOC emissions from 2007 to 2018 due to the RVP relaxation is an increase from -15.20 tons/day to -14.34 tons/day. Since the future inventory emissions are less than the attainment inventory emissions, continued maintenance of the 1997 8-hour ozone standard in the Triad maintenance area is expected.

**Table 2.2-2. Maintenance Demonstration for the Triad Area**

| Year | NOx TPD | VOC TPD |
|---|---|---|
| 2007 | 121.63 | 122.28 |
| 2011 | 91.58 | 111.73 |
| 2018 | 57.29 | 107.94 |
| Difference from 2007 to 2018 | -64.34 | -14.34 |

The difference between the attainment level of emissions from all sources and the projected level of emissions from all sources in the maintenance area is considered the "safety margin". The safety margin for each projected year is listed below in Table 2.2-3. As seen in Table 2.2-3, not only does the future inventory year demonstrate maintenance of the 1997 8-hour ozone standard, the interim inventory year demonstrates a continued trend downward of the emissions. This is occurring despite the small increase in 2018 total man-made NOx and VOC emissions due to the relaxation of the RVP shown earlier in Table 2.2-1.

**Table 2.2-3. Safety Margins for the Triad Area**

| Year | NOx TPD | VOC TPD |
|---|---|---|
| 2007 | N/A | N/A |
| 2011 | -30.05 | -10.55 |
| 2018 | -64.34 | -14.34 |

Table 2.2-1 showed that there is a slight increase in future year NOx and VOC emissions due to the relaxation of the RVP, but the relative impact of this increase on the safety margin does not alter the downward trend in overall emissions between 2007 and 2018 (see Table 2.2-3). The NCDAQ does not believe the decline in future year emissions is inconsistent with the maintenance demonstration for reasons cited below.

First, the 2018 emissions are still below the baseline emissions for 2007. Second, the Triad area is considered a NOx limited area with respect to ozone formation. This means there are significantly more VOC emissions in the atmosphere from natural sources and that reductions in man-made VOC emissions, which is the primary purpose of the RVP standard, will not result in reductions in ozone formation. Third, the NCDAQ performed a photochemical modeling exercise to examine the impact of NOx and VOC emissions increase on ambient ozone concentrations. The analysis clearly demonstrates that the slight increase in emissions will result in no change to future year ozone concentrations and the potential to interfere with the attainment of the 1997 and 2008 8-hour ozone standards is not present (see Section 2.3.1). Lastly, the NCDAQ believes that voluntary measures occurring in the Triad region will further reduce NOx emissions in the Triad area (see Section 2.3.1). Each of these reasons demonstrates that despite the recent violations of the 2008 8-hour ozone standard, the current Federal RVP standard is not an effective control strategy to address ozone attainment status in the Triad area. A discussion of the RVP relaxation interference with other NAAQS is provided in Section 2.3.2.

## 2.3 CLEAN AIR ACT SECTION 110(l) DEMONSTRATION

Relaxation of the Federal gasoline standard requires a demonstration that associated emissions increases will not interfere with the attainment of other NAAQS. This section shows that the RVP relaxation will not impact compliance with ozone, carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), and particulate matter (PM) NAAQS.

### 2.3.1 INTERFERENCE WITH OZONE NAAQS

Currently, all ozone monitors in the Triad area are attaining the 1997 8-hour ozone standard, and all but three ozone monitors are attaining the 2008 8-hour ozone standard. The violations occurred during the summer of 2012 due to extreme heat episodes that affected most of the country in a relatively short period of time.

The NCDAQ has investigated potential contemporaneous, surplus, compensating/equivalent emissions reductions, and has identified current and future activities that would compensate for the slight increase in NOx and VOC emissions discussed earlier. However, due to restrictions set forth requiring emission reduction projects to be located in maintenance areas only, the

NCDAQ is unable to select projects in adjacent counties that affect air quality in the Triad area. For example, the Triad area has implemented several large scale renewable energy and energy efficiency projects which result in direct emissions reductions at nearby coal-fired electric generating units (EGUs). These projects cannot be used to offset emissions increase because the affected EGUs are not located in the Triad area. In addition, the planned shutdown of several coal-fired EGUs by April 2013 cannot be used to compensate for the RVP related emissions increases, despite being located within close proximity to the Triad area. The Buck Plant is located about a quarter-mile from the Davidson County border. Other nearby EGUs that will retire are Riverbend, which is about 37 miles from Davie County and Dan River, which is about 16.5 miles from the Guilford County line.

**Photochemical Modeling Demonstration**

The NCDAQ performed an air quality modeling exercise to show that the relaxation of current Federal volatility regulations in the Triad maintenance area is not necessary to maintain or show reasonable further progress towards maintaining or attaining the ozone NAAQS. Specifically, the relaxation of the current RVP gasoline standard of 7.8 psi to 9.0 psi in Davidson, Davie, Forsyth, and Guilford Counties will have little to no impact on ambient concentrations of ozone. In addition to modeling the RVP changes, the NCDAQ also modeled the shutdown of nearby EGUs to show that the removal of the EGUs offsets the slight increase in emissions due to relaxation in gasoline RVP.

The NCDAQ utilized the USEPA Mercury and Air Toxics (MATS) modeling platform to model changes in ozone and particle pollution. The MATS modeling platform was chosen because it is fairly recent, has undergone full model performance, and used the MOVES mobile model to generate on-road mobile emissions. More information on the MATS modeling can be found at http://www.epa.gov/mats/actions.html. Both the 2005 base year and the 2016 future year were used in the modeling. 2016 was chosen as the future year because it is the latest MATS model data available. Tables 2.3-1 – 2.3-6 provide a summary of annual NOx, VOC, and $SO_2$ emissions in Guilford, Forsyth, Davie, and Davidson Counties where the RVP relaxation is proposed, as well as the greater Triad MSA including Buck Steam Station in Rowan County.

**Table 2.3-1 2005 Annual NOx Emissions for the Triad Area used in the MATS Modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 4516 | 779 | 202 | 194 | 0 | 380 | 6071 |
| Caswell | 733 | 75 | 137 | 0 | 0 | 47 | 992 |
| **Davidson** | **4973** | **776** | **710** | **829** | **0** | **366** | **7654** |
| **Davie** | **1829** | **241** | **25** | **14** | **0** | **86** | **2194** |
| **Forsyth** | **9122** | **1554** | **189** | **1734** | **0** | **618** | **13217** |
| **Guilford** | **13105** | **3410** | **676** | **3532** | **0** | **960** | **21683** |
| Randolph | 4574 | 770 | 140 | 2531 | 0 | 378 | 8393 |
| Rockingham | 2722 | 395 | 381 | 538 | 1621 | 243 | 5901 |
| *Rowan(Buck only)* | | | | | 2254 | | |
| Stokes | 1241 | 161 | 124 | 2 | 20422 | 84 | 22033 |
| Surry | 3442 | 436 | 0 | 1102 | 0 | 231 | 5212 |
| Yadkin | 1975 | 212 | 0 | 5 | 0 | 91 | 2282 |
| 4 County RVP Relax Area Total (shown in bold) | 29028 | 5980 | 1601 | 6109 | 0 | 2030 | 44749 |
| Triad MSA plus Buck | 48231 | 8808 | 2584 | 10481 | 24297 | 3485 | 97886 |

* Aircraft, locomotive, and marine equipment

**Table 2.3-2. 2016 Annual NOx Emissions for the Triad Area used in the MATS modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 2143 | 361 | 156 | 73 | | 371 | 3104 |
| Caswell | 315 | 42 | 89 | 0 | | 45 | 491 |
| **Davidson** | **2437** | **333** | **450** | **847** | | **350** | **4417** |
| **Davie** | **723** | **125** | **20** | **0** | | **83** | **951** |
| **Forsyth** | **5700** | **764** | **134** | **1888** | | **601** | **9087** |
| **Guilford** | **7300** | **1706** | **518** | **432** | | **932** | **10889** |
| Randolph | 1649 | 323 | 101 | 35 | | 363 | 2472 |
| Rockingham | 840 | 176 | 248 | 2192 | 1665 | 233 | 5354 |
| *Rowan (Buck only)* | | | | | 1597 | | |
| Stokes | 648 | 88 | 97 | 1 | 4970 | 80 | 5885 |
| Surry | 1371 | 204 | 0 | 123 | | 222 | 1920 |
| Yadkin | 912 | 115 | 0 | 0 | | 87 | 1115 |
| 4 County RVP Relax Area Total (shown in bold) | 16161 | 2927 | 1122 | 3167 | 0 | 1966 | 25344 |
| Triad MSA plus Buck | 24039 | 4238 | 1813 | 5591 | 8232 | 3369 | 47282 |

* Aircraft, locomotive, and marine equipment

**Table 2.3-3. 2005 Annual VOC Emissions for the Triad Area used in the MATS modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 1870 | 819 | 9 | 194 | 0 | 3436 | 6327 |
| Caswell | 343 | 72 | 5 | 0 | 0 | 405 | 825 |
| **Davidson** | **1704** | **672** | **29** | **829** | **0** | **3124** | **6359** |
| **Davie** | **368** | **410** | **1** | **14** | **0** | **904** | **1698** |
| **Forsyth** | **3660** | **1281** | **8** | **1734** | **0** | **5141** | **11824** |
| **Guilford** | **4843** | **2772** | **29** | **3532** | **0** | **24763** | **35939** |
| Randolph | 1882 | 632 | 6 | 2531 | 0 | 3450 | 8502 |
| Rockingham | 1205 | 451 | 14 | 538 | 7 | 2215 | 4431 |
| *Rowan (Buck only)* | | | | | 22 | | |
| Stokes | 705 | 269 | 5 | 2 | 169 | 793 | 1943 |
| Surry | 1385 | 481 | 0 | 1102 | 0 | 1805 | 4773 |
| Yadkin | 688 | 148 | 0 | 5 | 0 | 686 | 1526 |
| 4 County RVP Relax Area Total (shown in bold) | 10575 | 5135 | 67 | 6109 | 0 | 33933 | 55819 |
| Triad MSA plus Buck | 18653 | 8007 | 106 | 10481 | 199 | 46722 | 84169 |

* Aircraft, locomotive, and marine equipment

**Table 2.3-4. 2016 Annual VOC Emissions for the Triad Area used in the MATS modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 1001 | 425 | 8 | 193 | | 3266 | 4894 |
| Caswell | 170 | 38 | 3 | 0 | | 356 | 567 |
| **Davidson** | **967** | **337** | **22** | **819** | | **2775** | **4920** |
| **Davie** | **148** | **281** | **1** | **14** | | **813** | **1257** |
| **Forsyth** | **3411** | **655** | **7** | **1381** | | **4714** | **10167** |
| **Guilford** | **3328** | **1453** | **27** | **3470** | | **24173** | **32451** |
| Randolph | 738 | 330 | 5 | 2529 | | 3190 | 6792 |
| Rockingham | 352 | 268 | 9 | 537 | 27 | 2021 | 3215 |
| *Rowan (Buck only)* | | | | | 42 | | |
| Stokes | 409 | 184 | 5 | 2 | 182 | 696 | 1478 |
| Surry | 526 | 271 | 0 | 871 | | 1622 | 3290 |
| Yadkin | 355 | 76 | 0 | 5 | | 595 | 1031 |
| 4 County RVP Relax Area Total (shown in bold) | 7854 | 2725 | 57 | 5685 | 0 | 32474 | 48796 |
| Triad MSA plus Buck | 11403 | 4319 | 88 | 9822 | 251 | 44221 | 70105 |

* Aircraft, locomotive, and marine equipment

**Table 2.3-5. 2005 Annual SO2 Emissions for the Triad Area used in the MATS modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 102 | 67 | 12 | 73 | 0 | 305 | 558 |
| Caswell | 15 | 9 | 9 | 0 | 0 | 94 | 126 |
| **Davidson** | **119** | **61** | **42** | **245** | **0** | **359** | **827** |
| **Davie** | **45** | **24** | **1** | **0** | **0** | **102** | **172** |
| **Forsyth** | **217** | **152** | **11** | **4108** | **0** | **882** | **5371** |
| **Guilford** | **316** | **340** | **39** | **677** | **0** | **947** | **2320** |
| Randolph | 101 | 60 | 8 | 23 | 0 | 372 | 565 |
| Rockingham | 59 | 34 | 24 | 835 | 4253 | 309 | 5514 |
| *Rowan (Buck only)* | 92 | 52 | 36 | 1462 | 9583 | 300 | 11525 |
| Stokes | 24 | 18 | 7 | 0 | 96823 | 209 | 97081 |
| Surry | 75 | 37 | 0 | 104 | 0 | 234 | 450 |
| Yadkin | 43 | 22 | 0 | 0 | 0 | 221 | 286 |
| 4 County RVP Relax Area Total (shown in bold) | 698 | 577 | 94 | 5030 | 0 | 2290 | 8689 |
| Triad MSA plus Buck | 1117 | 824 | 154 | 6065 | 110659 | 4033 | 122852 |

* Aircraft, locomotive, and marine equipment

**Table 2.3-6. 2016 Annual SO2 Emissions for the Triad Area used in the MATS modeling (tons/yr)**

| | On-road | Non-road | Non-road ALM* | Point EGU | Point Non-EGU | Area | Total |
|---|---|---|---|---|---|---|---|
| Alamance | 13 | 1.1 | 0.1 | 73 | 0 | 304 | 392 |
| Caswell | 2 | 0.1 | 0.0 | 0 | 0 | 94 | 96 |
| **Davidson** | 18 | 1.0 | 0.2 | 245 | 0 | 358 | 622 |
| **Davie** | 5 | 0.3 | 0.0 | 0 | 0 | 102 | 107 |
| **Forsyth** | 38 | 1.9 | 0.0 | 3835 | 0 | 882 | 4757 |
| **Guilford** | 55 | 4.2 | 0.2 | 679 | 0 | 946 | 1685 |
| Randolph | 10 | 1.0 | 0.0 | 23 | 0 | 372 | 406 |
| Rockingham | 6 | 0.5 | 0.1 | 45 | 9211 | 308 | 9570 |
| *Rowan (Buck only)* | 10 | 0.8 | 0.2 | 1462 | 10761 | 300 | 12534 |
| Stokes | 4 | 0.2 | 0.0 | 0 | 8731 | 209 | 8944 |
| Surry | 8 | 0.6 | 0.0 | 104 | 0 | 233 | 345 |
| Yadkin | 5 | 0.2 | 0.0 | 0 | 0 | 221 | 226 |
| 4 County RVP Relax Area Total | 116 | 7 | 0 | 4758 | 0 | 2287 | 7170 |
| Triad MSA plus Buck | 164 | 11 | 1 | 5003 | 28704 | 4028 | 37910 |

* Aircraft, locomotive, and marine equipment

The USEPA MATS modeling used a national 36 kilometer (km) domain and an eastern US 12km domain. The NCDAQ modeling was performed using the 12km modeling domain. The USEPA is currently using 12km modeling to address the impacts of the proposed Tier 3 Motor Vehicle and Emissions Standards. Given that the USEPA is using the 12km modeling for Tier 3, NCDAQ feels comfortable in using the 12km modeling to estimate the impacts of the change in summertime RVP to 9.0 psi. The Eastern modeling region (i.e., Eastern modeling domain) extends from Texas northward to North Dakota and eastward to the East Coast. The Eastern modeling domain was nested within a coarse grid, 36 x 36 km modeling domain which covers the lower 48 states and adjacent portions of Canada and Mexico. The 36 km and 12km modeling domains extend vertically from the surface to 100 millibars (approximately 15 km) using a sigma-pressure coordinate system. Predictions from the 36 km Continental U.S. (CONUS) domain were used to provide initial and boundary concentrations for simulations in the 12 km domain. The 36 km and 12 km modeling domains are shown in Figure 2.3-1. Table 2.3-7 provides geographic specifications for these domains.

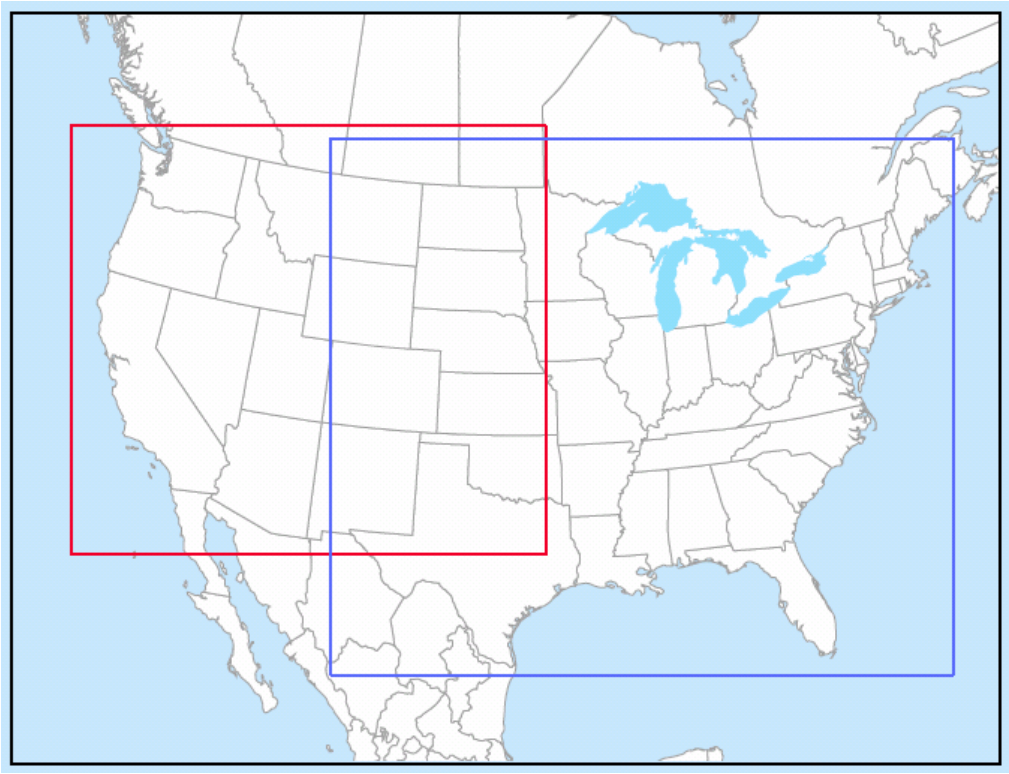

**Figure 2.3-1 Map of the CMAQ photochemical modeling domains.**

***(The black outer box denotes the 36 km national modeling domain; the red inner box is the 12 km western U.S. grid; and the blue inner box is the 12 km eastern U.S. grid.)***

**Table 2.3-7. Geographic Elements of Domains used in Photochemical Modeling**

| Photochemical Modeling Configuration | | |
|---|---|---|
| | **National Grid** | **Eastern US Fine Grid** |
| Map Projection | Lambert Conformal Projection | |
| Grid Resolution | 36km | 12km |
| Coordinate Center | 97 deg W, 40 deg N | |
| True Latitudes | 33 deg N and 45 deg N | |
| Dimensions | 148 x 112 x 14 | 279 x 240 x 14 |
| Vertical Extent | 14 Layers: Surface to 100 millibar level | |

As discussed earlier in Section 2.1, the NCDAQ used the MOVES mobile model to compute hourly changes in on-road mobile emissions with RVP settings of 7.8 psi and 9.0 psi. For the photochemical modeling evaluation, Guilford County was selected to represent the "highest" level of emissions increase expected because it has the greatest population of vehicles within the Triad maintenance area. Table 2.3-8 summarizes the emissions changes obtained from the MOVES model for each pollutant that contributes to ozone formation. Table 2.3-9 shows the ratios applied to the species within the CMAQ mobile emissions inputs.

**Table 2.3-8. MOVES 2018 Total Emissions Changes from 7.8 psi to 9.0 psi RVP for Guilford County**

| **Pollutant** | **Max % increase** | **Average % increase** |
|---|---|---|
| Acetaldehyde | 0.75% | 0.41% |
| Benzene | 0.00% | -2.76% |
| Carbon Monoxide (CO) | 2.09% | 1.63% |
| Ethanol | 0.00% | 0.00% |
| Formaldehyde | 0.00% | -1.01% |
| Hexane | 9.20% | 2.59% |
| Methane ($CH_4$) | 0.41% | 0.20% |
| Nitrogen Dioxide ($NO_2$) | 0.33% | 0.19% |
| Nitrogen Oxide (NO) | 0.61% | 0.38% |
| Nitrous Acid (HONO) | 0.57% | 0.37% |
| Non-Methane Hydrocarbons | 6.95% | 1.96% |
| Oxides of Nitrogen (NOx) | 0.57% | 0.37% |
| Styrene | 0.89% | 0.67% |
| Toluene | 7.67% | 2.21% |
| Total Gaseous Hydrocarbons | 6.55% | 1.81% |
| Volatile Organic Compounds (VOC) | 7.01% | 1.97% |
| Xylene | 8.10% | 2.33% |

**Table 2.3-9. Ratios applied to CMAQ Mobile Emissions within Davidson, Davie, Forsyth, and Guilford Counties**

| CMAQ Emissions Species | Ratio applied |
|---|---|
| NO | 1.0062 |
| NO2 | 1.0034 |
| CO | 1.0209 |
| HONO | 1.0057 |
| ALD2 | 1.0075 |
| CH4 | 1.0041 |
| Benzene | 0.97 |
| FORM | 0.998 |
| PAR | 1.07 |
| UNR | 1.07 |
| ALDX | 1.07 |
| ETH | 1.07 |
| IOLE | 1.07 |
| ISOP | 1.07 |
| NVOL | 1.07 |
| OLE | 1.07 |
| TERP | 1.07 |
| UNK | 1.07 |

Typically, the next step is to run SMOKE using the MOVES output. However, NCDAQ is unable to run the version of SMOKE used in the MATS modeling. As an alternative, for each pollutant, the average and maximum increase at any hour was calculated (see Table 2.3-8). In order to generate very conservative estimates of the impacts of the RVP relaxation, the maximum percent increase was applied to the mobile emissions for all hours of the June 1st to September 15th summertime RVP period. The adjustments were applied to both the 2005 and 2016 emissions in Guilford, Forsyth, Davie, and Davidson Counties where the RVP relaxation is proposed.

These adjustments were applied to the grid cells covering the four counties. The array of grid cells (i.e., grid cell mask) where the RVP emissions changes were applied is shown in Figure 2.3-2. A grid cell was included in the grid cell mask if as little as 20% of the cell area includes one or more of the counties where the RVP relaxation is proposed. The grid cell mask includes 42 grid cells with an area of 6,048 $km^2$. A typical application of the mask would include 32 grid

cells with an area of 4,608 $km^2$. By comparison, the total area of the four counties is 4,935 $km^2$. The 20% threshold grid cell mask used in the modeling will adjust the mobile emissions in a larger area than the actual area of the four counties and will lead to conservative modeling results.

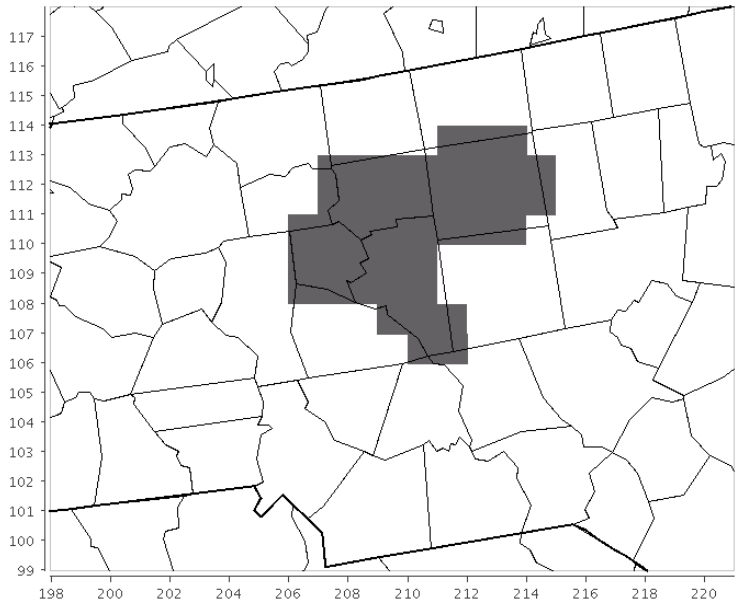


**Figure 2.3-2 Area Mask for Emissions Adjustments Due to Changes in Gasoline RVP**

In summary, several layers of conservative estimates were used to determine the maximum impact of RVP relaxation. This includes: (1) selecting the most populous county to represent other counties, (2) applying the maximum emissions increase for a given hour to the entire summertime period, (3) using the highest emissions increase for a given pollutant to represent VOC emissions, and (4) the liberal application of the grid masking.

The NCDAQ used the Community Multiscale Air Quality Modeling System (CMAQ, v.4.71) to perform the air quality runs. A total of six runs were made from March 20 to September 30, 2005. The September 30$^{th}$ model completion date is 2 weeks beyond the RVP period and is well beyond the time when the changes in the gasoline RVP would potentially impact model predictions. In addition, the month of October contained no days that would impact the ozone relative response factors. A total of three runs were made using the 2005 emissions. The first run used the default 2005 MATS emissions (BASE05). The second run adjusted the mobile emissions due to the change in RVP from 7.8 psi to 9.0 psi during the June 1st to September 15th

RVP period (RVP05). The final run simulated the gasoline RVP change along with the switch of coal-fired EGUs to combustion turbines at Buck, Dan River, and Riverbend (RVPPT05). Actual and projected annual emissions for the three plants are shown in Table 2.3-10 for NOx and Table 2.3-11 for $SO_2$. Conservatively, emissions at these coal-fired plants were reduced by 85% for NOx and 100% for $SO_2$ to simulate the switch to natural gas turbines. Actual NOx reductions are closer to 95% at Buck and Dan River, and 100% at Riverbend. (Note that since the completion of the modeling, Riverbend is now slated to be shut down completely instead of converted to natural gas.)

**Table 2.3-10. Actual and Projected NOx Emissions for Buck, Dan River, and Riverbend (tons/yr)**

| | Buck | Dan River | Riverbend |
|---|---|---|---|
| **2005** | 2195 | 1542 | 2542 |
| **2006** | 2146 | 2276 | 2270 |
| **2007** | 1660 | 1535 | 2243 |
| **2014*** | 111 | 111 | 0 |
| **2015*** | 101 | 107 | 0 |
| **2016*** | 89 | 83 | 0 |

* Projected emissions

**Table 2.3-11. Actual and Projected SO2 Emissions for Buck, Dan River, and Riverbend (tons/yr)**

| | Buck | Dan River | Riverbend |
|---|---|---|---|
| **2005** | 9603 | 4272 | 13990 |
| **2006** | 9584 | 7086 | 15181 |
| **2007** | 10285 | 7693 | 15940 |
| **2014*** | 9 | 9 | 0 |
| **2015*** | 8 | 9 | 0 |
| **2016*** | 7 | 7 | 0 |

* Projected emissions

The 2016 model runs were run in a similar fashion as the 2005 runs. The first run used the default 2016 MATS emissions (BASE16). The second run adjusted the mobile emissions due to the change in RVP from 7.8 to 9.0 psi during the June 1st to September 15th RVP period (RVP16). The final run simulated the gasoline RVP change along with the removal of controlled coal fired EGUs at Buck, Dan River, and Riverbend (RVPPT16). The MATS 2016 emissions incorrectly contain controlled coal-fired EGUs at these plants. The coal fired EGUs at Dan River were retired in 2012, and the units at Buck and Riverbend are scheduled to be retired in April 2013. For a full list of the runs see Table 2.3-12.

**Table 2.3-12. NCDAQ Model Runs**

| Model Run | Emissions Year | Summary |
|---|---|---|
| Base05 | 2005 | Default 2005 MATS emissions |
| RVP05 | 2005 | 2005 Emissions adjusted in the RVP counties during June 1st and Sep 15th |
| RVPPT05 | 2005 | 2005 RVP adjustments with Buck, Dan River, Riverbend -85% NOx, -100% $SO_2$ |
| Base16 | 2016 | Default 2016 MATS emissions |
| RVP16 | 2016 | 2016 Emissions adjusted in the RVP counties June 1st and Sep 15th |
| RVPPT16 | 2016 | 2016 RVP adjustments with coal-fired EGUs at Buck, Dan River, Riverbend removed -100% NOx, -100% $SO_2$ |

For the 2005 and 2016 model runs, the 2005 monitored design values are set as the 'base' ozone value. The Model Attainment Test Software is used to compute relative reduction factors (RRFs) for each of the sensitivity runs at the area monitors. The 2005 sensitivity runs are compared to the Base05 run, and the 2016 sensitivity runs are compared to the Base16 run. RRF values of 1.0005 or less would indicate less than a 0.05 ppb rise within the base year or future year modeling.

The modeling shows insignificant changes in ozone levels for both 2005 and 2016 due to relaxation of the RVP standard. The change in ozone for monitors in and near the Triad area generated by the change in RVP in the 2005 base year is shown in Table 2.3-13. There is no appreciable change in ozone concentrations due to the increase in gasoline RVP. When the conversion of the coal-fired EGUs to natural gas is factored in at the three power plants (RVPPT05 run, Table 2.3-14), the ozone levels decrease between 0.1 and 0.6 ppb. This indicates that the conversion of Buck, Dan River, and Riverbend to natural gas will easily offset any slight increase in NOx due to the relaxation of gasoline RVP.

**Table 2.3-13. Change in Ozone Concentrations and RRFs in the 2005 Base Year Modeling with Summertime RVP change to 9.0 psi**

| Monitor ID | County | Base05 Ozone Design Value[1] (ppb) | RVP05 Ozone Design Value[2] (ppb) | RRF | Change from Base05 to RVP05 (ppb) |
|---|---|---|---|---|---|
| 37-033-0001 | Caswell | 76.3 | 76.3 | 1.0002 | 0.0 |
| 37-059-0002 | Davie | 81.3 | 81.3 | 1.0002 | 0.0 |
| 37-067-0028 | Forsyth | 78.0 | 78.0 | 1.0004 | 0.0 |
| 37-067-0030 | Forsyth | 73.0 | 73.0 | 1.0003 | 0.0 |
| 37-067-1008 | Forsyth | 76.0 | 76.0 | 1.0004 | 0.0 |
| 37-067-0027 | Forsyth | 80.0 | 80.0 | 1.0004 | 0.0 |
| 37-081-0011 | Guilford | 77.0 | 77.0 | 1.0005 | 0.0 |
| 37-081-0013 | Guilford | 82.0 | 82.0 | 1.0005 | 0.0 |
| 37-157-0099 | Rockingham | 77.0 | 77.0 | 1.0003 | 0.0 |
| 37-159-0022 | Rowan | 86.7 | 86.7 | 1.0002 | 0.0 |
| 37-159-0021 | Rowan | 86.7 | 86.7 | 1.0001 | 0.0 |

[1] Default 2005 MATS concentrations

[2] 2005 concentrations with summertime RVP changed to 9.0 psi

**Table 2.3-14 Change in Ozone in the 2005 Base Year Modeling with Summertime RVP changed to 9.0 psi and Coal-Fired EGU Emissions Reduced by 85%**

| Monitor ID | County | Base05 Ozone Design Value[1] (ppb) | RVPPT05 Ozone Design Value[2] (ppb) | RRF | Change from Base05 to RVPPT05 (ppb) |
|---|---|---|---|---|---|
| 37-033-0001 | Caswell | 76.3 | 76.2 | 0.9987 | -0.1 |
| 37-059-0002 | Davie | 81.3 | 80.9 | 0.9953 | -0.4 |
| 37-067-0028 | Forsyth | 78.0 | 77.9 | 0.9995 | -0.1 |
| 37-067-0030 | Forsyth | 73.0 | 72.9 | 0.9997 | -0.1 |
| 37-067-1008 | Forsyth | 76.0 | 75.9 | 0.9996 | -0.1 |
| 37-067-0027 | Forsyth | 80.0 | 79.8 | 0.9987 | -0.2 |
| 37-081-0011 | Guilford | 77.0 | 76.9 | 0.9993 | -0.1 |
| 37-081-0013 | Guilford | 82.0 | 81.9 | 0.9993 | -0.1 |
| 37-157-0099 | Rockingham | 77.0 | 76.9 | 0.9995 | -0.1 |
| 37-159-0022 | Rowan | 86.7 | 86.1 | 0.9939 | -0.6 |
| 37-159-0021 | Rowan | 86.7 | 86.2 | 0.9952 | -0.5 |

[1] Default 2005 MATS concentrations

[2] 2005 concentrations with summertime RVP changed to 9.0 psi and coal-fired EGU emissions reduced by 85%

The change in ozone concentration at monitors in and near the Triad area caused by the relaxation in gasoline RVP in the 2016 future year is shown in Table 2.3-15 (RVP16 run). Again, there is no appreciable change in ozone concentrations at any of the area monitors. The RVPPT16 run removes controlled coal-fired EGUs at Buck, Dan River, and Riverbend. The maximum change in ozone in the RVPPT16 run is a decrease of 0.1 ppb (see Table 2.3-16). The shutdown and conversion of the coal fired EGUs to natural gas at Buck, Dan River, and Riverbend to natural gas will easily offset any slight increase in NOx due to the relaxation in gasoline RVP.

**Table 2.3-15 Change in Ozone Concentrations and RRFs in the 2016 Future Year Modeling with Summertime RVP changed to 9.0 psi**

| Monitor ID | County | Base16 Ozone Design Value[1] (ppb) | RVP16 Ozone Design Value[2] (ppb) | RRF | Change from Base16 to RVP16 (ppb) |
|---|---|---|---|---|---|
| 37-033-0001 | Caswell | 76.3 | 76.3 | 0.9997 | 0.0 |
| 37-059-0002 | Davie | 81.3 | 81.3 | 0.9988 | 0.0 |
| 37-067-0022 | Forsyth | 78.0 | 78.0 | 1.0001 | 0.0 |
| 37-067-0028 | Forsyth | 73.0 | 73.0 | 1.0002 | 0.0 |
| 37-067-0030 | Forsyth | 76.0 | 76.0 | 1.0001 | 0.0 |
| 37-067-1008 | Forsyth | 80.0 | 80.0 | 1.0001 | 0.0 |
| 37-081-0011 | Guilford | 77.0 | 77.0 | 1.0001 | 0.0 |
| 37-081-0013 | Guilford | 82.0 | 82.0 | 1.0001 | 0.0 |
| 37-157-0099 | Rockingham | 77.0 | 77.0 | 1.0000 | 0.0 |
| 37-159-0021 | Rowan | 86.7 | 86.7 | 0.9988 | 0.0 |
| 37-159-0022 | Rowan | 86.7 | 86.7 | 0.9989 | 0.0 |

[1] Default 2016 MATS concentrations

[2] 2016 concentrations with summertime RVP changed to 9.0 psi, coal-fired EGU emissions shutdown, and natural gas fired combustion turbines operating

**Table 2.3-16 Change in Ozone Concentrations and RRFs in 2016 Future Year Modeling with Summertime RVP changed to 9.0 psi, Coal-fired EGU emissions shutdown, and Natural Gas Fired Combustion Turbines Operating**

| Monitor ID | County | Base16 Ozone Design Value[1] (ppb) | RVPPT16 Ozone Design Value[2] (ppb) | RRF | Change from Base16 to RVP16 (ppb) |
|---|---|---|---|---|---|
| 37-033-0001 | Caswell | 76.3 | 76.2 | 0.9997 | -0.1 |
| 37-059-0002 | Davie | 81.3 | 81.2 | 0.9988 | -0.1 |
| 37-067-0022 | Forsyth | 78 | 78 | 1.0001 | 0.0 |
| 37-067-0028 | Forsyth | 73 | 73 | 1.0002 | 0.0 |
| 37-067-0030 | Forsyth | 76 | 76 | 1.0001 | 0.0 |
| 37-067-1008 | Forsyth | 80 | 80 | 1.0001 | 0.0 |
| 37-081-0011 | Guilford | 77 | 77 | 1.0001 | 0.0 |
| 37-081-0013 | Guilford | 82 | 82 | 1.0001 | 0.0 |
| 37-157-0099 | Rockingham | 77 | 77 | 1.0000 | 0.0 |
| 37-159-0021 | Rowan | 86.7 | 86.5 | 0.9988 | -0.2 |
| 37-159-0022 | Rowan | 86.7 | 86.6 | 0.9989 | -0.1 |

[1] Default 2016 MATS concentrations

[2] 2016 concentrations with summertime RVP changed to 9.0 psi, coal-fired EGU emissions shutdown, and natural gas fired combustion turbines operating

In summation, the NCDAQ applied a very conservative modeling approach to estimate the increase in emissions due to the relaxation of current gasoline standard of 7.8 psi to proposed 9.0 psi. Modeling results for 2005 and 2016 show no changes in ozone concentrations at monitors. Additionally, the planned shutdown of coal-fired EGUs near the Triad maintenance area will reduce ozone levels. The NCDAQ concludes that relaxation of the Federal standard does not interfere with the attainment and maintenance of the ozone NAAQS.

**Voluntary Efforts to Reduce Air Pollution**

The NCDAQ has identified several voluntary programs undertaken by local municipalities, local air awareness programs, and other organizations, which target emissions sources that will help the Triad area meet the 2008 8-hour ozone standard. A few examples include an annual commuter challenge which reduces commuter vehicle miles travelled, a transition to electrified/hybrid buses by a municipality, and idle reduction policies, technologies, and programs in several Triad counties. Additionally, the NCDAQ has been working with North Carolina industries on a voluntary basis to increase energy efficiency at manufacturing facilities. Under this partnership, several companies in the Triad area have completed on-site energy assessments that have identified cost effective energy efficiency measures with the potential to

reduce air emissions. Table 2.3-17 summarizes the results to date. Actual emission reductions would be realized once the companies make decisions on which efficiency measures to implement. The NCDAQ and its partners plan to track actual reductions achieved through this voluntary program in the coming years. Additional energy assessments are also planned.

**Table 2.3-17 Emissions Reductions from Select Voluntary Projects**

| County | Facility | Year Energy Assessments Conducted /Year Efficiency Measures Implemented | NOx | | VOC | |
|---|---|---|---|---|---|---|
| | | | Emission Reductions Potential (tons/yr) | Reductions Achieved to Date (tons/yr) | Emission Reductions Potential (tons/yr) | Reductions Achieved to Date (tons/yr) |
| Davidson | Furniture Plant 1 | 2012/ | 0.93 | | 0.03 | |
| Davidson | Furniture Plant 2 | 2012/ | 1.41 | | 0.020 | |
| Davidson | Furniture Plant 3 | 2011/2011 | 0.03 | 0.01 | 0.001 | 0.000 |
| Guilford | Manufacturing Plant 1 | 2012/ | 1.06 | | 0.060 | |
| Guilford | Manufacturing Plant 2 | 2012/ | 1.69 | | 0.090 | |
| **Total** | | | **5.12** | **0.01** | **0.200** | **0.000** |

### 2.3.2 INTERFERENCE WITH CO, PM, $SO_2$, and $NO_2$ NAAQS

The current ambient air quality levels for CO is about 25% of the CO standard. Although on-road mobile sources are a large contributor to CO ambient air concentrations, CO emissions increase of about 5 tons/day from relaxation of the RVP standard is not expected to affect the attainment status of the area. Nonroad and area sources are not large contributors to CO emissions.

The revised nitrogen dioxide ($NO_2$) standard was published in the Federal Register on February 9, 2010. The monitoring requirements are focused on near-road monitoring; therefore, one focus of this standard is on-road mobile sources. To date, none of the near-road $NO_2$

monitors have been established in North Carolina. Since there is no data to determine if North Carolina is violating or close to exceeding this standard, it is difficult to assess whether increasing the RVP will result in a violation of the $NO_2$ standard. However, on-road mobile sources are a large contributor of NOx emissions and $NO_2$ is a component of NOx. Based upon the MOVES mobile model emission estimations, the RVP relaxation would not increase $NO_2$ concentrations.

On-road mobile, nonroad mobile, and area sources are not believed to be large contributors to directly emitted fine particulate matter less than 2.5 micrometers ($PM_{2.5}$) or indirectly formed $PM_{2.5}$ concentrations. The photochemical modeling analysis discussed earlier for ozone was also used to calculate the changes in $PM_{2.5}$. The analysis showed no change in particle pollution due to changes in RVP in 2005 and 2016 at any of the monitors.

In North Carolina, directly emitted $PM_{2.5}$ is a very small component of the overall $PM_{2.5}$ ambient concentrations. The primary species impacting $PM_{2.5}$ concentrations are the secondarily formed sulfates and organic carbons. Sulfates are formed through the chemical reaction of sulfur dioxide ($SO_2$) and ammonia and the majority of the organic carbons come from natural sources like trees. A 2009 analysis of $SO_2$ emissions, which is a primary contributor to the formation of $PM_{2.5}$ within North Carolina, found about 3.3% of total $SO_2$ emissions came from on-road, nonroad and area sources combined, while the remaining 96.7% came from point sources (see "Redesignation Demonstration and Maintenance Plan for the Hickory (Catawba County) and Greensboro/Winston-Salem/High Point (Davidson and Guilford Counties) Fine Particulate Matter Nonattainment Areas", submitted to the USEPA on December 18, 2009, Figure 4-2, p. 4-4). Based on this, it is concluded that the relatively small RVP related emissions change in particulate matter will not affect $PM_{2.5}$ NAAQS.

For the reasons outlined above, it is not likely that increasing the RVP will result in a violation of the CO, $SO_2$, $PM_{2.5}$, and $PM_{10}$ NAAQS.

## 2.4 AMBIENT AIR QUALITY MONITORING

The NCDAQ has collected ambient monitoring data for the Triad area since the late seventies. At the time of the April 2004 8-hour ozone designations, there were nine ozone monitors throughout the Triad area, with only six monitors in the Triad 1-hour maintenance counties (Figure 2.4-1). These monitors were installed in accordance with 40 CFR 58.

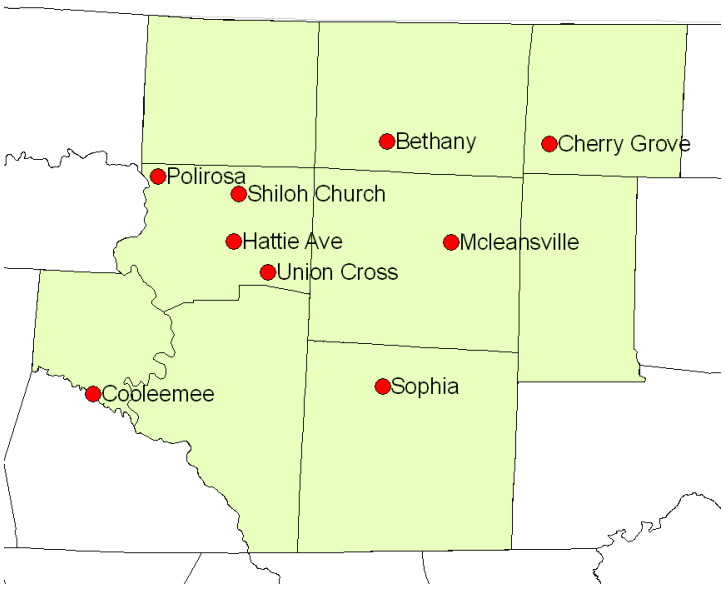


**Figure 2.4-1 Historic Triad Ozone Monitoring Network**

Since the 2004 designations, three of the Triad ozone monitors have moved and one monitor has shut down. In 2005, the Mendenhall monitor in Guilford County replaced the McLeansville monitor and the Forsyth County monitor at Pollirosa moved to Clemmons. Also in 2005, the Sophia monitor in Randolph County shutdown. In 2010, the Cooleemee monitor in Davie County moved to Mocksville. All of these changes to the monitoring network were done in consultation with the USEPA and in accordance with 40 CFR 58. The current monitoring locations are presented in Figure 2.4-2.

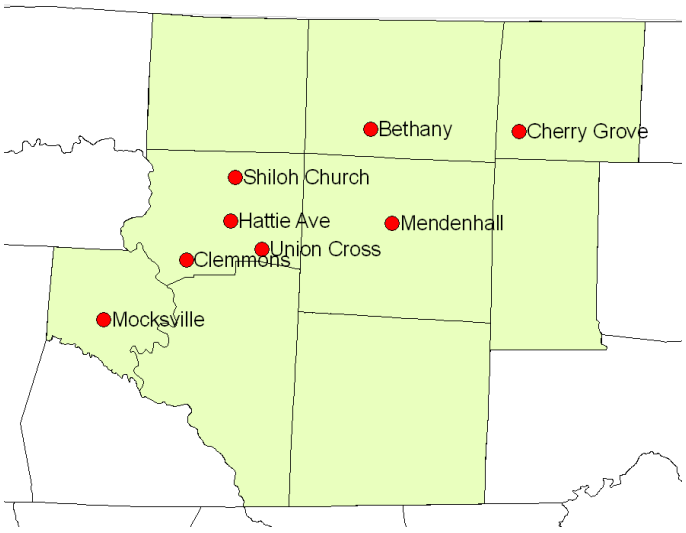


**Figure 2.4-2 Current Triad Ozone Monitoring Network**

Tables 2.4-1 and 2.4-2, respectively, show the 8-hour ozone air quality data and corresponding design values for the monitors in the Triad area from 2001 through 2010. All of the monitors in the Triad area have continued to maintain the 1997 8-hour ozone standard since being designated attainment in 2008 (see Table 2.4-2). Since the attainment designation given to the Triad area for the more stringent 2008 8-hour ozone standard, three monitors have measured exceedances of the standard due to the extreme heat event that affected most of the country during a two week period in the summer of 2012.

**Table 2.4-1 Triad Area's 4th Highest 8-hour Ozone Values (2001-2010)**

| Monitor | 4th Highest 8-hour Ozone Values (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012* |
| Cooleemee Davie County | 0.089 | 0.073 | 0.084 | 0.080 | 0.085 | 0.081 | 0.068 | --- | --- | --- |
| Mocksville Davie County | --- | --- | --- | --- | --- | --- | --- | 0.072 | 0.072 | 0.076 |
| Hattie Ave. Forsyth County | 0.087 | 0.075 | 0.074 | 0.082 | 0.082 | 0.081 | 0.068 | 0.081 | 0.076 | 0.079 |
| Union Cross Forsyth County | 0.081 | 0.078 | 0.080 | 0.082 | 0.083 | 0.078 | 0.068 | 0.078 | 0.074 | 0.074 |
| Shiloh Church Forsyth County | 0.074 | 0.071 | 0.078 | 0.067 | 0.076 | 0.077 | 0.066 | 0.076 | --- | 0.074 |
| Cherry Grove Caswell County | 0.083 | 0.074 | 0.076 | 0.075 | 0.082 | 0.080 | 0.067 | 0.073 | 0.070 | 0.077 |
| McLeansville Guilford County | 0.079 | 0.071 | 0.081 | --- | --- | --- | --- | --- | --- | --- |
| Mendenhall Guilford County | --- | --- | 0.082 | 0.080 | 0.086 | 0.081 | 0.072 | 0.076 | 0.076 | 0.078 |
| Bethany Rockingham County | 0.083 | 0.074 | 0.078 | 0.075 | 0.082 | 0.084 | 0.068 | 0.074 | 0.071 | 0.076 |

**Table 2.4-1 Continued: Triad Area's 4th Highest 8-hour Ozone Values (2001-2010)**

| Monitor | 4th Highest 8-hour Ozone Values (ppm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012* |
| Sophia Randolph County | 0.078 | 0.076 | --- | --- | --- | --- | --- | --- | --- | --- |
| Pollirosa Forsyth County | 0.078 | 0.072 | --- | --- | --- | --- | --- | --- | --- | --- |
| Clemmons Forsyth County | --- | --- | 0.075 | 0.077 | 0.078 | 0.078 | 0.062 | 0.081 | 0.074 | 0.076 |

* indicates values calculated with preliminary ozone data for the year 2012

**Table 2.4-2 Triad Area's Design Values (2001-2010)**

| Monitor | Design Value (ppm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 03-05 | 04-06 | 05-07 | 06-08 | 07-09 | 08-10 | 09-11 | 10-12* |
| Cooleemee Davie County | 0.082 | 0.079 | 0.083 | 0.082 | 0.078 | --- | --- | --- |
| Mocksville Davie County | --- | --- | --- | --- | --- | --- | 0.070 | 0.073 |
| Hattie Ave. Forsyth County | 0.078 | 0.077 | 0.079 | 0.081 | 0.077 | 0.076 | 0.075 | 0.078 |
| Union Cross Forsyth County | 0.079 | 0.080 | 0.081 | 0.081 | 0.076 | 0.074 | 0.072 | 0.075 |
| Shiloh Church Forsyth County | 0.074 | 0.072 | 0.073 | 0.073 | 0.073 | 0.073 | 0.071 | 0.075 |
| Cherry Grove Caswell County | 0.077 | 0.075 | 0.077 | 0.079 | 0.076 | 0.073 | 0.070 | 0.073 |
| McLeansville Guilford County | 0.077 | 0.076 | --- | --- | --- | --- | --- | --- |
| Mendenhall Guilford County | --- | 0.081 | 0.082 | 0.082 | 0.079 | 0.076 | 0.074 | 0.076 |
| Bethany Rockingham County | 0.078 | 0.075 | 0.078 | 0.080 | 0.078 | 0.075 | 0.071 | 0.073 |
| Sophia Randolph County | --- | --- | --- | --- | --- | --- | --- | --- |
| Pollirosa Forsyth County | --- | --- | --- | --- | --- | --- | --- | --- |
| Clemmons Forsyth County | --- | 0.076 | 0.076 | 0.077 | 0.072 | 0.073 | 0.072 | 0.077 |

Bold values indicates violations of the 1997 8-hour ozone standard
* indicates values calculated with preliminary ozone data for the year 2012
---- indicates no data to calculate design value
Underlined data indicates fewer than three years or previous site data in design value calculation

Ambient air quality monitoring is one of the requirements of Section 110 of the Clean Air Act. The NCDAQ commits to continue operating the current ozone monitors in the Triad 8-hour ozone attainment area, provided sufficient funding is available for continued operation. Any monitor shutdowns or relocations will only be made with the approval of the USEPA. No plans are underway to discontinue operation, relocate or otherwise affect the integrity of the ambient monitoring network in place. The current monitors are operated consistent with 40 CFR 58 and any changes will only be made if they are consistent with 40 CFR 58.

## 2.5 CONTINGENCY PLAN

### 2.5.1 Overview

The two main elements of the North Carolina contingency plan are tracking and triggering mechanisms to determine when contingency measures are needed and a process of developing and adopting appropriate control measures. There will be three triggers for the contingency plan. The primary trigger of the contingency plan will be a violation of the 1997 8-hour ozone NAAQS at any of the Triad area monitors. The secondary trigger will be a monitored air quality pattern that suggests an actual 1997 8-hour ozone NAAQS violation may be imminent. The tertiary trigger will be a monitored fourth high exceedance of the NAAQS. Upon either the primary or secondary triggers being activated, the NCDAQ will commence analyses to determine what additional measures, if any, will be necessary to attain or maintain the 1997 8-hour ozone standard. If activation of either the primary or secondary triggers occurs, this plan provides a regulatory adoption process for revising emission control strategies. Activation of the tertiary trigger will result in an analysis to understand the cause of the exceedance and to identify voluntary measures if needed.

In addition, there will be a tracking mechanism that requires a comparison of the actual emissions inventory submitted under the AERR to the projected inventories, and to the attainment year inventory contained in this maintenance plan. The AERR reporting years coincides with the interim year and is within one year of the final year of the emission inventories in this maintenance demonstration.

### 2.5.2 Primary and Secondary Triggers

The primary trigger of the contingency plan will be a violation of the 1997 8-hour ozone standard, or when the three-year average of the 4$^{th}$ highest values is equal to or greater than 0.085 ppm at a monitor in the Triad maintenance area. The trigger date will be 60 days from the date that the State observes a 4$^{th}$ highest value that, when averaged with the two previous ozone seasons' fourth highest values, would result in a three-year average equal to or greater than 0.085 ppm.

The secondary trigger will apply where no actual violation of the 1997 8-hour ozone standard has occurred, but where the State finds monitored ozone levels indicating that an actual ozone NAAQS violation may be imminent. A pattern will be deemed to exist when there are two consecutive ozone seasons in which the 4$^{th}$ highest values are 0.085 ppm or greater at a single monitor within the Triad maintenance area. The trigger date will be 60 days from the date that

the State observes a 4th highest value of 0.085 ppm or greater at a monitor for which the previous season had a 4th highest value of 0.085 ppm or greater.

Similarly, the tertiary trigger will not be an actual violation of the 1997 8-hour ozone standard. This trigger will be a first alert as to a potential air quality problem on the horizon. The trigger will be activated when a monitor in the Triad maintenance area has a 4th highest value of 0.085 ppm or greater, starting the first year after the maintenance plan has been approved. The trigger date will be 60 days from the date that the State observes a 4th highest value of 0.085 ppm or greater at any monitor.

### 2.5.3 Action Resulting From Trigger Activation

Once the primary or secondary trigger is activated, the Planning Section of the NCDAQ shall commence analyses including trajectory analyses of high ozone days, and emissions inventory assessment to determine those emission control measures that will be required for attaining or maintaining the 1997 8-hour ozone standard. By May 1st of the year following the ozone season in which the primary or secondary trigger has been activated, North Carolina will complete sufficient analyses to begin adoption of necessary rules for ensuring attainment and maintenance of the 1997 8-hour ozone NAAQS. The rules would become State effective by the following January 1st, unless legislative review is required.

The measures that will be considered for adoption upon a trigger of the contingency plan include: NOx Reasonably Available Control Technology on stationary sources in the Triad maintenance area, diesel inspection and maintenance program, implementation of diesel retrofit programs, including incentives for performing retrofits, and additional controls in upwind areas.

The NCDAQ commits to implement within twenty-four months, or as expeditiously as practicable, at least one of the control measures listed above, or other contingency measures that may be determined to be more appropriate based on the analysis performed,.

Once the tertiary trigger is activated, the Planning Section of the NCDAQ shall commence analyses including meteorological evaluation, trajectory analyses of high ozone days and emissions inventory assessment to understand why a 4th highest exceedance of the standard has occurred. Once the analyses are completed, the NCDAQ will work with the local air awareness program and develop an outreach plan to identify any additional voluntary measures that can be implemented. If the 4th highest exceedance occurs early in the season, the NCDAQ will work with entities identified in the outreach plan to determine if the measures can be implemented during the current season, otherwise, NCDAQ will work with the local air awareness coordinator to implement the plan for the following ozone season.

## 2.6 VERIFICATION OF CONTINUED ATTAINMENT

In addition to the contingency measures listed above, the 110(a)(1) maintenance plan should indicate how the state will track the progress of the maintenance plan. For the verification of continued attainment, the NCDAQ will carry out emission inventory comparisons. The large stationary sources are required to submit an emission inventory annually to the NCDAQ. The NCDAQ will commit to review these emissions inventories to determine if an unexpected growth in NOx emissions in the Triad area may endanger the maintenance of the 1997 8-hour ozone standard. Additionally, as new VMT data is provided by the North Carolina Department of Transportation, the NCDAQ commits to review this data and determine if any unexpected growth in VMT may endanger the maintenance of the 1997 8-hour ozone standard.

Additionally, under the AERR the NCDAQ is required to develop a comprehensive, annual, statewide emissions inventory every three years and is due twelve to eighteen months after the completion of the inventory year. The AERR inventory years coincides with the interim year and is within a year of the final year of the maintenance plan. Therefore, the NCDAQ commits to compare the AERR inventories, as they are developed, with the maintenance plan to determine if additional steps are necessary for continued maintenance of the 1997 8-hour ozone standard in this area.

## 2.7 CONCLUSION

The most recent three years of ozone monitoring data for the Triad maintenance area demonstrate compliance with the 1997 8-hour ozone NAAQS. Three monitors are showing violations of the 2008 8-hour ozone NAAQS. Since the 1990's, there have been many major programs enacted in North Carolina that have led to significant actual, enforceable emissions reductions, which have led to air quality improvements in the Triad area. The planned closing or conversion of nearby coal-fired power plants is expected to further improve air quality in the Triad maintenance area.

The maintenance plan demonstrates that the projected emissions inventory for 2018 is less than the base year emissions inventory without the current RVP requirement of 7.8 psi. The lower RVP requirement was implemented as a control measure to reduce VOC emissions. Since VOC emissions from biogenic sources dominate in the Southeast, controlling ozone in North Carolina is most effectively done through reduction in NOx emissions. The maintenance plan demonstrates that the slight increase in NOx emissions predicted by the MOVES model correlates to no change in ozone concentrations at monitors in and near the Triad due to the relaxation of the RVP standard. It has also been demonstrated that the higher RVP standard will not interfere with the attainment of other NAAQS.

This maintenance plan has been prepared to meet the requirements of the 1990 Clean Air Act Amendments.