Chattanooga Early Action Compact
Ozone State Implementation Plan Revision

For

Walker and Catoosa Counties

December 31, 2004
Revised June 8, 2005

Prepared by:

Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Table of Contents

List of Tables

List of Figures

1. Introduction

1.1 Background

An Early Action Compact (EAC) serves as a Memorandum of Agreement among government agencies representing both local and state governments. A *Compact* is designed specifically as a commitment to EPA's *Protocol for Early Action Compacts Designed to Achieve and Maintain the 8-Hour Ozone Standard*, June 19, 2002.

The *Protocol* allows for early voluntary 8-hour air quality improvement plans to be developed through a *Compact* between Local, State, and EPA officials for areas that are in attainment for the 1-hour ozone standard, but approach or monitor exceedances of the 8-hour ozone standard. All areas of Tennessee and those areas in Georgia that are a part of the Chattanooga Metropolitan Statistical Area (MSA) are in attainment of the 1-hour standard. However, based on preliminary monitoring data the Chattanooga MSA may not be in attainment with the 8-hour ozone standard. Therefore, the local and state governments in the Chattanooga MSA are eligible to enter into an Early Action Compact.

The EAC requires the states to develop an early action plan that includes all of the necessary elements of a comprehensive air quality plan, but is developed specifically to meet the needs of the local government agencies involved. As long as all terms and milestones are met, the effective date of a non-attainment designation and its respective requirements is deferred.

This document satisfies the Early Action Plan (EAP) requirement for Chattanooga's compact between the local governments representing the Chattanooga area, the Georgia Environmental Protection Division (EPD), and the United States Environmental Protection Agency (EPA). Its purpose is to proactively reduce ozone precursors and ozone levels in the Chattanooga area sooner than expected under an expeditious timeline to attain and maintain compliance with the 8-hour ozone standard.

1.2 1-Hour Ozone Standard

National Ambient Air Quality Standards (NAAQS) are health-based standards set by EPA for six air pollutants that must be met in all areas of the United States. The NAAQS for the ozone standard that was previously implemented by the EPA is known as the 1-hour standard. This standard is based on the number of days per year during which the measured concentration of ozone in the air, averaged over one hour, is 0.12 parts per million (ppm) or greater. For an area to meet or attain the standard, the average number of days with one or more hourly observations above 0.12 ppm at each ozone monitor within that area must be equal to or less that one over a consecutive three-year period.[1]

[1] 40 Code of Federal Regulations (CFR) Part 50.9.

1.3 8-Hour Ozone Standard

In 1997, the EPA set a new ozone NAAQS called the 8-hour ozone standard. This standard is based on the measured concentration of ozone in the air, averaged over a consecutive 8-hour period. For an area to attain the standard, the three-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration in the area must be less than or equal to 0.08 ppm.[2] The 8-hour ozone standard will be more difficult to attain than the 1-hour standard, but it will also provide a greater level of protection to the public against a wide range of ozone-related health effects. On April 1, 2004, EPA published the *Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard - Phase I*, in the Federal Register.[3] Phase 2 of the final implementation guidance for the 8-hour standard is scheduled for release in early 2005.

1.4 Early Action Compacts

On June 19, 2002, EPA released the *Protocol for Early Action Compacts Designed to Achieve and Maintain the 8-Hour Ozone Standard* (hereinafter referred to as the Protocol). Early Action Compacts (EACs) are contracts that can be signed between Local, State, and EPA officials for areas that are in attainment of the 1-hour ozone standard, but approach or monitor exceedances of the 8-hour ozone standard. EACs call for comprehensive air quality plans tailored to local needs that will develop and implement control strategies to achieve and maintain the 8-hour ozone standard. By signing an EAC, an area would be responsible for complying with a more expeditious timeline for achieving emissions reductions and would be responsible for meeting many reporting milestones throughout the process. The benefit to working on the expedited timeline is that the area's official nonattainment designation would be postponed, and the area would achieve cleaner air sooner. EAC areas must show attainment by December 31, 2007.

Table 1-1: Basic Timeline for EACs under Protocol for Early Action Compacts

EAC Protocol Timeline	
Year	Task/Commitment
2002	Compact detailing milestones for how an area will create their early action plan must be finished and signed.
2003	State support to complete technical work and develop control measures.
2004	Early action plan must be complete and integrated into the SIP for submittal to EPA.
2005	All control strategies must be implemented.
2006	Ongoing reporting and review process is continued, including plan updates as necessary.
2007	Area reaches attainment of the 8-hour ozone standard.
2008	EPA re-designates area as attainment.

[2] 40 CFR Part 50.10
[3] Federal Register Vol. 69, No. 84, 23951

The principles of the EAC to be executed by Local, State, and the EPA officials are as follows:

- Early planning and implementation of emission reductions leading to expeditious attainment and maintenance of the 8-hour ozone standard;
- Local control of the measures to be employed with broad-based public input;
- State support to ensure technical integrity of the EAP;
- Formal incorporation of the EAP into the state implementation plan (SIP);
- Deferral of the effective date of nonattainment designation and related requirements[4] so long as all Compact terms and milestones are met; and
- Safeguards to return areas to traditional SIP requirements should EAC terms and/or milestones be unfulfilled, with appropriate credit given for emission reduction measures implemented.

EAC areas that fulfill milestone and reporting requirements will have the benefit of a deferred effective date of nonattainment designation. If at any time the EAC area does not meet the terms of its contract, then the area's nonattainment designation will become effective immediately and the compact will be dissolved.

EPA published the final nonattainment designation effectiveness deferral in the April 30, 2004, Federal Register, entitled *Air Quality Designations and Classifications for the 8-Hour Ozone National Ambient Air Quality Standards; Early Action Compact Areas With Deferred Effective Dates*.[5] In this promulgation, EPA promulgated an initial deferral date of September 30, 2005, provided EAC areas continue to meet their milestones and fulfill their EAC obligations. EPA will then promulgate a new deferral date before the expiration of the September 30, 2005, deferral date, and would then promulgate a third and final deferral date before the second deferral date expires.

1.5 Walker and Catoosa County Early Action Compact History

On December 24, 2002, the EPD submitted to the EPA a Letter of Support from Walker and Catoosa Counties supporting Tennessee's 8-hour Ozone EAC for the greater Chattanooga area. Attachment B contains copies of letters of support for the Chattanooga EAC from both Catoosa Walker Counties. Walker and Catoosa Counties support Tennessee's EAC because it will get cleaner air sooner, helping the entire region. EPD has continued to fulfill the EAC progress reporting milestones for the Chattanooga area EAC.

---

[4]One nonattainment area requirement that will not apply for EAC areas meeting all their milestones is transportation conformity. Therefore, no motor vehicle emissions budgets for transportation conformity purposes are being established with this SIP revision.

[5]Federal Register Vol. 69, No. 84, 23858

On July 15, 2003, Georgia EPD submitted a letter to EPA recommending that none of the Georgia counties that are part of the Chattanooga metropolitan statistical area (MSA) be designated as nonattainment for the 8-hour ozone standard. Walker and Catoosa counties, which are part of the greater Chattanooga area, support EPD's recommendation. A December 3, 2003, letter from EPA indicated that EPA intends to modify EPD's 8-hour ozone nonattainment area recommendations to include Walker and Catoosa counties. EPD responded to EPA's intent to designate Walker and Catoosa Counties as nonattainment in a February 6, 2004, letter, which gave a detailed discussion and valid arguments as to why Walker and Catoosa Counties should not be designated as nonattainment. The end result being the implementation of an EAC for Walker and Catoosa Counties.

The Tennessee Department of Environment and Conservation has expended considerable effort planning for ozone abatement efforts in the Chattanooga area. Georgia EPD has been supportive throughout the planning process by assisting Tennessee in their development of emission inventories, modeling, trends analysis, and quantification and comparison of control measures for the greater Chattanooga area. EPD has provided necessary information on all federal and state adopted emission reduction measures that affect the area. EPD has provided technical and strategic assistance, as appropriate, in the selection and implementation of control strategies. EPD has provided technical and planning assistance, as appropriate, in developing and implementing processes to address the impact of emissions growth beyond the attainment date. EPD has adopted control measures, identified through this process and deemed necessary for attaining the 8-hour ozone standard, into an Early Action Compact SIP.

1.6 Public Involvement

<u>Informational Meetings</u>

EPD held three Public Information Meetings in the Walker/Catoosa County areas in order to provide the public an opportunity to comment upon and provide input into the proposed open burning and Stage I Vapor Recovery amendments. An Open Burning Public Outreach meeting was held on July 19, 2004 from 1:00 to 3:00 pm at the Walker County Civic Center (10052 Highway 27, Rock Springs, Georgia 30739). Public Outreach Meetings were held for Stage I Vapor Recovery Requirements on August 3, 2004 from 1:00 to 3:00 pm at the Walker County Civic Center and on August 26, 2004 from 7:00 to 9:00 pm also at the Walker County Civic Center.

At the Open Burning Public Outreach meeting that was held on July 19, 2004, EPD ensured public participation by implementing the following measures:

- Letters were sent to 35 stakeholders,
- Reporters from the local newspapers were contacted,
- Information was distributed via e-mail through the Chamber of Commerce's distribution list
- Letters were faxed to elected officials
- Information was posted on the Air Protection's Open Burning Ban website, and

- District Offices, Extension Services, Code Enforcements, and the Forestry Service was contacted.

As a part of the August 3, 2004 Public Information meeting, EPD implemented the following measures to ensure public participation:

- EPD worked with Petroleum Council of GA, Georgia Oilmen's Association, Georgia Association of Convenience Stores, Atlanta Retailers Association, Georgia Association of Petroleum Retailers, Korean American Grocers Association of Georgia who emailed or faxed the information to their members,
- Information was posted on the Air Protection's Stage I Vapor Recovery website, and
- EPD notified elected officials.

For the August 26, 2004 Public Information meeting, EPD implemented additional measures:

- A flier was emailed to the Walker & Catoosa Chambers of Commerce who in turn emailed the flier to their members,
- EPD worked with Petroleum Council of GA, Georgia Oilmen's Association, Georgia Association of Convenience Stores, Atlanta Retailers Association, Georgia Association of Petroleum Retailers, Korean American Grocers Association of Georgia who emailed or faxed the information to their members,
- Information was sent to EPD's enviro-net website,
- EPD sent fliers to 810 (Augusta & Walker County) stakeholders (UST, Carriers, and Transporters mailing lists),
- Letters were sent to elected officials,
- The District Offices were notified of the meeting, and
- Meeting information was sent to local newspapers.

Public Hearing for Rule Making

To provide the public an opportunity to comment upon and provide input into the proposed Open Burning and Stage I Vapor Recovery rule amendments, a public hearing was held at 7:00 p.m. on October 28, 2004, at the Walker County Civic Center. As a part of notifying the Public, EPD ensured that the following measures were implemented:

- The public notice was published in both counties' legal organs,
- The public notice was posted on EPD's and the Air Protection Branch's website,
- The public notice was sent to EPD's enviro-net,
- A copy of proposed rule was made available to the public at the local library,
- A reminder email sent to Stakeholders, elected officials and media, and
- Letters were sent to elected officials.

These rules were incorporated in EPD's regular rulemaking process and responses to comments on those rules were included among responses for all proposed rules for all affected areas in the state of Georgia. Therefore, the responses to comments specifically concerning Open Burning Ban and Stage I Vapor Recovery rule amendments will be included in the revision to Georgia's SIP that includes amendments to Georgia's rules for Air Quality Control that will be submitted early in 2005.

Public Hearing for SIP Revision

To provide the public an opportunity to comment upon and provide input into the proposed Chattanooga EAC Ozone SIP Revision, a public hearing was held at 7:00 p.m. on December 21, 2004, at the Walker County Civic Center. As a part of notifying the Public, EPD ensured that the following measures were implemented:

- The public notice was published in both counties' legal organs,
- The public notice was posted on EPD's and the Air Protection Branch's website,
- The public notice was sent to EPD's enviro-net,
- A copy of proposed rule was made available to the public at the local library.

Please refer to the Public Notice in Attachment D. On November 17, 2004, EPD issued a public notice requesting comments on the proposed "Chattanooga Early Action Compact Ozone State Implementation Plan Revision." A correction was issued on November 24, 2004 providing more details about the plan. No written comments were received during the 30-day public comment period, which concluded at the end of the formal public hearing on December 21, 2004. Oral comments were received during the public hearing, however, none were specific to the SIP. Comments made during the public hearing were either concerning rule revisions from a previously concluded comment period or other public concerns not relevant to the SIP.

1.7 Social and Economic Considerations

An explanation of the social and economic issues involved with any state assisted strategies can be found in the memorandum regarding the economic impacts of the proposed amendments on small businesses and the regulated community in Georgia, as included in the Memorandum to the Board of Natural Resources for the Adoption of changes to the Rules for Air Quality Control, Chapter 391-3-1, December 7, 2004. This Document will be included in the revision to Georgia's SIP that includes amendments to Georgia's rules for Air Quality Control that will be submitted early in 2005.

1.8 Fiscal and Manpower Resources

Please refer to the Statement of Rational as included in with the Board of Natural Resources Rules for Air Quality Control, Chapter 391-3-1, adoption package, December 7, 2004. This Document will be included in the revision to Georgia's SIP that includes amendments to Georgia's rules for Air Quality Control that will be submitted early in 2005.

1.9 Early Action Compact SIP Outline

This EAC SIP contains the following sections:

- Section 2, Conceptual Description of the Ozone Problem in Chattanooga;

- Section 3, Emissions Inventory Development, describing how inventories for the years 2000, 2007, and 2012 were developed;

- Section 4, Atmospheric Modeling and Data Analysis for Emissions Control Strategy Development and Attainment Demonstration;

- Section 5, Control Strategy and Emissions Budgets, which provides details on the control strategies to be implemented in the EAC area and the corresponding emissions budget; and

- Section 6, Rate of Progress Plan and Mid-Course Review, which will be developed in the future as necessary

2. Conceptual Description of the Ozone Problem in Chattanooga

This EAC is a memorandum of agreement between EPA and the local governments in the Chattanooga MSA (Hamilton and Marion Counties), the Chattanooga Local Air Pollution Control Program, Meigs County Executive (Tennessee), the State of Tennessee represented by Tennessee Department of Environment and Conservation, the Tennessee Air Pollution Control Program, and Walker and Catoosa Counties in Georgia.

Table 2-1 shows ozone design value calculations at all monitors located within the Chattanooga area. Since, a design value of 85 ppb or greater (for ozone) represents non-attainment of the National Ambient Air Quality Standard (NAAQS), the Chattanooga area is not in attainment with the 8-hour ozone standard since 2003.

Table 2-2 provides a summary of the number of days with exceedances of the 8-hour standard for 1999 through 2002 in the MSA[6].

Table 2-1: Ozone design value calculations for Chattanooga area (2000-2002)

County	**Site Name**	**Monitor ID**	**4th Highest daily 8-hour average ozone concentration (in ppmv)**			**2002 Design Value (in ppmv)**
			2000	**2001**	**2002**	
Hamilton	Volunteer Army Ammunition Plant	470650028	0.095	0.087	0.094	0.092
Hamilton	Ridge Trail Road	470651011	0.098	0.082	0.099	0.093
Meigs	Meigs	471210104	0.095	0.085	0.099	0.093

Table 2-2: Number of 8-Hour Ozone Exceedances within the Chattanooga area

County	**Site Name**	**Monitor ID**	**Number of 8-hour average ozone exceedances**			
			1999	**2000**	**2001**	**2002**
Hamilton	Volunteer Army Ammunition Plant	470650028	11	9	4	12
Hamilton	Ridge Trail Road	470651011	11	10	2	18
Meigs	Meigs	471210104	-	16	5	28

Catoosa and Walker counties are both rural and have neither ambient air monitors nor major sources that contribute formation of ozone in the Chattanooga area. Open burning, fueling operations, and transportation are the only quantifiable anthropogenic contributors to ozone precursors, with those contributions being relatively less than significant. The Fall line Air Quality Study that was used to help develop the emission inventory for the modeling is contained in the Lower Savannah-Augusta EAC SIP submittal, December 31, 2004, and contains a detailed conceptual description for that modeling exercise. An electron version of that plan can be found on the accompanying CD containing the electronic version of this submittal. A detailed conceptual description of the air quality problems in the Chattanooga and surrounding areas was performed as part of the ATMOS modeling and is included in the technical support document that is part of the Chattanooga-Hamilton County Tennessee submission of their Local Plan for the Chattanooga Area Early Action Plan.

[6] http://www.state.tn.us/environment/apc/ozone/o3page.php

3. Emissions Inventory Development

This section summarizes methods and tools used in the development of base (i.e., 2000) and future year (i.e., 2007 and 2012) emission inventories.

In general, the emissions inventory for modeling and analysis was developed by augmenting the 1999 National Emissions Inventory (NEI) v2.3 with the Fall line Air Quality Study (FAQS) emissions inventory. Emissions of Carbon Monoxide, Nitrogen Oxides (NOx), Ammonia (NH3), Sulfur dioxide (SO2), Particulate Matter (PM2.5, PM10), and Volatile Organic Compound (VOCs) from Electricity Generating Units (EGUs), Non- Electricity Generating Units (non-EGUs), on-road mobile sources, off-road mobile sources, and biogenic sources are included. Databases and tools used in the development of emission inventories are briefly described in the following paragraphs.

Electricity Generating Units
Sulfur dioxide (SO2) and Nitrogen Oxides (NOx) emissions are based on Continuous Emissions Monitoring (CEM) data available from the EPA's Clean Air Markets Division, and NEI version 2.3. Emissions of other pollutants are calculated by multiplying relevant emission factors with the heat input values obtained from the CEM database. Future year emissions were computed using unit-specific control factors and projection factors from the Economic Growth and Analysis System (EGAS) version 4.0. These have been provided in Attachment A.

Non-Electricity Generating Units and Area Sources
Emissions inventory of Non-Electricity Generating Units in Georgia was developed by augmenting the 1999 National Emissions Inventory (NEI) v2.3 with the Fall line Air Quality Study (FAQS) emissions inventory. The FAQS inventory was developed through a survey of industrial facilities in 11 counties in and around the cities of Augusta, Columbus, and Macon. The emission inventory includes only those sources that have annual emissions greater than 25 tons. Future year emission inventories were developed using control factors developed by USEPA (communicated to Georgia Environmental Protection Division through an email, See Attachment), and projection factors from the Economic Growth and Analysis System (EGAS) version 4.0.

On-road Mobile Sources
EPA's MOBILE6 model was used to calculate on-road mobile source emission factors. Estimates of vehicle miles traveled (VMT) from GDOT and speeds from the Atlanta Regional Commission (ARC) were used. In addition to VMT and speeds, EPD provided inputs and supporting files containing other information needed to develop the mobile source emissions inventories.

Off-road Mobile Sources
With the exception of emissions from aircraft and locomotives, off-road mobile emissions were calculated using EPA's NONROAD model. Aircraft and locomotive emission were obtained from the NEI version 2.3.

The Biogenic Emissions Inventory System (BEIS) version 3.0 was used to calculate biogenic emissions.

Databases and modeling tools used to generate base and future year emission inventories have been summarized in Table 3-1, 3-2a and 3-2b. County-wise breakdown of emission totals have been provided in Attachment A.

Table 3-1: Data sources and modeling tools used in the development of base year (i.e., 2000) Emissions Inventory

Source category		Georgia: FAQS Area[a]	Georgia: Rest of the State	Other states
Point	EGU	Continuous Emissions Monitoring (CEM) Data[b] for August 2000 and NET99[c] Emissions Inventory version 2.3		
	Non-EGU	FAQS Emissions Inventory[d]		NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors
Area (NH_3)	All	Cardelino, 2003[e]		NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors
Area	Forest wildfires, slash burning and prescribed burning, agricultural burning	FAQS Emissions Inventory		NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors
	Others	NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors		
Non-road	Aircraft, Railroad and Locomotives	FAQS Emissions Inventory	NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors	
	Others	NET99 EI version 2.3 projected to 2000 with growth factors from EPA's NONROAD model[f]		
On-road (VMT and speeds)		GDOT[g] and ARC[h] respectively.		NET99 mobile source activity data[i] projected to 2000 using EGAS4.0

a. Includes the counties of Richmond, Columbia, McDuffie, Muscogee, Chattahoochee, Harris, Bibb, Houston, Jones, Peach and Twiggs.
b. Emissions from EGUs in the NET99 Emissions Inventory are replaced with CEM data available at http://cfpub.epa.gov/gdm using the air quality emissions processor.
c. Emissions Inventory is available at http://www.epa.gov/ttn/chief/net/index.html#1999.
d. FAQS Emissions Inventory Development report available at http://cure.eas.gatech.edu/faqs/models/index.html.
e. Developed by Dr. Carlos Cardelino (carlos.cardelino@eas.gatech.edu), School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, Georgia.
f. EPA's Non-road mobile model (June 2000) http://www.epa.gov/ttn/chief/emch/models/index.html.
g. Annual average daily VMT data for 2000 available at http://www.dot.state.ga.us/dot/plan-prog/transportation_data/400reports/index.shtml, with additional details provided in Attachment C.
h. Speed data for the 13-county Atlanta nonattainment area is from Atlanta Regional Commission's travel demand model. Additional details are provided in Attachment C.

Table 3.2a: Data sources and modeling tools used in the development of future year (i.e., 2007) Emissions Inventory

Source category		Growth		Controls	
		Georgia	Other States	Georgia	Other State
Point	EGU	EGAS4.0	EAGS4.0	Plant specific control factors (Attachment F)	NOx SIP call and plant specific control factors (Attachment F)
	Non-EGU	EGAS4.0		VOC RACT and MACT controls, NOx SIP call control factors used in development of EPA's Emissions Inventory for HDDV Final Rulemaking (Attachment F)	
Area	All	EGAS4.0		STAGE-II controls, VOC controls, fuel efficiency factors used in EPA's HDDV Rulemaking (Attachment F)	
Non-road	Aircraft, Railroad and Locomotives	NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors			
	Others	EPA's NONROAD model (June, 2000)			
On-road VMT		VMT grown using the linear regression described in Attachment C	EGAS4.0	Enhanced vehicle I/M, Stage II vapor recovery, Phase 1 Ga. Gasoline. Additional details are provided in Attachment C	NET99 EI version 2.3 MOBILE6 input files

Table 3-2b: Data sources and modeling tools used in the development of future year (i.e., 2012) Emissions Inventory

<table>
<tr><th colspan="2" rowspan="2">Source category</th><th colspan="2">Growth</th><th colspan="2">Controls</th></tr>
<tr><th>Georgia</th><th>Other States</th><th>Georgia</th><th>Other State</th></tr>
<tr><td rowspan="2">Point</td><td>EGU</td><td>EGAS4.0</td><td>EAGS4.0</td><td>Plant specific control factors (Attachment F)</td><td>NOx SIP call and plant specific control factors (Attachment F)</td></tr>
<tr><td>Non-EGU</td><td colspan="2">EGAS4.0</td><td colspan="2">VOC RACT and MACT controls, NOx SIP call control factors used in development of EPA's Emissions Inventory for HDDV Final Rulemaking (Attachment F)</td></tr>
<tr><td>Area</td><td>All</td><td colspan="2">EGAS4.0</td><td colspan="2">STAGE-II controls, VOC controls, fuel efficiency factors used in EPA's HDDV Rulemaking (Attachment F)</td></tr>
<tr><td rowspan="2">Non-road</td><td>Aircraft, Railroad and Locomotives</td><td colspan="4">NET99 EI version 2.3 projected to 2000 with EGAS4.0 growth factors</td></tr>
<tr><td>Others</td><td>EPA's NONROAD model (June, 2000)</td><td>EGAS4.0</td><td>EPA's NONROAD model (June, 2000)</td><td>None</td></tr>
<tr><td colspan="2">On-road VMT</td><td>VMT grown using the linear regression described in Attachment C</td><td>EGAS4.0</td><td>Enhanced vehicle I/M, Stage II vapor recovery, Phase 1 Ga. Gasoline. Additional details are provided in Attachment C</td><td>NET99 EI version 2.3 MOBILE6 input files</td></tr>
</table>

Tables and Figures summarizing the base (i.e., 2000) and future year (i.e., 2007 and 2012) emissions in Georgia have been provided in this Section. NOx emissions from anthropogenic emission sources are expected to decline by 26 percent by 2007, and an additional 11 percent by 2012. VOC emissions are also expected to see a similar decline (19 percent by 2007, and an additional 4 percent by 2012). These reductions are primarily due to Federal and State regulations that are to be implemented between 2000 and 2012.

Table 3-3: NO_x and VOC emissions (tons per ozone season day) from anthropogenic sources in Georgia

	2000		2007		2012	
	NOx	VOC	NOx	VOC	NOx	VOC
Point	760	104	497	78	456	74
Area	105	672	105	612	106	653
Mobile	923	570	679	389	463	288
Nonroad	304	197	287	177	288	179
Total	**2,092**	**1,542**	**1,568**	**1,256**	**1,314**	**1,195**

Figure 3-1: NO_x emissions (tons per ozone season day) from anthropogenic sources in Georgia

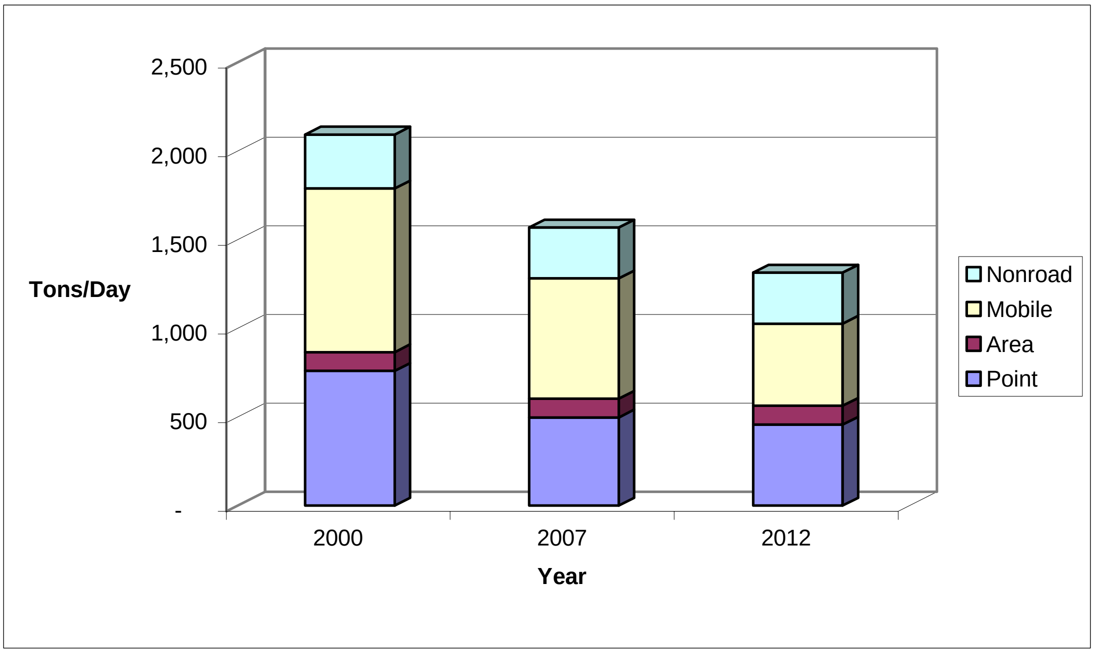
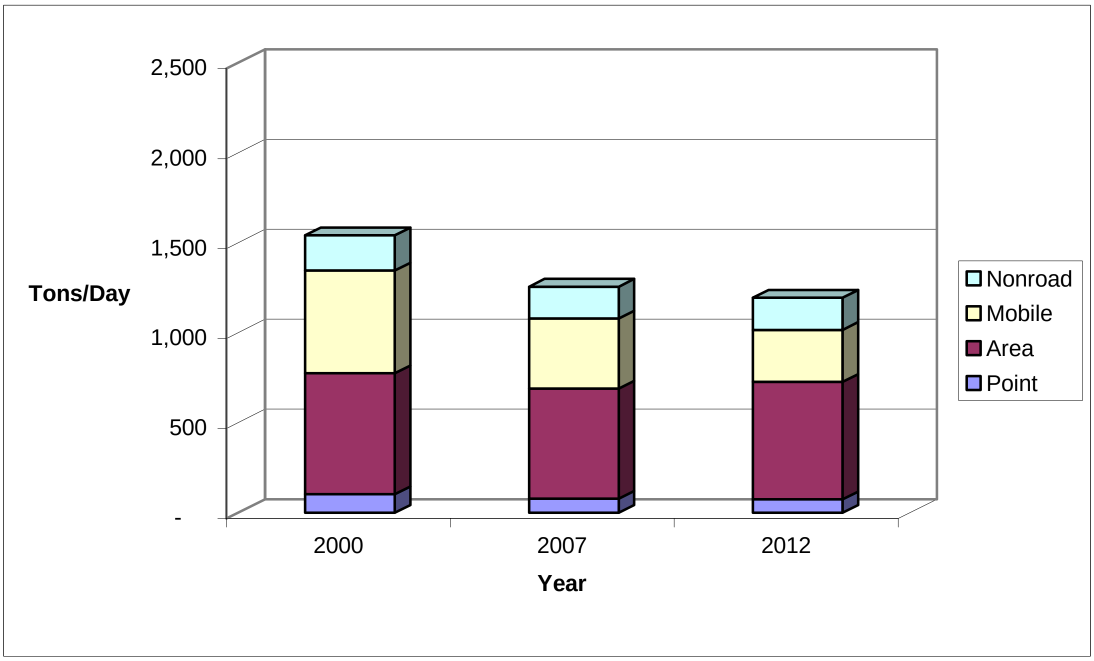


Figure 3-2: VOC emissions (tons per ozone season day) from anthropogenic sources in Georgia



Tables and Figures summarizing the base (i.e., 2000) and future year (i.e., 2007 and 2012) emission in the Chattanooga area have been provided below. NOx emissions from anthropogenic emissions sources are expected to decline by 18 percent by 2007, and an additional 23 percent by 2012. VOC emissions are also expected to see a similar decline (17 percent by 2007). These reductions are primarily due to Federal and State regulations that are to be implemented between 2000 and 2012.

Table 3-4: NO_x and VOC emissions (tons per ozone season day) from anthropogenic sources in Walker and Catoosa counties

	2000		2007		2012	
	NOx	VOC	NOx	VOC	NOX	VOC
Point	0	0	0	1	0	1
Area	1	14	1	12	1	13
Mobile	13	9	10	6	7	5
Nonroad	3	1	3	1	3	1
Total	**17**	**24**	**14**	**20**	**10**	**20**

Figure 3-3: NO_x emissions (tons per ozone season day) from anthropogenic sources in Walker and Catoosa counties

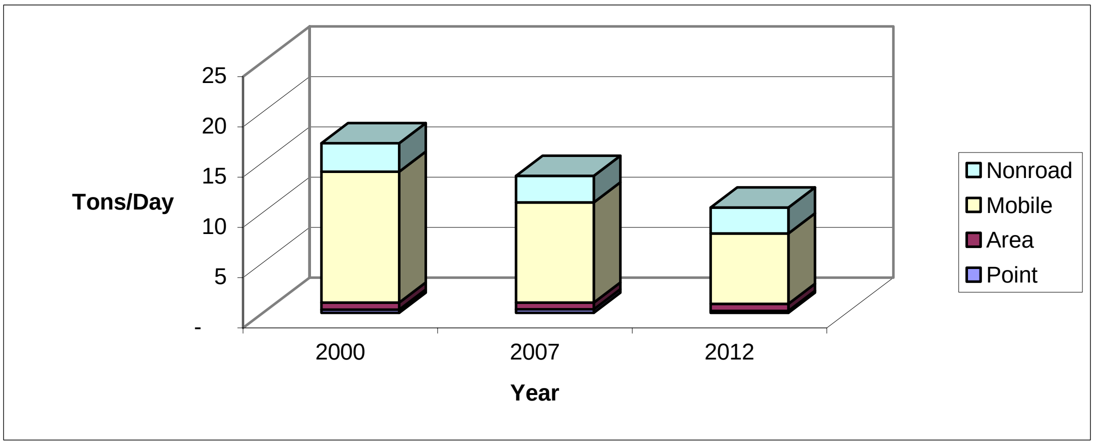
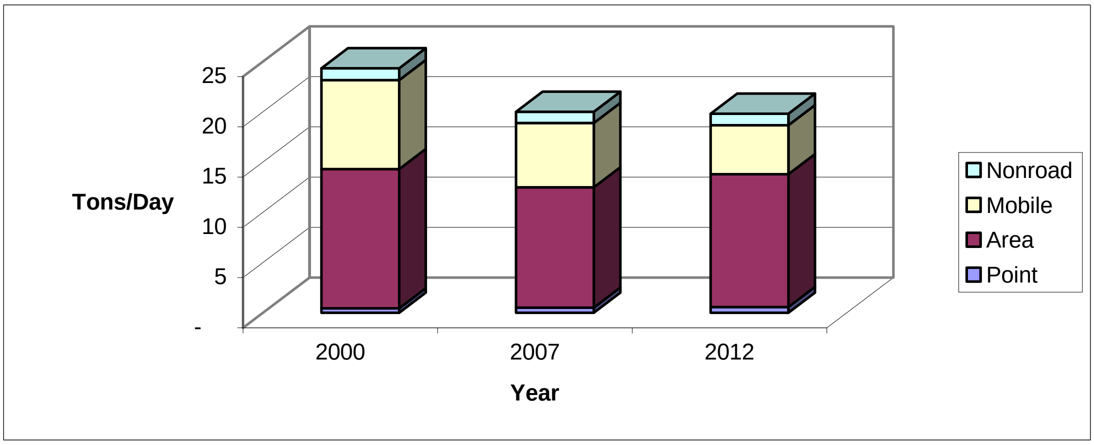


Figure 3-4: VOC emissions (tons per ozone season day) from anthropogenic sources in Walker and Catoosa counties



4. Atmospheric Modeling and Attainment Demonstration

4.1 Background

This section provides details of atmospheric modeling conducted in support of the Chattanooga EAC. The modeling effort utilizes the atmospheric modeling products (i.e., emission and air quality databases, modeling simulation results, software tools, etc.) developed during the Fall-line Air Quality Study (FAQS) (FAQS, 1999). Launched in 2000, FAQS is designed to investigate the level of air pollution in the cities of Augusta, Macon and Columbus and suggest control strategies for attainment of the NAAQS. With the expected completion date of December 2004, FAQS is one of the most comprehensive air quality studies conducted in Georgia and includes enhanced monitoring, emissions inventory development, and atmospheric modeling. Results of the modeling study are currently being documented and are expected to become available in December 2004.

4.2 Atmospheric Modeling System

Atmospheric modeling systems provide a scientific means of linking emissions, meteorology and air quality over a geographical region. Using spatially and temporally resolved meteorological, emission and air quality data; atmospheric models solve mathematical equations that describe the physical and chemical processes that occur in the atmosphere. The complexity of atmospheric processes, scarcity or total absence of quality input data at adequate spatial and temporal resolution, and computational limitations necessitate the use of simplifying assumptions that contribute to uncertainty in modeling results. In spite of these uncertainties, atmospheric models continue to play a central role in the development and analysis of emissions control strategies that are designed to improve local and regional air quality. The United States Environmental Protection Agency (USEPA) recommends the use of photochemical models to demonstrate attainment and maintenance of the NAAQS. It has provided extensive guidance on the use of photochemical models for air quality management (EPA, 1999). Atmospheric modeling conducted in support of the Chattanooga EAC and described in this document was conducted pursuant to these recommendations.

The selection of an atmospheric modeling system that can be used for developing and evaluating emission control strategies is of critical importance for States and Local agencies, especially those that have multiple regions that exceed the NAAQS for one or more criteria pollutants. Although the guidance document does not specify a particular modeling system for use in regulatory applications, it does provide a list of attributes that in large part ensure the adequacy of the system for emissions control strategy development and evaluation. These attributes include:

- The model has received a scientific peer review.
- Databases needed to perform the analysis are available and adequate.
- Past performance demonstrates that the model is not biased towards underestimates.
- The model is available to users free or at a reasonable cost and is not proprietary.

The atmospheric modeling system selected by the GAEPD fulfills all of the above requirements. It is comprised of the Mesoscale Meteorological Model (MM5) developed by National Center of Atmospheric Research (NCAR); Community Multiscale Air Quality (CMAQ or Models3) developed by EPA; and Sparse Matrix Operator Kernel Emissions (SMOKE) processor developed by MCNC. This system has been used in a large number of research projects as well as regulatory applications in the last five years with satisfactory results.

4.3 Atmospheric Modeling for Emissions Control Strategy Development

The task of simulating atmospheric processes over a region and assessing future changes in emissions and air quality is a complex one, requiring knowledge in various disciplines of mathematics and science. Selection of a geographical region and the historical meteorological episode to be simulated is the first step in the atmospheric modeling process. The selected geographical region is divided into a three-dimensional grid. Available computational resources largely determine the resolution and extent of the modeling grid. Generally, modeling grids extend thousands of square kilometers, at a resolution that ranges from 4 to 100 kilometer in the horizontal, and 20 meters to several kilometers in the vertical direction. As for the length of modeling episode, a two to three week period is considered appropriate for atmospheric modeling that is aimed at developing emission control strategies for attainment of the NAAQS for ozone. This in an effort to minimize the effect of initial conditions and to capture full synoptic cycles associated with long-range transport of pollutants that are important for ozone formation.

Once the three-dimensional modeling grid is defined, emissions, meteorology and air quality databases are developed for the region of interest. These databases include; activity levels; emission rates and physical parameters (e.g., location of roadways, diameter of point source stacks, etc.) of various sources, terrestrial, surface, and upper level meteorological data; ambient air quality concentrations recorded at the monitoring stations, etc. These databases are supplemented with available socio-economic data for the region. A prognostic meteorological model is generally used to simulate the dynamic physical processes over the domain. These models utilize meteorological databases to solve the coupled mass, energy and momentum equations and generate temporally and spatially resolved meteorological fields. An emissions processor performs spatial and temporal allocation; and chemical speciation of area, mobile, biogenic and point source emissions inventories. The output of emission processors is gridded, speciated and temporalized emission files for use in air quality modeling. Finally, the air quality database is used to generate initial conditions, boundary conditions and photolysis rates for the modeling grid. Utilizing all the processed data, the air quality model simulates the evolution of pollutant concentration in the modeling domain for the entire study period. The modeling results are compared with observations to assess the overall accuracy of the modeling effort.

Once the ability of the atmospheric modeling system to accurately simulate an historical air pollution episode is established, changes in future emissions within the modeling domain are estimated. Modeling simulations are conducted with estimated emission, and predicted air quality concentrations are used to assess the status of future air quality in the region with reference to a desired goal (e.g., NAAQS). If future air quality is determined to exceed permissible limits, an emission control strategy is developed for various sources within the modeling domain. This is followed by another round of modeling simulations to assess air quality improvement. The process continues until the desired level of future air quality is attained. The atmospheric modeling and emission control strategy development process is depicted in Figures A-1 and A-2 in Attachment A.

The following sections describe atmospheric modeling and emission control strategy development tasks undertaken in support of Chattanooga EAC. These include:

- Episode Selection
- Modeling domain and grid configuration
- Mesoscale Meteorological modeling
- Emissions processing
- Air quality modeling
- Attainment demonstration

4.4 Episode Selection

In order to evaluate the suitability of selected episodes for photochemical modeling related to the 8-hour ozone standard, air quality and meteorological data was examined. Important considerations included: (1) a range of meteorological conditions that accompany air quality events, (2) pollutant concentration levels that characterize the air quality problem (e.g., nonattainment), and (3) the frequency of occurrence of the relevant meteorological/air quality events (to avoid using results from infrequent or extreme events to guide the assessment process).

The episode selection methodology is based on that developed by Deuel and Douglas (1998). It includes the classification of days within a multi-year period (e.g., 1995–2001) according to meteorological and air quality parameters using the Classification and Regression Tree (CART) analysis technique. The frequency of occurrence of ozone exceedances for each classification type is then determined for each area of interest. Days with maximum ozone concentrations within approximately 10 ppb of the respective design values can be identified. In addition, an optimization procedure can be applied to select multi-day episodes for maximum achievement of specified episode selection criteria for various combinations of geographical areas and ozone metrics (e.g., 1-hour and 8-hour ozone). The episode selection methodology provides an objective approach to selecting modeling episodes that optimally represent typical meteorological conditions and relevant ozone concentration levels (per the ozone standard(s)). This methodology can also be used in reverse to evaluate the representativeness of predetermined episodes.

CART analysis (Douglas et al., 2002) was conducted to determine how representative the August 11-20, 2000 and August 1-20, 1999 air pollution episodes were of the meteorological conditions that caused exceedances in the Chattanooga area during the 1995–2001 ozone seasons (May–October). The individual modeling days for these episodes are listed in Table 4-1. The observed maximum 8-hour ozone concentration, the number of monitoring sites within 10 ppb of Chattanooga’s 2001 design value (91 ppb), and the CART classification bins are provided in this table. Episode days with maximum 8-hour ozone concentrations greater than or equal to 85 ppb are marked in bold. Also marked in bold are key exceedance regimes and episode days that contain at least one monitor with a maximum 8-hour ozone concentration within 10 ppb of the design value. Shading denotes primary episode days that exceed the 8-hour NAAQS, contain at least one monitor with a maximum 8-hour ozone concentrations within 10 ppb of the design value, and represent a key exceedance bin.

The key meteorological/air quality regimes for 8-hour ozone exceedances in Chattanooga corresponded to CART Bins 26 (20 days), 11 (15 days), and 21 (15 days). The total number of 8-hour exceedance days recorded during the 1995-2001 period was 82. Table 4-2 contains a summary of the exceedance bin classification splits for the 8-hour ozone analysis of Chattanooga (frequent bins).

Table 4-1: Modeling Episodes for Chattanooga EAC

Exceedances of the 8-hour NAAQS, Episode Days with Maximum 8-hour Ozone Concentrations within 10 ppb of the Design Value (91 ppb), and Key Exceedance Regimes Are Marked In Bold. Shading denotes primary episode days that meet all three criteria listed above.

Year	Month	Day	Chattanooga 8-hr O3 max	Number of Sites w/in 10 ppb of the 8-hr site-specific DV	CART bin for Chattanooga
2000	8	10	59.3	0	9
2000	8	11	54.9	0	15
2000	8	12	53.4	0	15
2000	8	13	51.1	0	13
2000	8	14	62.6	0	13
2000	8	15	73.8	0	**11**
2000	8	16	**98.1**	**1**	**11**
2000	8	17	**105.5**	0	**21**
2000	8	18	72.8	0	23
2000	8	19	73	0	**11**
2000	8	20	54.4	0	18
1999	8	1	62.1	0	27
1999	8	2	63.3	0	15
1999	8	3	71.9	0	14
1999	**8**	**4**	**102.9**	**2**	**11**
1999	8	5	69.1	0	23
1999	8	6	70.6	0	10
1999	**8**	**7**	**94.6**	**2**	**11**
1999	8	8	69.9	0	28
1999	8	9	49.3	0	13
1999	8	10	84.9	**1**	13
1999	8	11	73.6	0	7
1999	8	12	79.4	0	12
1999	8	13	70.9	0	23
1999	8	14	44.5	0	15
1999	8	15	56.8	0	15
1999	8	16	80.5	0	13
1999	8	17	82.5	**1**	20
1999	8	18	76	0	20
1999	8	19	**108.1**	0	**21**
1999	8	20	69.1	0	28

Table 4-2: Summary of Exceedance Bin Classification Splits for 8-hour Ozone Analysis of Chattanooga

Bin	11	21	26
# of exceedance days	15	15	20
Key classification parameters	ybirmax8 > 65.6 ychamax8 ≤ 75.1 rh12ch ≤ 59.5 ws85pma ≤ 5.1 rh85pma ≤ 62.3 ws85amb > 2.0	ybirmax8 > 65. 6 ychamax8 >75.05 rh85pm ≤ 62.4 ws85amn ≤ 7.45 wb10136ch = 2, 3, 4	ybirmax8 > 65. 6 ychamax8 > 75.1 rh85pm > 62.4 t85amn ≤ 22.6 ws85pma ≤ 4.1 avg85a > 1538. tmaxch > 30.6

ybirmax8	Yesterday's maximum 8-hour average ozone concentration (Birmingham).
ychamax8	Yesterday's maximum 8-hour average ozone concentration (Chattanooga).
rh12ch	Surface relative humidity at noon (Chattanooga).
rh85pma	Upper-air 850 mb relative humidity corresponding to the afternoon sounding on the current day (Atlanta).
rh85pm	Upper-air 850 mb relative humidity corresponding to the afternoon sounding on the current day (?).
ws85pma	Upper-air 850 mb wind speed corresponding to the afternoon sounding on the current day (Atlanta).
ws85amb	Upper-air 850 mb wind speed corresponding to the morning sounding on the current day (Birmingham).
ws85amn	Upper-air 850 mb wind speed corresponding to the morning sounding on the current day (Nashville).
wb1013ch	Average surface wind speed (m/s) from 1000 to 1300 LST (Chattanooga)
t85pma	Upper-air 850 mb temperature corresponding to the afternoon sounding on the current day (Atlanta).
t85pmc	Upper-air 850 mb temperature corresponding to the afternoon sounding on the current day (Charleston).
avg85a	Average of the morning and afternoon sounding heights above sea level of the 850 mb surface (Atlanta).

Each episode period contains episodes day from two of the three most critical bins (Bins 21 and 11), multiple exceedance days, and at least one day with a maximum 8-hour ozone concentration within approximately 10 ppb of the 1999-2001 design value for Chattanooga. With respect to the considerations listed above, the two multi-day episode periods (not considering the two start-up days assigned to each period) include:

- Seven days that captures the most important meteorological bins.

- Five 8-hour ozone exceedance days
- Five days with maximum ozone concentrations within 10 ppb of the 8-hour design value.
- Three exceedance days meeting the 10 ppb criterion that represent primary exceedance regimes (Bins 11 and 21)
- Non-exceedance days meeting the 10 ppb criterion that represents other meteorological regimes (Bins 13 and 20)
- Weekends and weekdays

Based on the above CART analysis, the August 11-20, 2000, and August 1-20, 1999 episodes were deemed appropriate for characterizing 8-hour ozone in the Chattanooga area.

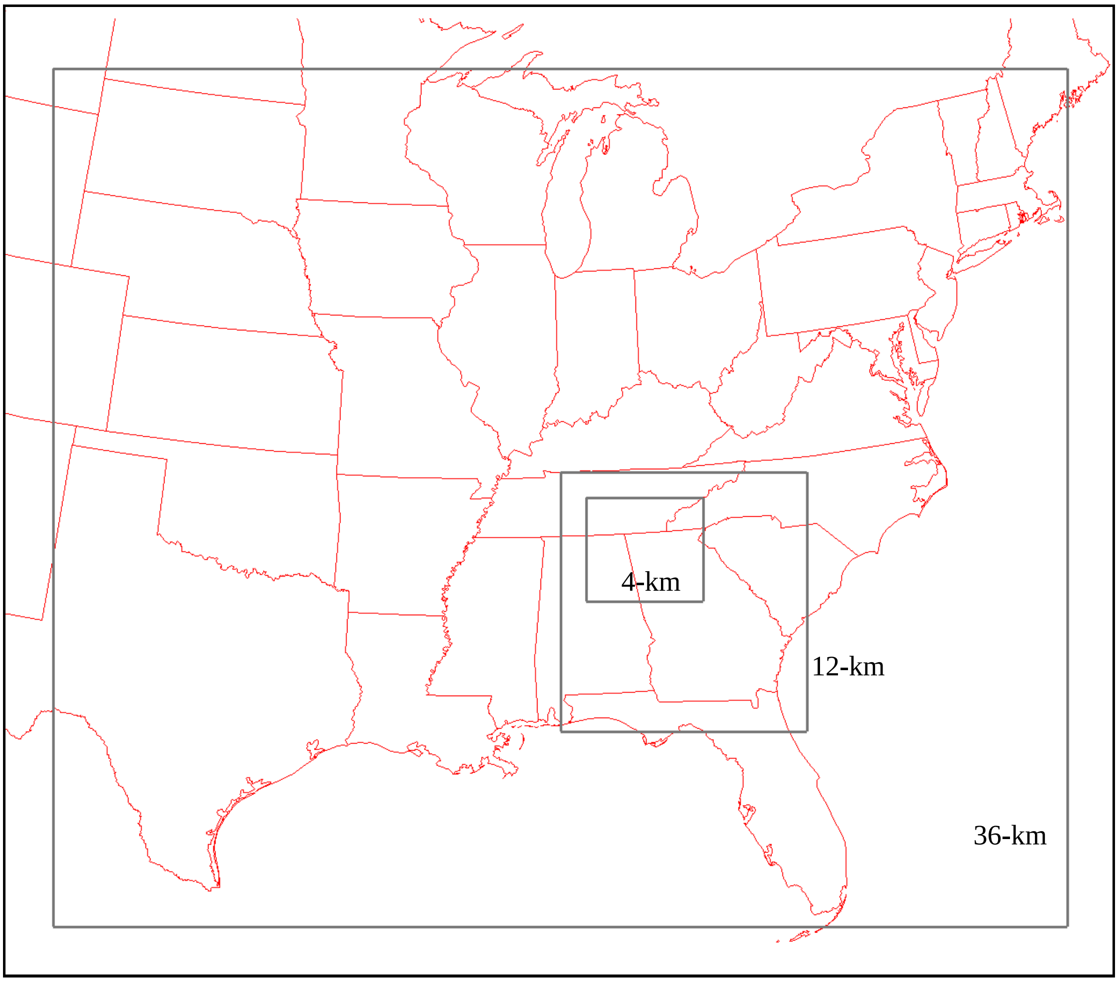


Figure 4-1: Atmospheric Modeling Domain

4.5 Modeling Domain and Grid Configuration

Size and spatial resolution of a modeling grid can have a significant effect on how well the modeling simulation is able to capture the long-range transport of ozone and precursor species to and from the region of interest. Finer resolution grids tend to capture the non-linear physical and chemical processes (e.g., in urban areas and point source plumes) better than their coarse grid counterparts do. Thus, large domains at fine grid resolution are desirable. Since computational costs might quickly become prohibitive, selection of a modeling domain requires a balance between modeling accuracy and computational efficiency.

Atmospheric modeling conducted in support of the Chattanooga EAC and described in this documents, employs a nested grid modeling approach with three grids at 36, 12 and 4-km grid resolution (Figure 4-1). The grid has a Lambert Conformal map projection with origin at 90W and true latitudes at 30 and 60N. The top of the modeling grid has been fixed at 70mb. Details of the MM5 and CMAQ modeling grids have been provided in Tables 4-3 and 4-4.

Table 4-3: MM5 and CMAQ Grid Configuration

Model	NLAYS	36-km resolution		12-km resolution		4-km resolution	
		NCOLS	NROWS	NCOLS	NROWS	NCOLS	NROWS
MM5	35	84	72	63	66	88	79
CMAQ	13	78	66	57	60	81	72

Table 4-4: MM5 and CMAQ Vertical Grid Structure

CMAQ Layer Number	MM5 Layer Number	Sigma level of Layer Top	Approximate height above Ground Level (meters)
Ground Surface	35	1.0	0.0
1	34	0.9975	18.0
2	33	0.9950	37.0
3	32	0.9900	74.0
4	31	0.9800	149.0
5	30	0.9700	225.0
	29	0.9600	301.0
6	28	0.9400	456.0
	27	0.9200	612.0
7	26	0.9000	772.0
	25	0.8750	975.0
8	24	0.8500	1182.0
	23	0.8200	1438.0
9	22	0.7900	1699.0
	21	0.7550	2014.0
	20	0.7200	2341.0
	19	0.6850	2677.0
	18	0.6500	3030.0
10	17	0.6150	3393.0
	16	0.5800	3772.0
	15	0.5450	4165.0
	14	0.5100	4582.0
	13	0.4750	5041.0
11	12	0.4400	5471.0
	11	0.4000	6023.0
	10	0.3600	6611.0
	9	0.3200	7243.0
12	8	0.2800	7930.0
	7	0.2400	8677.0
	6	0.2000	9498.0
	5	0.1600	10415.0
13	4	0.1200	11457.0
	3	0.0800	12656.0
	2	0.0400	14115.0
	1	0.0000	15952.0

4.6 Mesoscale Meteorological Modeling

4.6.1 Introduction

The fifth-Generation Penn State/NCAR Mesoscale Model (MM5) (Grell et al., 1994; Dudhia et al., 2002) was used to simulate local and synoptic scale meteorological conditions prevalent during the period of interest. MM5 is the latest in a series of models that were developed from a mesoscale model used at Penn State in the early 1970's (Anthes and Warner, 1978). Since that time, it has undergone many changes designed to broaden its usage. These include, (1) a multiple-nest capability; (2) non-hydrostatic dynamics that allow the model to be used at a few-kilometer scale; (3) multi-tasking capability on shared- and distributed-memory machines; (4) four-dimensional data-assimilation (FDDA) capability, and (5) multiple physics options (http://box.mmm.ucar.edu/mm5). It has been extensively used to develop meteorological fields for air quality models and its performance has been thoroughly evaluated and found adequate for air quality model applications. It requires a significant amount of data, most of which is available through the Data Support Section of Scientific Computing Division at NCAR. This includes:

- Topography and land use data;
- Gridded atmospheric data that has at least the following variables: sea-level pressure, wind, temperature, relative humidity and geopotential height at the following pressure levels: 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100 millibars;
- Observation data that contains soundings and surface reports.

It is important to point out that meteorological fields simulated by MM5 are used as an input to the emissions and air quality models. Their accuracy is thus of considerable importance. The predicted meteorological variables are compared against meteorological data collected at observation stations in an effort to determine the overall accuracy of the modeling system. The meteorological model performance evaluation methodology and associated tools are thus an integral part of the meteorological modeling system.

4.6.2 Description of meteorological patterns observed during August 11-20, 2000 air pollution episode

Before discussing the application of the meteorological modeling system to the August 11-20, 2000 air pollution episode, it will be useful to describe the synoptic scale meteorological conditions prevalent during the period of interest. The following, is a day-by-day account of atmospheric conditions observed during this period:

August 9, 2000: A strong upper level ridge whose center was positioned over southern Louisiana was the dominant synoptic feature. High pressure extended over the southeastern US and the flow aloft was predominantly zonal with the main jet over the US-Canadian border. The 12Z Rawinsonde data for Peachtree City (FFC) indicated slightly unstable conditions with light winds aloft coupled with low-level instability and some moisture advection near 600 mb. These parameters were indicative of the potential for afternoon cumulus convection. Good warm air advection was apparent from the sounding upper level wind profile, and water vapor and satellite imagery indicated a good swath of Gulf moisture advection over the Southeast. Visible satellite imagery at 18Z showed a convective outflow boundary setting up and extending across northern Alabama through north Georgia into upstate South Carolina. With no major focus mechanism nearby, such as a front, and minimal upper level support, cumulus convection was isolated in nature. With low-level moisture and reduced photochemistry due to variable cloud cover, ozone levels across the state remained below the federal air quality standard.

August 10, 2000: The outflow boundary from 9 August was still an important feature to consider since synoptic conditions were similar to 10 August. However, an increase in downslope (NW) flow near 200 mb with additional mid-level drying above 600 mb was evident from the 12Z FFC Rawinsonde data on 10 August. The ETA forecast model predicted lowering of geopotential heights with some minor cooling at 850 mb, which would only slightly enhance the convective potential across north Georgia. Upper level synoptic charts indicated that the upper level ridge was strengthening near the surface over the Southeastern US. An outflow boundary did develop just south of metro Atlanta; however, outflow from this convective activity could have enhanced subsidence north of that Atlanta metro area. An outflow boundary did develop just south of metro Atlanta; however, the resulting convective activity contributed to enhanced subsidence north of the area as indicated by elevated ozone concentrations in the region.

August 11–13, 2000: Synoptic conditions for the period involved a weak frontal passage on 12 August. Pre-frontal conditions existed on 11 August. The major synoptic features for 11 August were a weak trough digging from the north, a high amplitude ridge out west and a weak tropical disturbance off the Florida/Georgia coast. Mid-level moisture advection at 500 mb was evident from the 12Z FFC Rawinsonde data along with minor cold air advection, which was indicative of the frontal passage. Post-frontal conditions existed on 12 August, with strong drying above 700 mb. With frontal conditions on the 11th and 12th, ozone levels remained within good air quality standards. Stable conditions existed with drying aloft, in response to the upper air anticyclone slowly drifting eastward and the front slipping southward of the Atlanta metro area. An upper level vorticity skirted across north Georgia following the passage of the front. On 13 August, additional low and mid-level drying occurred in response to the surface ridge building across the Southeast. The strong upper level anticyclone responsible for this drying was centered over the north central plains. The strong upper level anticyclone responsible for drying was centered over the north central plains. The increased drying and subsidence from expanding ridge allowed for increased ozone production and accumulation in the region during this period.

August 14, 2000: A strong steep surface inversion indicated good residual buildup and the onset of a regional episode, as verified by the high nocturnal ozone readings at the elevated Fort Mountain site (~865m ASL). Light wind speed, low relative humidity at 850 mb, a stable lapse, and good downslope flow gave stable conditions over north Georgia, in response to the strong surface ridge beginning to build over the Southeast. The strong upper level ridge drifted over the Central Plains.

August 15–18, 2000: A surface ridge axis extended southward towards the Gulf Coast, while the upper level ridge held firm over the Central Plains and upper

Mississippi Valley on 15 August. On 16 August, a regional buildup of ozone continued as an upper level ridge became firmly entrenched over the north central Gulf of Mexico, and the surface ridge intensified. Light northwesterly flow was indicated above 1200m agl at the FFC SODAR PA1-LR acoustic sounder during the day on 16 August. Mixing heights extended up to 2500m according to the SODAR mixing height calculation, this was in agreement with the mixing height and stable conditions depicted by the FFC 12Z Rawinsonde data. Split flow with light NNE winds aloft existed over north Georgia due to the center of the high being positioned slightly west of metro Atlanta. With plenty of subsidence and light NNE flow, the highest concentrations of surface ozone should have been on the south side of the metro area. On 17 August, continued subsidence and stable conditions led to high ozone production over the Atlanta metro area. This production combined with high residual ozone and fumigation, helped enhance the regional episode. On 18 August, isentropic forward and back trajectory analysis indicated possible transport from Alabama. However, some ventilation did occur during the afternoon of 18 August to keep levels from really ramping, due to the passage of a weak 500 mb upper level trough.

August 19-20, 2000: Instability was on the rise on 19 August as the surface ridge weakened and a weak front approached north Georgia from the west. Some moisture advection was evident at 850 mb, due to a weak disturbance riding along the front. However, a definite air mass change did not occur until 20 August, when split flow and an increase in low-level wind speed “bumped” the residual ozone layer. The ETA forecast model depicted a weak Atlantic back-door cold front building in from the northeast. This front was accompanied by a slight increase in Atlantic moisture at 850 mb on 20 August, which gave a “cleaner” flow regime across north Georgia.

4.6.3 Application of Mesoscale Model

A number of meteorological modeling simulations aimed at evaluating strengths and weaknesses of various physics options available in MM5 were conducted. Operational details and results of these simulations are documented in Hu et al., (2003). The modeling simulation described below was determined to be of a quality adequate for regulatory applications. The simulation was conducted with version 3-5-3 of MM5 released on 8/27/02. The following meteorological datasets were used.

- Surface elevation, land use/vegetation and soil temperature data from USGS at 30 second resolution available with MM5 installation package.
- NCEP ETA gridded analysis data available at 40-km resolution archived at 3-hour intervals were used for FDDA. The data are available at http://dss.ucar.edu/datasets/ds609.2.
- ADP observational data that consists of land and surface ship observations archived at 3-hour intervals and soundings data at 12-hour intervals available at http://dss.ucar.edu/datasets/ds353.4 and http://dss.ucar.edu/datasets/ds464.0.

The physics options and associated parameters used in the simulation are summarized in Table 4-5.

Table 4-5: Meteorological Model Physics Options and Related Modeling Parameters

Physics options	**Grid resolution**		
	36-km	**12-km**	**4-km**
Nesting Type	One-way	One-way	One-way
Numerical Time Step	90 sec	30 sec	10 sec
Cumulus parameterization	Grell	Grell	None
PBL scheme	MRF	MRF	MRF
Moisture scheme	Mixed Phase	Mixed Phase	Mixed Phase
Radiation scheme	RRTM scheme	RRTM scheme	RRTM scheme
Land Surface scheme	OSU/Eta	OSU/Eta	OSU/Eta
Convection scheme	None	None	None
Observation nudging	None	None	None
3-D Grid analysis nudging	Yes	Yes	No
3-D Grid analysis nudging time interval	3-hour	3-hour	-
3-D Grid analysis nudging co-efficient	$GV=1x10^{-4}$ $GT=3x10^{-4}$ $GQ=1x10^{-6}$	$GV=1x10^{-6}$ $GT=3x10^{-4}$ $GQ=1x10^{-5}$	-
Surface Analysis nudging	Yes	Yes	No
Surface Analysis nudging time interval	3-hour	3-hour	-
Surface Analysis nudging co-efficient	$GV=1x10^{-4}$	$GV=1x10^{-6}$	No

4.6.4 Model Performance

Introduction

Model performance is the process of evaluating how accurately a modeling simulation estimates observed quantities. In case of a meteorological model, these quantities are atmospheric variables such as temperature, pressure, humidity, wind speed, and wind direction. Since it is appropriate to use the modeling results in a regulatory application only if they are determined to be of acceptable level of accuracy, detailed model performance was conducted and is briefly described in this section. In the absence of regulatory guidance on adequate performance measures for prognostic meteorological models, statistical metrics were computed and evaluated against benchmarks proposed by Emery (2001) (Table 4-6 and Table 4-7). The results were also compared with other peer-reviewed work (Table 4-8).

Table 4-6: Mathematical Formulation of Statistical Metrics Used for Evaluating Mesoscale Meteorological Model Performance

Metrics	Formulation
Bias	$B = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(P_j^i - O_j^i\right)$
Gross Error	$E = \frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left\|P_j^i - O_j^i\right\|$
Root Mean Square Error	$RMSE = \left[\frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(P_j^i - O_j^i\right)^2\right]^{1/2}$
Systematic Root Mean Square Error	$RMSE_S = \left[\frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(\hat{P}_j^i - O_j^i\right)^2\right]^{1/2}$
Unsystematic Root Mean Square Error	$RMSE_u = \left[\frac{1}{IJ}\sum_{j=1}^{J}\sum_{i=1}^{I}\left(P_j^i - \hat{P}_j^i\right)^2\right]^{1/2}$
Index of Agreement	$IOA = 1 - \left[\frac{IJ.RMSE^2}{\sum_{j=1}^{J}\sum_{i=1}^{I}\left\|P_j^i - M_o\right\| + \left\|O_j^i - M_o\right\|}\right]$

Table 4-7: Statistical Benchmarks for Mesoscale Meteorological Model Performance Proposed by Emery (2001)

Statistical Measure	Benchmark
Wind Speed Bias (m/s)	<±0.5
Wind Speed Total RMSE (m/s)	2.0
Wind Speed Index of Agreement	0.6
Wind Direction Gross Error (degree)	30.0
Wind Direction Bias (degree)	<±10.0
Temperature Bias (Kelvin)	<±0.5
Temperature Gross Error (degree)	2.0
Temperature Index of Agreement	0.8
Humidity Bias (g/kg)	<±1.0
Humidity Gross Error (g/kg)	2.0
Humidity Index of Agreement	0.6

Methodology

Meteorological inputs required by CMAQ include three-dimensional distribution of winds, temperature, humidity, pressure, cloud cover, and other physical parameters in addition to diagnosed quantities such as turbulent mixing and planetary boundary layer heights. Given that the MM5 model code and algorithms have undergone significant peer review, operational evaluation of the model is sufficient to serve as the basis of evaluating if the model is operating with sufficient reliability to be used in support of SIP development. Thus, the prognostic meteorological model performance discussed here is limited to statistical analysis of the hourly-averaged modeled predictions and surface meteorological measurements that have been obtained from http://dss.ucar.edu/datasets/ds472.0. The location of monitoring stations is provided in the Table 2, Attachment A. Surface statistics for base meteorological variables, namely temperature, wind speed and direction, and humidity, have been computed. The metrics include: Bias Error (B), Gross Error (E) and Root Mean Square Error (RMSE), Systematic Root Mean Square Error ($RMSE_s$), Unsystematic Root Mean Square Error ($RMSE_u$) and Index Of Agreement (IOA). A graphical summary of the daily and hourly mean performance statistics for the modeling simulations at 12 and 4-km grid resolution is provided in Figures 4-2 through 4-10. A summary of the modeling results is provided below.

Results of Modeling Simulation at 12-km Grid Resolution

Temperature

The episode-average Bias (0.91 Kelvin) (Figures 4-2 and 4-3) fails to meet the benchmark with daily averages exhibiting over-prediction of the temperature on most days. Although the episode-average Gross Error (1.83 Kelvin) meets the benchmark, the daily-average Gross Error marginally exceeds it on August 19th and 20th. A high IOA (0.93) and low Systematic RMSE suggests that the temperature field simulated by the model is of satisfactory quality. The hourly statistical time series reveals a slight over prediction of peak temperature during the daytime hours. Also of note is the under prediction in nighttime temperatures on August 19th and 20th.

Wind Speed and Direction

The episode-average wind speed Bias (–0.27m/s) and total RMSE (systematic plus unsystematic) (1.94m/s) (Figure 4-4) meet the benchmark. However, the contribution of systematic RMSE towards the total is found to be higher. While ideally we want the episode-average IOA to be greater than 0.6, the computed IOA of 0.43 is not unusually poor. The episode-average wind direction Gross Error (50.2 degrees) fails to meet the benchmark.

Humidity

The episode-average statistics (Figures 4-5 and 4-6) indicate that the modeling simulation tends to under predict humidity throughout the episode. The average-daily Bias and Gross Error fail to meet the benchmark on most days. Bias and Gross Errors increase from –0.93 g/kg and 1.62 g/kg respectively on August 14th, to –2.6 g/kg and 2.82 g/kg on August 18th. Also of note is the larger contribution of the Systematic RMSE towards the total on August 16th, 17th and 18th.

Results of Modeling Simulation at 4-km Grid Resolution

Temperature

The episode-average Bias (1.3 Kelvin) (Figures 4-7 and 4-8) fails to meet the benchmark with daily averages exhibiting over-prediction of the temperature on most days. Although the episode-average Gross Error (1.99 Kelvin) meets the benchmark, the daily-average Gross Error marginally exceeds it on some days. A high IOA (0.93), a low Systematic RMSE, and a relatively low episode-average Gross Error (1.99

Kelvin), suggest that the simulated temperature field is of satisfactory quality. A slight over prediction of daytime and an under prediction of nighttime temperatures is revealed in the hourly statistical time series.

Wind Speed and Direction

Although the episode-average wind speed Bias (–0.058m/s) is very low, a large RMSE (systematic plus unsystematic) (2.13 m/s) (Figure 4-9), a low IOA (0.3), and high wind direction Gross Error (56.2 degrees) indicate less than satisfactory performance of model. Contribution of systematic RMSE towards the total is found to be higher when compared to unsystematic RMSE.

Humidity

The episode-average statistics (Figures 4-10 and 4-11) indicate that the modeling simulation tends to under predict humidity throughout the episode. The average-daily Bias and Gross Error fail to meet the benchmark on most days. Bias and Gross Errors increase from –0.91 g/kg and 1.45 g/kg respectively on August 14th, to –3.14 g/kg and 3.28 g/kg on August 18th. Also of note is the larger contribution of the Systematic RMSE towards the total on almost all episode days.

Summary

While reviewing these statistics, the reader is cautioned that summary statistics are useful in making only a general assessment about the adequacy of meteorological fields. For example, daily-mean performance statistics are likely to conceal important hour-to-hour variations. Also, note that the summary statistics depend upon the number of observation-prediction pairs and generally improve with larger sampling sizes and longer averaging periods. This is because the probability of statistics being affected by extreme values is high in smaller sample sizes.

A literature review (Table 4-8) indicates that typical RMSE of hourly averaged surface wind speeds is 2-3 m/s for a wide range of wind speeds, models and geographic regions. For wind speeds in the range of 3-4 m/s, the RMSE in surface wind direction is around 50 degrees. The literature suggests that uncertainties in wind speeds and direction are primarily due to random turbulent processes and sub-grid variations in terrain and land use. It is therefore unlikely that the mesoscale models currently in use will be able to reduce these errors much further.

Although some of the model performance parameters do not meet the desired benchmarks, the results fall within the range of prognostic meteorological model performance that is generally used for air quality modeling. In addition to the model performance statistics described above, similar statistics were computed using ADP observational data (Hu et al. 2003). Both analyses reveal that temperature and winds were simulated with good to satisfactory accuracy. Although humidity was less well modeled, it is of less importance in an air quality modeling effort that is aimed at developing an emission control strategy for attainment of the NAAQS for ozone. It should be pointed out that air quality performance serves as an additional check on how accurately a meteorological model was able to capture atmospheric dynamics during the episode. In the unlikely event of an unusually poor air quality model performance, it is reasonable to further investigate the performance of meteorological model.

Table 4-8: List of Peer-Reviewed Journal Articles Related to Mesoscale Meteorological Performance

	Emery et al., 2001	Rao et al., 2001		Zhong et al., 2003 (a) light winds; (b) strong winds						Castelli et al., 2004		Hanna et al., 2001. (c) 1995, OTAG; (d) 1991, Central California		
	Benchmark	RAMS3b	MM5	RAMS (a)	MM5 (a)	Meso-Eta (a)	RAMS (b)	MM5 (b)	Meso-Eta (b)	RAMS	Eta	RAMS (c)	MM5 (c)	MM5 (d)
Temperature Bias (degree C)	±0.5	1.38	-0.93	-0.74	-0.70	-1.77	-1.78	-0.74	-2.14	-	-	-	-	
Temperature Error (degree C)	2.0	2.29	2.22	-	-	-	-	-	-	-	-	-	-	-
Temperature RMSE (degree C)	-	3.03	2.89	2.50	2.17	2.57	2.62	1.97	2.99	3.40	3.37	-	-	-
Mixing Ratio Bias (g/kg)	±1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixing Ratio Error (g/kg)	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Mixing Ratio RMSE (g/kg)	-	-	-	-	-	-	-	-	-	1.70	1.76	-	-	-
Wind Speed Bias (m/s)	-	0.61	0.28	0.66	0.46	0.13	0.35	-0.26	1.64	-	-	-0.1	0.5	1.5
Wind Speed Error (m/s)	-	1.41	1.34	-	-	-	-	-	-	-	-	-	-	-
Wind Speed RMSE (m/s)	2.0	1.80	1.71	1.63	1.57	1.41	2.00	1.98	2.56	1.57*	2.21*	1.6	1.9	2.5
Wind Direction Bias (degree)	-	-	-	-0.43	9.91	0.85	-1.11	4.10	3.89	-	-	-12	14	-2
Wind Direction Error (degree)	20	-	-	-	-	-	-	-	-	-	-	-	-	-
Wind Direction RMSE (degree)	-	-	-	68.37	66.66	69.49	64.58	72.98	61.02	-	-	76	51	66

*RMSVE

Castelli, S. T., S. Morelli, D. Anfossi, J. Carvalho, and S. Z. Sajani, 2004: Inter-comparison of two models, ETA and RAMS, with TRACT field campaign data. *Environmental Fluid Mechanics*, **4,** 157-196

Emery, C. et al., 2001: Enhanced meteorological modeling and performance evaluation for two Texas ozone episodes. Prepared for the Texas Natural Resource Conservation Commission, Prepared by ENVIRON International Corporation, Novato, CA.

Hanna, S. R. and R. X. Yang, 2001: Evaluations of mesoscale models' simulations of near-surface winds, temperature gradients, and mixing depths. *Journal of Applied Meteorology*, **40,** 1095-1104

Hogrefe, C., S. T. Rao, P. Kasibhatla, G. Kallos, C. J. Tremback, W. Hao, D. Olerud, A. Xiu, J. McHenry, and K. Alapaty, 2001: Evaluating the performance of regional-scale photochemical modeling systems: Part I - meteorological predictions. *Atmospheric Environment*, **35,** 4159-4174

Zhong, S. Y. and J. Fast, 2003: An evaluation of the MM5, RAMS, and Meso-Eta models at sub-kilometer resolution using VTMX field campaign data in the Salt Lake Valley. *Monthly Weather Review*, **131,** 1301-1322

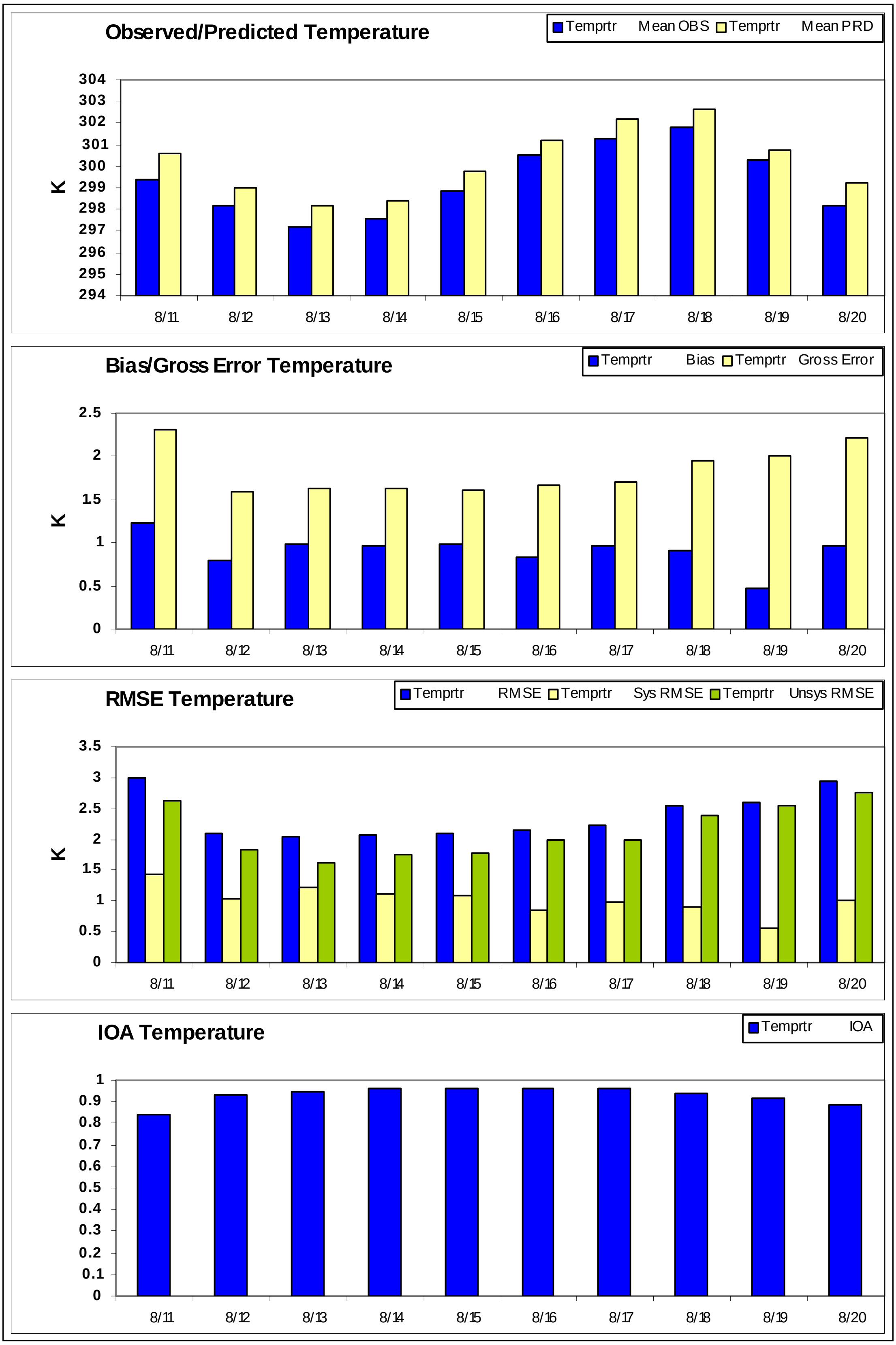


Figure 4-2: Daily Statistical Temperature Time Series Plot for the 12-Km Grid Resolution Simulation.

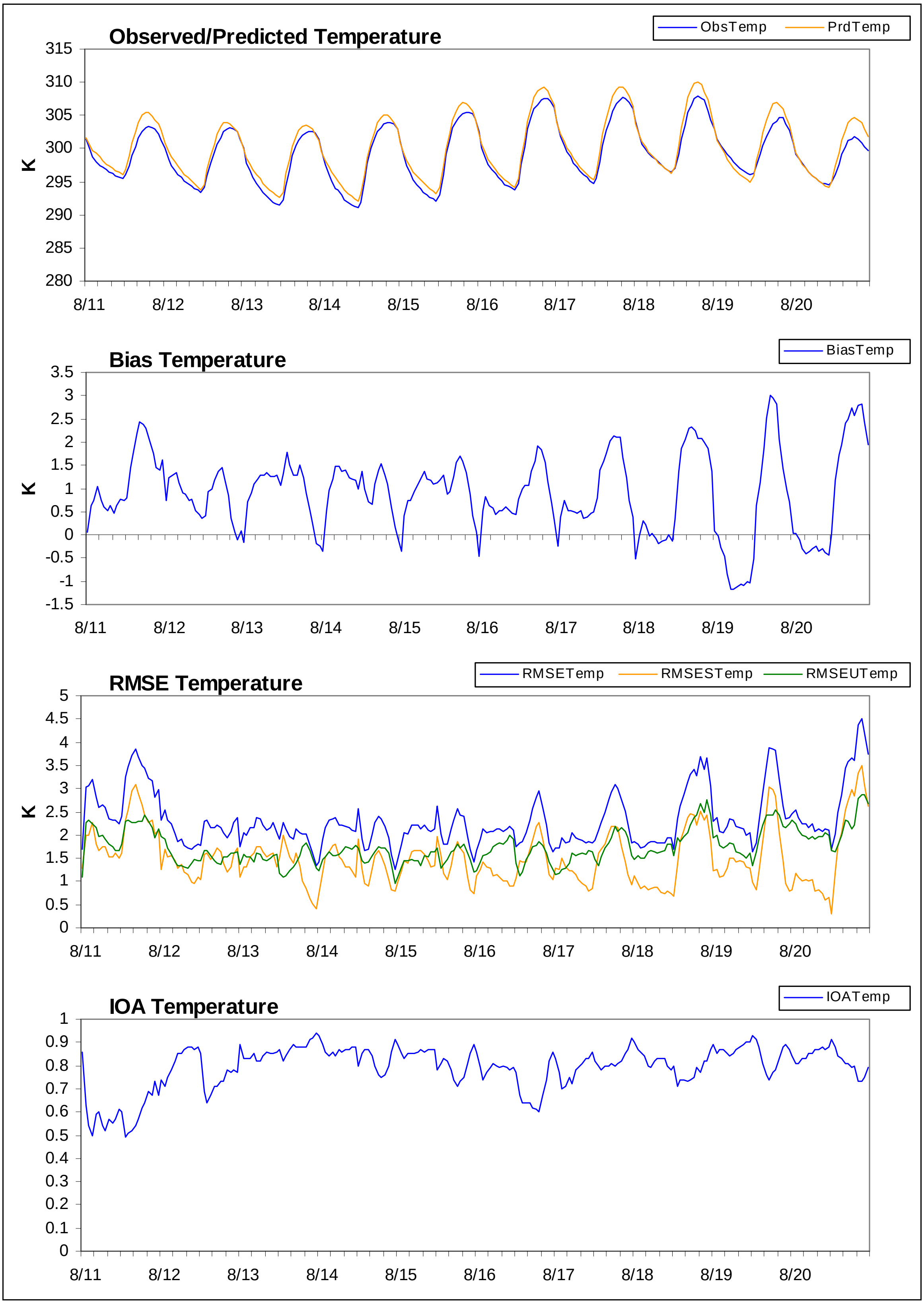


Figure 4-3: Hourly statistical temperature time series plot for the 12-km grid resolution simulation.

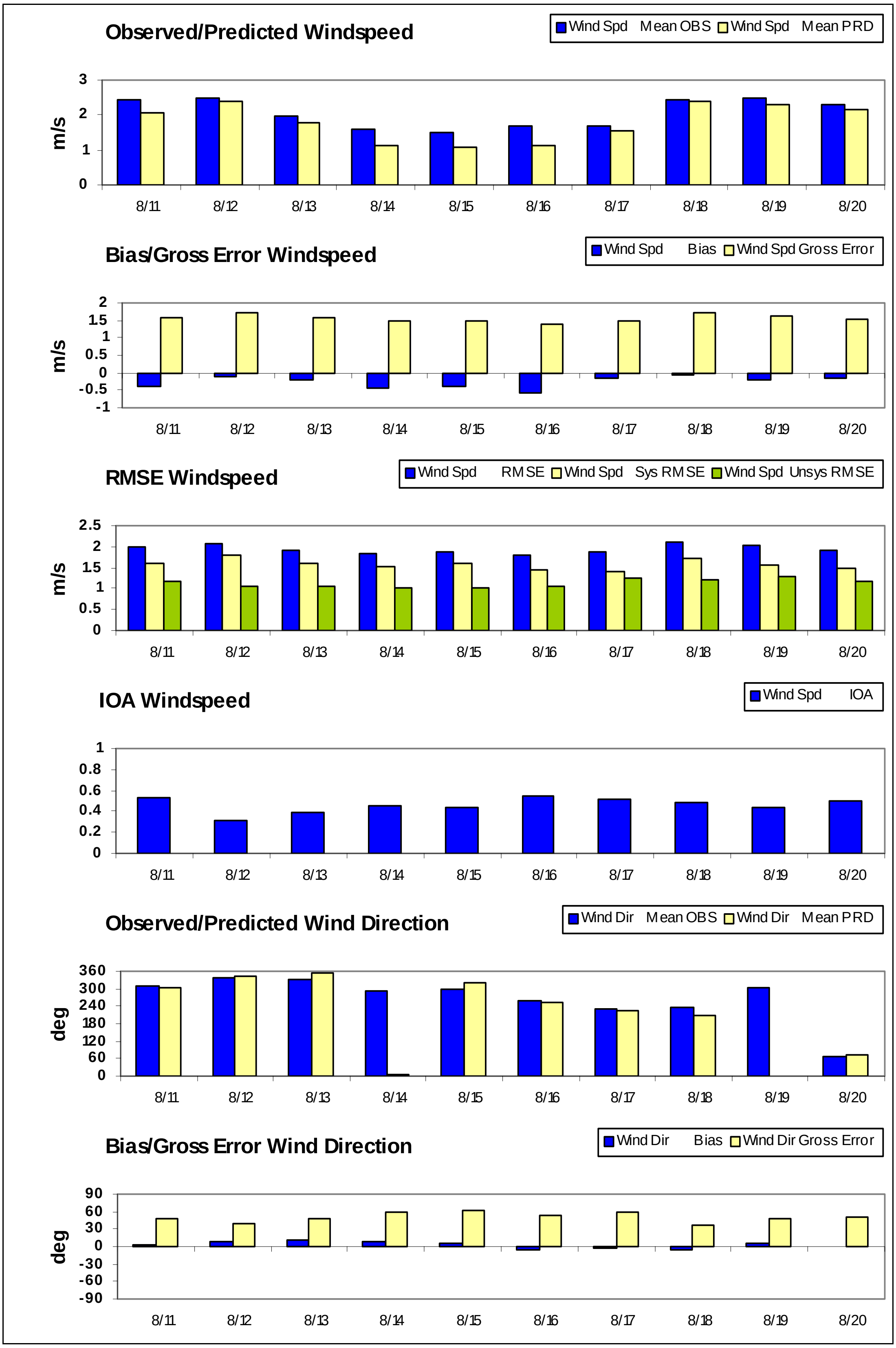


Figure 4-4: Daily statistical wind speed and direction time series plot for the 12-km grid resolution simulation

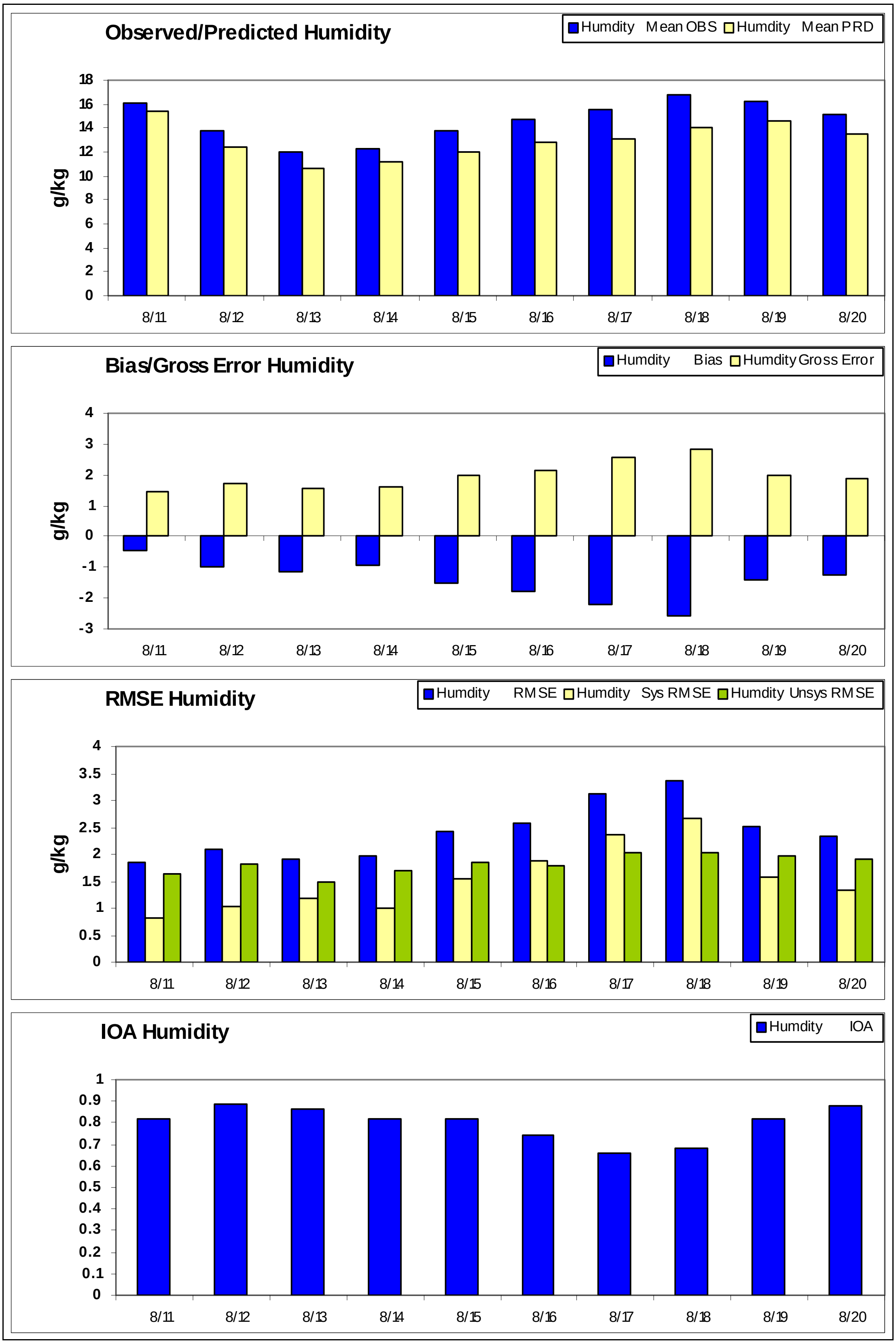


Figure 4-5: Daily Statistical Humidity Time Series Plot for the 12-Km Grid Resolution Simulation.

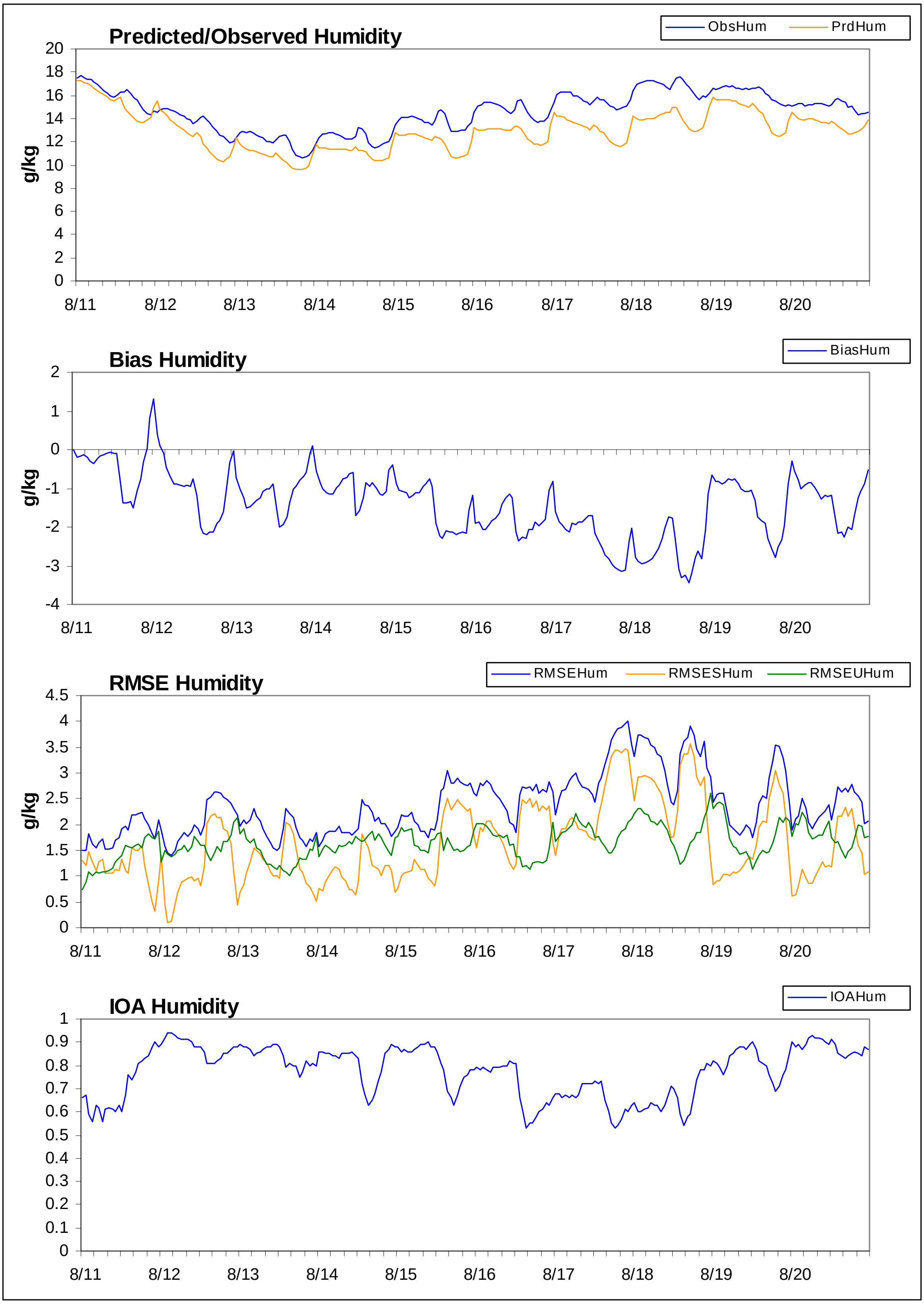


Figure 4-6: Hourly Statistical Humidity Time Series Plot for the 12-Km Grid Resolution Simulation.

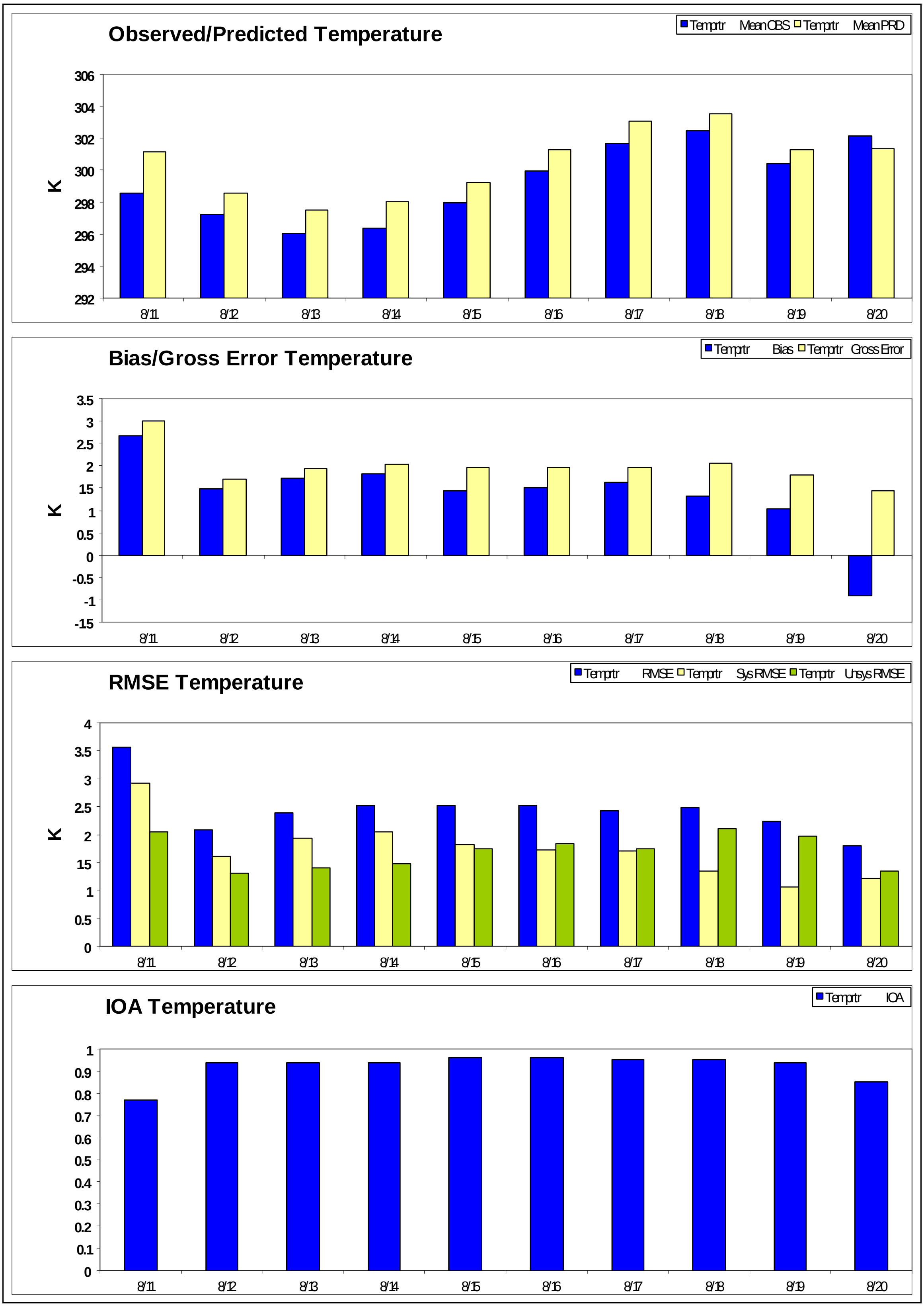


Figure 4-7: Daily statistical temperature time series plot for the 4-km grid resolution simulation

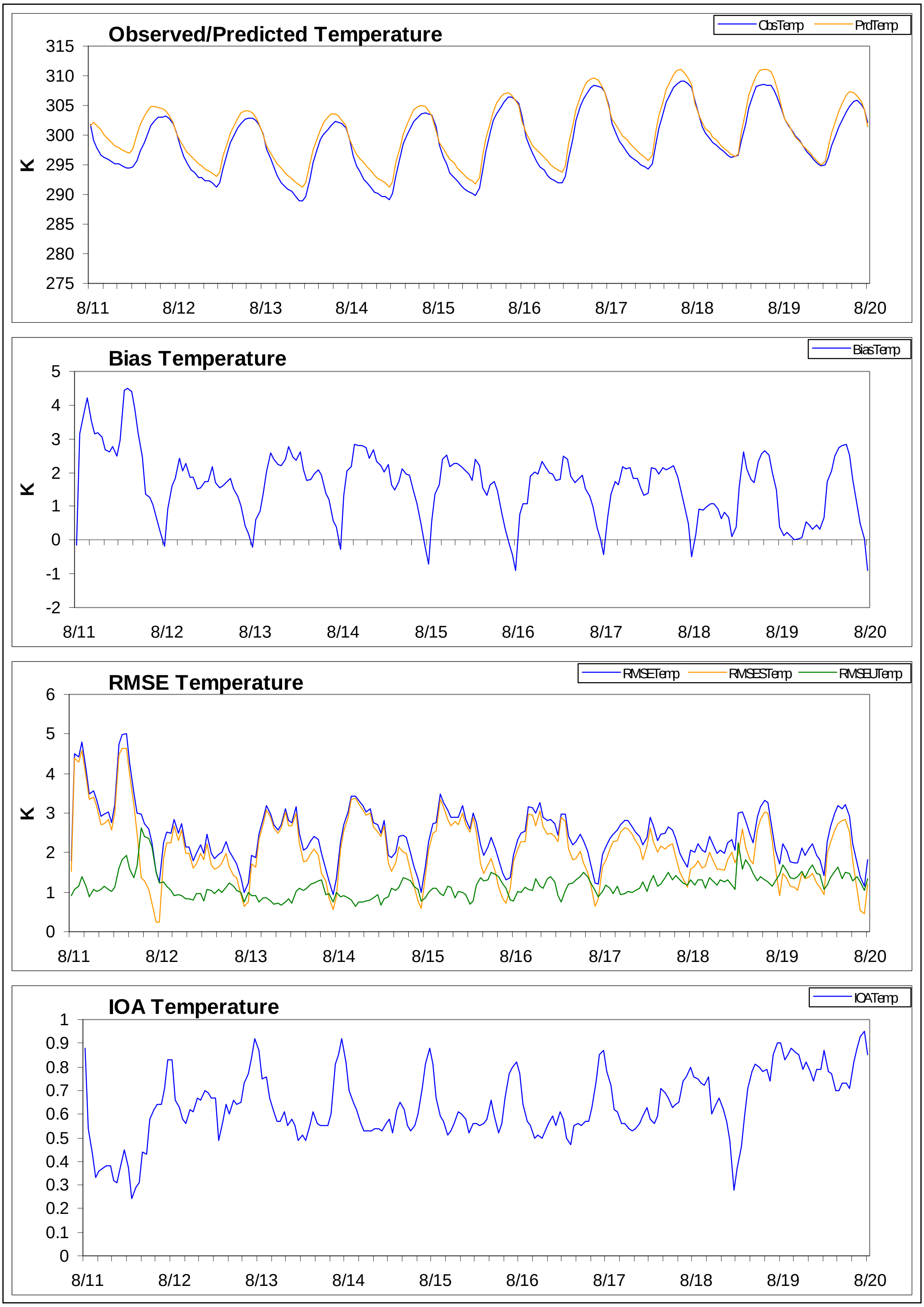


Figure 4-8: Hourly statistical temperature time series plot for the 4-km grid resolution simulation

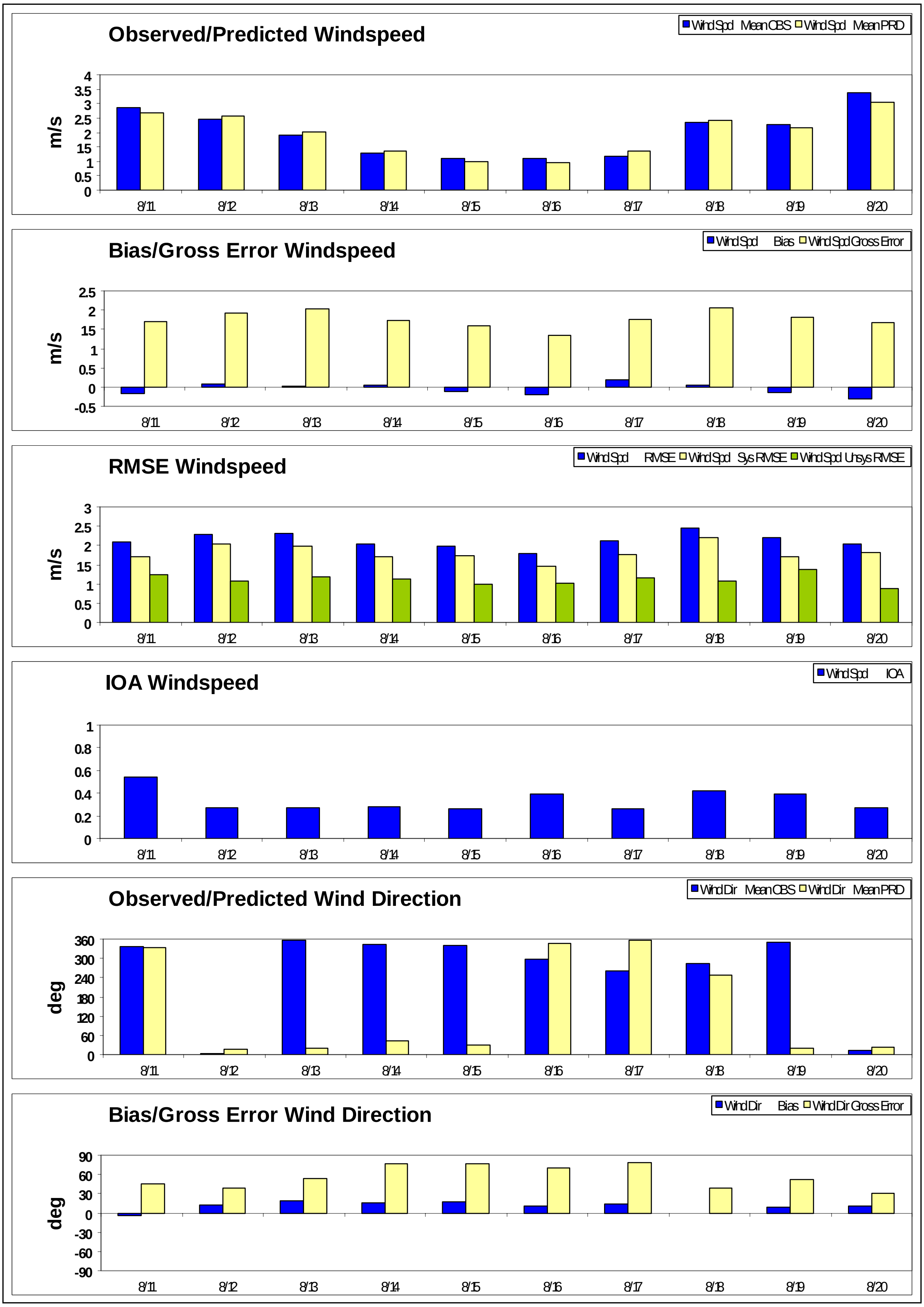


Figure 4-9: Hourly statistical wind speed and direction time series plot for the 4-km grid resolution simulation

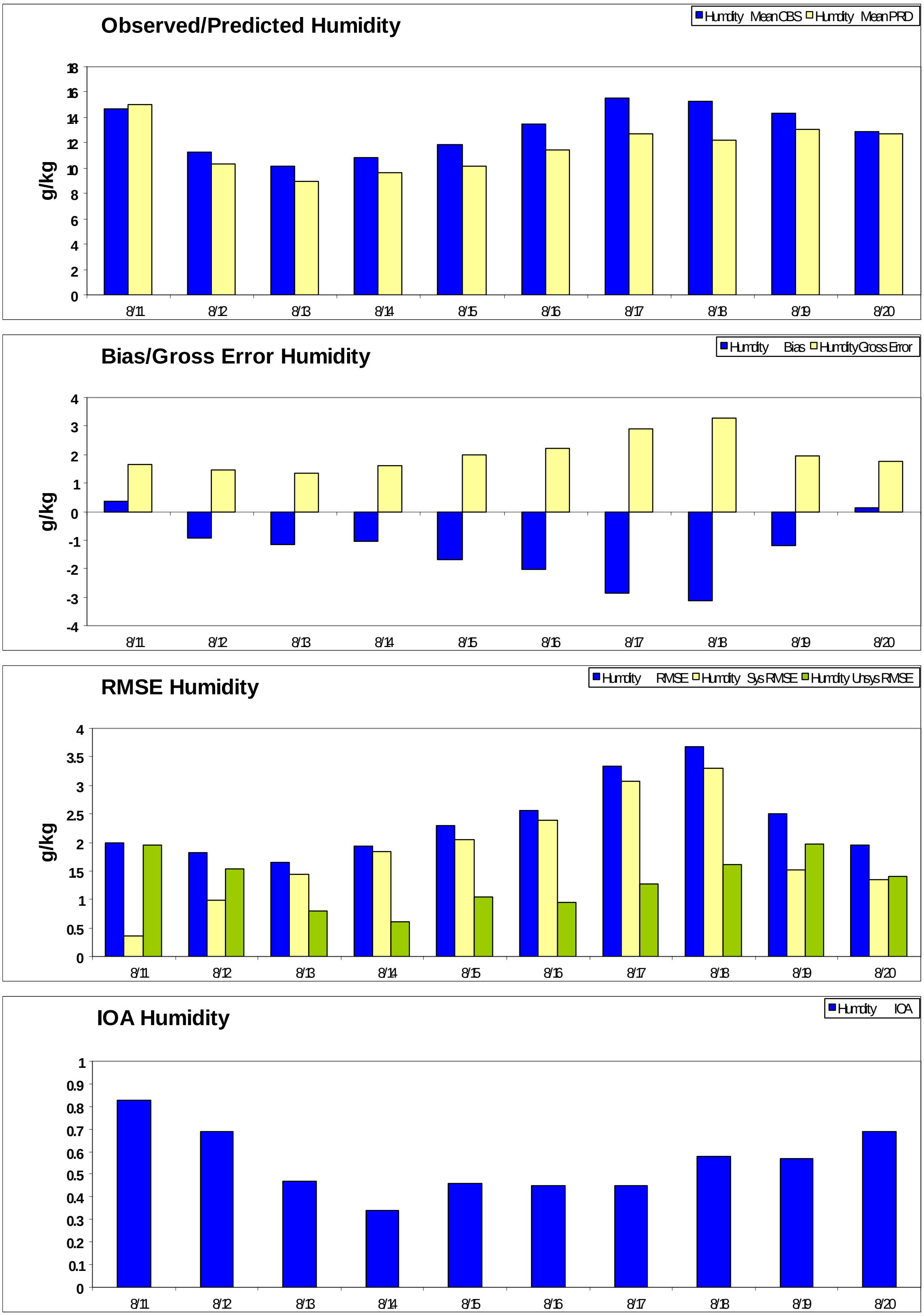


Figure 4-10: Daily statistical humidity time series plot for the 4-km grid resolution simulation

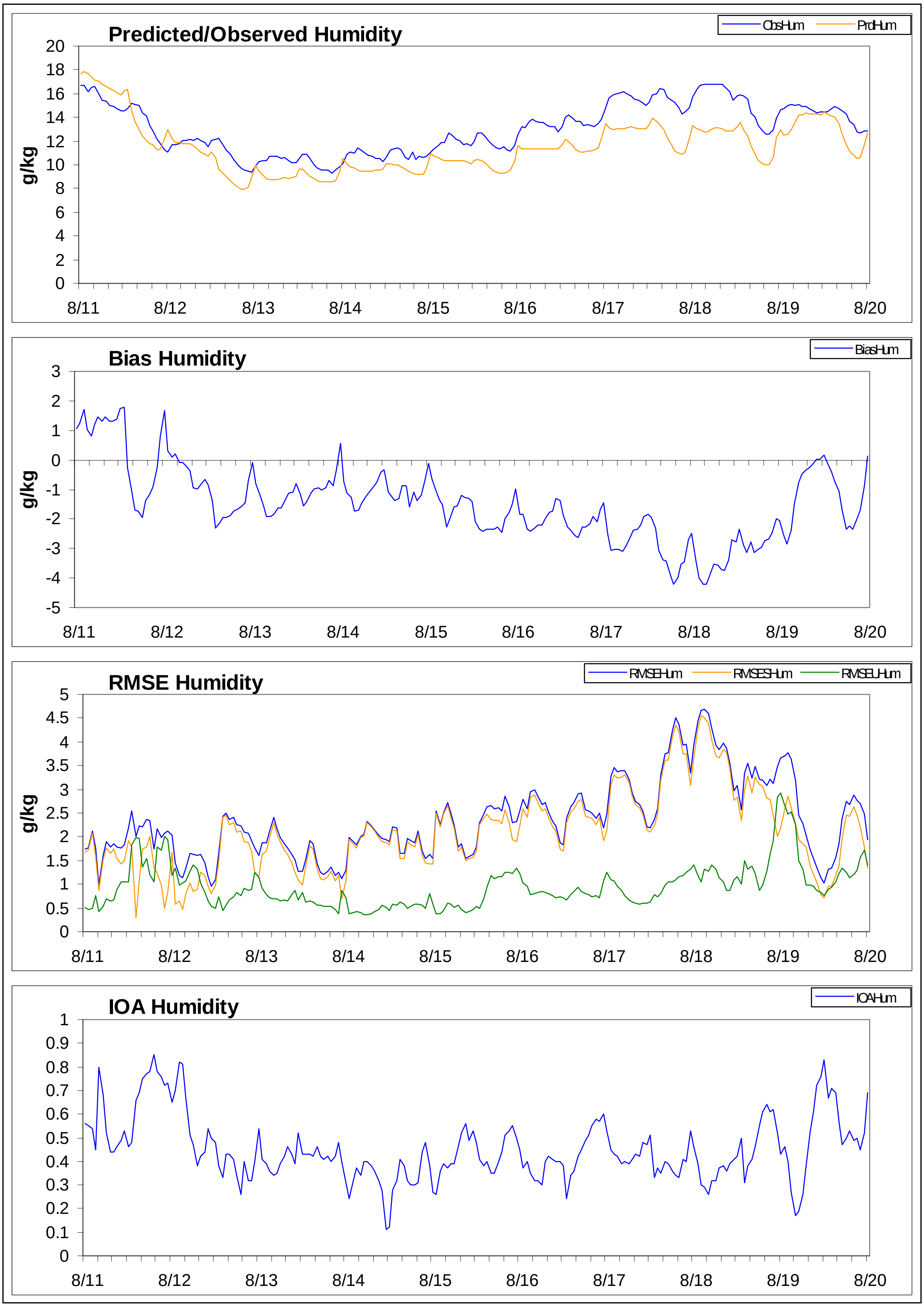


Figure 4-11: Hourly statistical humidity time series plot for the 4-km grid resolution simulation

4.7 Emissions Processing

4.7.1 Introduction

Emission inventories are typically available with an annual or daily total emissions value for each emissions source. Air quality models such as CMAQ, however, require emissions data on an hourly basis, for each model grid cell and species. Consequently, emission processing requires processing of the emission inventory through temporal allocation, chemical speciation, and spatial allocation, to achieve the input requirements of the air quality model. The Sparse Matrix Operator Kernel Emissions (SMOKE) processor (Coats, 1996; Houyoux, 1999) was used for creating gridded, temporalized and speciated emission files for use in CMAQ. SMOKE is capable of generating temperature sensitive mobile source emission factors using EPA's MOBILE6 emission factors model. It is also capable of generating a biogenic emissions inventory using the Biogenic Emissions Inventory System (BEIS) version 3 (Guenther, 2000; Pierce, 1998). In addition to large amounts of source-specific data, certain aspects of emissions processing require meteorological variables. These are provided by the meteorological model and include daily surface temperature for calculating mobile source emission factors; temperature and radiation fields for calculating biogenic emissions; and surface Planetary Boundary Layer (PBL) heights, surface heat fluxes, wind speeds, and temperatures for estimating plume rise for point sources.

4.7.2 Emissions Inventory

Emission inventories for base and future years (discussed in Section 3) were used to generate hourly, speciated, and gridded emission files for air quality modeling. The list of SMOKE input files is provided in Table A-3, Attachment A. Following is a brief description of the data and methodology used in emissions processing for air quality modeling. Additional details have been provided in Hu et al. (2004).

4.7.3 Spatial Allocation

Emission models use spatial surrogates to allocate countywide emissions estimates of area, non-road and on-road mobile emissions to the modeling grid. The spatial surrogate database contains, for each modeling grid cell, fractions of demographic and/or geographic "features" of counties that fall within the grid cell. This fraction is usually referred to as the "spatial surrogate ratio". For simplicity, an integer code (i.e., Spatial Surrogate Code) is assigned to each feature. Each Source Classification Code (SCC) is assigned a Spatial Surrogate Code (SSC) through a cross-reference file and the countywide emissions are allocated to the grid cell based on the spatial surrogate ratio of the grid cell. A spatial surrogate dataset at 1-km resolution was developed from the geographic and demographic datasets available from various federal agencies. Details of this processing are provided in Hu et al. (2004).

4.7.4 Temporal Allocation

The annual or daily emission estimates of area, non-road mobile, on-road mobile and non-EGU point source categories have been distributed using a set of monthly, weekly and diurnal weighting profiles developed by EPA and available at http://www.epa.gov/ttn/chief/emch/temporal. For EGUs, Continuous Emissions Monitoring (CEM) data available at http://cfpub.epa.gov/gdm/ have been used.

4.7.5 Chemical Speciation

Emissions inventories are generally built and reported for a variety of compounds such as Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOC) and Sulfur Oxides (SO_x). However, condensed chemical mechanisms used in air quality models contain a simplified set of equations that use representative "model species" to fully describe atmospheric chemistry. Source-specific factors are therefore required to convert the emissions from chemical classes in the emissions inventory to the species in the mechanism. Speciation profiles for the SAPRC99 (Carter, 2000) chemical mechanism and information on how to assign them to individual sources is available at http://www.epa.gov/ttn/chief/emch/speciation

4.7.6 Quality Assurance

A three-step quality assurance procedure was adopted to identify any potential problems in emissions processing. It involved (1) examining the log files created by SMOKE during emissions processing for error messages, (2) comparing countywide emission totals generated by SMOKE with emission inventory totals, and (3) visual examination of emission fields using available graphics packages. Emission fields for all source categories were examined in order to make a qualitative assessment about the accuracy of spatial and temporal distribution of emissions. The visualization also provides a better understanding of the relative importance of various emission sources that contribute to poor air quality in the region of interest.

Daily average emission totals for Base (i.e., 2000) and Future years (i.e., 2007 and 2012 projected from 1999) for all source categories at the 12- and 4-km resolution grids have been provided in Tables 4-9a and 4-9b. The numbers clearly show that emission reductions due to Federal, State and Local controls scheduled to go in place in the eight to thirteen years following the base year will considerably lower the anthropogenic emission loading in Georgia and foster continued air quality improvements in the region.

Table 4-9a: Daily average gridded anthropogenic emission totals for base (2000) and future years (2007 and 2012) simulations at 12-km grid resolution

	AREA											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	5775.3	5417.6	5437.2	214.6	215.5	217.7	2951.9	2516.9	2681.9	273.5	271.9	272.6
14th	5780.1	5422.3	5442.0	225.4	226.2	228.3	2952.3	2517.3	2682.4	302.3	300.6	301.3
15th	5780.9	5423.2	5442.8	227.2	228.0	230.1	2952.4	2517.4	2682.5	307.7	306.0	306.8
16th	5780.9	5423.2	5442.8	227.2	228.0	230.1	2952.4	2517.4	2682.5	307.7	306.0	306.8
17th	5780.9	5423.2	5442.8	227.2	228.0	230.1	2952.4	2517.4	2682.5	307.7	306.0	306.8
18th	5780.9	5423.2	5442.8	227.2	228.0	230.1	2952.4	2517.4	2682.5	307.7	306.0	306.8
19th	5777.6	5419.8	5439.4	219.6	220.5	222.6	2952.1	2517.1	2682.2	287.3	285.7	286.4
	MOBILE											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	12664.5	8503.3	7483.9	1302.4	899.0	590.5	1221.3	805.1	618.1	72.8	38.5	42.4
14th	15994.9	10698.7	9405.8	1628.6	1119.8	734.8	1555.4	1019.5	782.4	91.0	47.4	52.1
15th	16292.0	10890.8	9561.9	1658.7	1140.1	747.7	1590.2	1041.6	796.6	92.8	48.3	53.0
16th	16093.2	10769.3	9459.9	1643.6	1129.9	740.7	1570.0	1029.1	787.1	92.0	47.9	52.6
17th	17346.1	11598.7	10189.4	1765.8	1214.2	796.6	1689.5	1107.2	848.2	98.7	51.4	56.5
18th	17255.6	11558.1	10159.4	1765.7	1215.1	796.9	1678.4	1101.8	843.7	98.8	51.7	56.7
19th	14506.0	9719.8	8539.6	1486.6	1023.9	671.7	1409.4	926.1	708.4	83.1	43.6	47.9
	NON-ROAD											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	5284.6	5879.2	4697.6	574.6	535.9	632.8	451.1	439.8	396.0	82.9	94.7	90.4
14th	6944.4	7837.8	6194.7	608.2	566.8	664.2	532.7	502.6	466.2	88.2	100.9	96.4
15th	7138.5	8061.1	6363.8	613.2	571.3	669.1	543.5	510.5	475.4	89.0	101.9	97.4
16th	7138.5	8061.1	6363.8	613.2	571.3	669.1	543.5	510.5	475.4	89.0	101.9	97.4
17th	7138.5	8061.1	6363.8	613.2	571.3	669.1	543.5	510.5	475.4	89.0	101.9	97.4
18th	7138.5	8061.1	6363.8	613.2	571.3	669.1	543.5	510.5	475.4	89.0	101.9	97.4
19th	5478.6	6102.5	4866.7	579.7	540.5	637.7	461.9	447.6	405.3	83.7	95.7	91.3
	POINT											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	1797.9	2234.6	2330.1	1545.1	984.0	1016.3	849.1	630.3	695.2	5203.0	5347.1	5724.0
14th	1809.4	2246.9	2343.7	1656.6	1049.5	1080.9	878.4	651.0	718.0	5564.8	5699.8	6228.3
15th	1812.0	2249.8	2346.8	1725.4	1086.6	1096.1	883.6	653.4	720.7	5930.4	6064.0	6347.7
16th	1812.0	2249.8	2346.8	1752.9	1093.4	1096.1	883.6	653.4	720.7	6170.4	6299.2	6347.7
17th	1812.0	2249.8	2346.8	1783.4	1108.6	1096.1	883.6	653.4	720.7	6197.9	6331.1	6347.7
18th	1812.0	2249.8	2346.8	1810.2	1125.5	1096.1	883.6	653.4	720.7	6210.8	6347.9	6347.7
19th	1805.3	2242.6	2339.1	1679.1	1053.6	1050.9	882.7	652.4	719.7	5910.1	6032.0	5986.7

Table 4-9b: Daily average gridded anthropogenic emission totals for base (2000) and future years (2007 and 2012) simulations at 4-km grid resolution

	AREA											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	1377.5	1320.7	1323.0	65.5	65.9	66.6	711.5	604.6	645.7	79.1	79.3	79.9
14th	1379.5	1322.7	1325.0	69.4	69.7	70.4	711.6	604.7	645.9	87.3	87.6	88.3
15th	1379.8	1323.0	1325.4	70.0	70.3	71.0	711.6	604.7	645.9	88.9	89.2	89.9
16th	1379.8	1323.0	1325.4	70.0	70.3	71.0	711.6	604.7	645.9	88.9	89.2	89.9
17th	1379.8	1323.0	1325.4	70.0	70.3	71.0	711.6	604.7	645.9	88.9	89.2	89.9
18th	1379.8	1323.0	1325.4	70.0	70.3	71.0	711.6	604.7	645.9	88.9	89.2	89.9
19th	1378.4	1321.6	1323.9	67.3	67.7	68.4	711.5	604.6	645.8	83.1	83.3	84.0
	MOBILE											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	3923.8	2607.0	2279.9	392.2	277.1	184.3	376.0	251.5	179.5	19.2	11.5	13.4
14th	5084.2	3332.4	2899.9	505.1	352.4	232.9	489.9	322.0	228.1	24.6	14.6	16.9
15th	5178.2	3390.3	2948.8	515.7	359.2	237.3	500.2	328.3	232.3	25.1	14.9	17.2
16th	5103.5	3349.1	2915.4	510.0	355.5	234.9	493.0	324.1	229.6	24.9	14.8	17.0
17th	5505.0	3608.0	3139.4	547.4	381.9	252.4	531.0	349.1	247.2	26.7	15.9	18.3
18th	5442.3	3582.8	3122.6	544.0	380.4	251.8	524.7	346.4	245.8	26.6	15.8	18.3
19th	4547.7	3000.2	2616.9	455.0	319.0	211.4	438.0	290.1	206.2	22.2	13.3	15.3
	NON-ROAD											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	1693.2	1902.3	1042.2	177.6	166.9	139.1	125.4	117.8	81.7	25.2	28.9	23.9
14th	2273.5	2589.6	1365.3	186.0	175.2	145.6	153.5	139.4	95.0	26.5	30.4	25.3
15th	2340.1	2666.4	1403.2	187.2	176.4	146.6	157.2	142.1	96.9	26.7	30.7	25.5
16th	2340.1	2666.4	1403.2	187.2	176.4	146.6	157.2	142.1	96.9	26.7	30.7	25.5
17th	2340.1	2666.4	1403.2	187.2	176.4	146.6	157.2	142.1	96.9	26.7	30.7	25.5
18th	2340.1	2666.4	1403.2	187.2	176.4	146.6	157.2	142.1	96.9	26.7	30.7	25.5
19th	1759.8	1979.2	1080.2	178.8	168.1	140.2	129.1	120.4	83.6	25.4	29.2	24.2
	POINT											
	CO			NOX			VOC			SO2		
DATE	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**	**2000**	**2007**	**2012**
13th	231.1	267.3	304.3	316.2	138.3	147.4	139.6	110.3	122.8	1183.4	1221.4	1294.9
14th	233.9	270.4	307.8	340.6	147.0	156.7	148.5	114.0	127.0	1293.1	1333.8	1414.0
15th	234.6	271.1	308.5	346.3	149.1	158.9	149.3	114.4	127.5	1317.6	1358.9	1440.6
16th	234.6	271.1	308.5	346.3	149.1	158.9	149.3	114.4	127.5	1317.6	1358.9	1440.6
17th	234.6	271.1	308.5	346.3	149.1	158.9	149.3	114.4	127.5	1317.6	1358.9	1440.6
18th	234.6	271.1	308.5	346.3	149.1	158.9	149.3	114.4	127.5	1317.6	1358.9	1440.6
19th	233.3	269.8	307.2	329.0	143.1	152.6	149.2	114.3	127.3	1239.2	1278.6	1355.4

4.8 Air Quality Modeling

4.8.1 Introduction

Air quality modeling simulations were conducted using EPA's Community Multiscale Air Quality Chemistry Transport Model (CMAQ-CTM) or Models-3 (Dennis et al., 1996). The modeling system contains state-of-the-science parameterization of atmospheric processes affecting transport, transformation, and deposition of such pollutants as ozone, particulate matter, airborne toxics, and acidic and nutrient pollutant species. CMAQ has the "one atmosphere" modeling capability based mainly on the "first principal" description of the atmosphere. With atmospheric science in a continual state of advancement and review, the modeling structure of CMAQ is designed to integrate and test future formulations in an efficient manner without requiring the development of a new modeling system. This fact alone makes CMAQ a suitable candidate for development and evaluation of emission control strategies.

4.8.2 Input Data and Model Configuration

CMAQ-CTM incorporates output fields from the meteorological (e.g., MM5) and emissions (e.g., SMOKE) modeling systems and several other data sources through special processors. The meteorological data is processed using Meteorology Chemistry Interface Processor (MCIP), initial and boundary conditions through ICON and BCON and clear sky photolysis rate using JPROC. Initial and boundary condition processors allow the use of a gridded concentration field as well as the species concentration profiles that are available with the installation. JPROC generates the photolysis rate lookup table under clear sky conditions. Data necessary for these computations is also available with the installation. Following is a brief description of the input data and model configuration used to conduct air quality modeling simulations in support of the Chattanooga EAC.

Meteorology and Emissions

MCIP version 2.2 is used to create meteorological input files required by the air quality model. Most meteorological variables are passed through directly from the MM5 output fields. Others, such as dry deposition velocities, are computed by MCIP. MCIP also creates the horizontal and vertical grid structure for CMAQ by extracting data for the domain defined by the user. Since computational limitations prohibit the use of 34 vertical layers (MM5 default) in air quality modeling, the CMAQ modeling grid consisted of only 13 vertical layers.

Emissions processing required for generating speciated, temporalized and gridded emission files for CMAQ-CTM was discussed in the previous section.

Initial and Boundary Conditions

Initial and boundary conditions for the 36-km domain are generated from a set of predefined vertical profiles available with the CMAQ installation. For all nested domains (i.e., 12 and 4-km), air quality concentrations predicted on the "parent" domain are spatially interpolated onto the "daughter" domain. For example, boundary conditions for the 4-km domain (i.e., daughter domain) are obtained by spatially interpolating concentrations predicted at the 12-km resolution grid (i.e., parent domain).

Photolysis Rates

The photolysis rates processor JPROC was used to generate clear sky photolysis rates. The processing was performed using modified extraterrestrial radiation data from the World Meteorological Organization (WMO) (Chang et al., 1994) and O_2 and O_3 absorption cross-section data from NASA (DeMore et al., 1994).

Model Configuration

CMAQ provides several scientific options for the most important atmospheric processes (e.g., gas-phase chemistry, advection). Since selection of a particular model configuration can have a significant effect on model performance and emission control strategy evaluation, several model configurations, parameters, and input datasets were evaluated. The simulations provided useful information about the inherent uncertainties in the modeling system and helped develop a more thoughtful approach towards the use of air quality models for regulatory proposes. CMAQ version 4.3 with modification to the vertical diffusion module was used in all simulations. Details of these simulations and the changes to the CMAQ source code are documented in Hu et al. (2004). The scientific options selected for these simulations are provided in Table 4-10.

Table 4-10: CMAQ and MCIP Configuration

Physical Process	Reference
Horizontal and vertical advection	Piecewise Parabolic Method (PPM)
Horizontal diffusion	Spatially varying
Vertical diffusion	Eddy diffusion formulation based on K-theory
Gas-phase chemistry and solver	SAPRC-99 chemical mechanism with Modified Euler Backward Iterative (MEBI) solver
Aqueous-phase chemistry	RADM
Aerosol chemistry	Improved treatment for Secondary Organic Aerosol (SOA) and ISORROPIA for thermodynamics
Dry deposition	RADM
Cloud dynamics	RADM

4.8.3 Model Performance

Introduction

Model performance methodology outlined in EPA's draft 8-hour modeling guidance (EPA, 1999) is used as a guide for evaluating air quality model performance. The following sub-section describes the methodology used in evaluating the adequacy of air quality model results for regulatory proposes. It is important to point out that model performance evaluated against observational data recorded at hourly intervals (i.e., finest temporal resolution at which air quality predictions are available) provides a more stringent test of the model's ability to replicate pollutant concentrations as compared to an evaluation that uses temporal averages (e.g., comparison of 8-hour average observation-prediction pairs). Similarly, comparison of observed and predicted concentration from a grid cell that “contains” the monitoring station is a more rigorous test (i.e., finest spatial resolution at which air quality concentrations are available) than a test that utilizes predicted concentrations from “nearby” grid cells. The statistics described below utilizes the above-mentioned approach and thus represent a more stringent test of the model and it’s ability to capture pollutant dynamics during the episode. Model performance statistics for the 8-hour metric have been provided in Attachment A.

Methodology

The performance of the model at 12- and 4-km grid resolution is presented here. The statistical measures include the Mean Normalized Bias (MNB) and Mean Normalized Error (MNE) in hourly averaged O_3 concentrations predicted at the monitoring station. Mathematical formulation of these metrics is provided in Table 4-11. Since the normalized quantities can become large when observations are small, a cut-off value of 40 ppb is used in these computations. Thus, whenever the observation is smaller than the cut-off value, the prediction-observation pair is excluded from the calculation. The hourly normalized bias and error metrics are presented as daily averages over all monitoring stations. The normalized bias and error in peak O_3 concentration prediction at each monitoring station is also evaluated. The results from the analyses are compared with performance goals suggested in the guidance document (Table 4-11). Since an accurate prediction of O_3 precursor species is as important as ozone itself, model performance for Nitrogen Oxide (NO), Nitrogen Dioxide (NO_2), Isoprene and Non-Methane Hydrocarbon (NMHC) was also conducted. The results of this analysis have been documented in Hu et al. (2004).

Table 4-11: Performance Statistics and EPA Criteria

Metrics	Formulation	EPA criteria
Mean Normalized Bias	$\frac{1}{N}\sum_{i=1}^{N}\frac{\left(C_i^s - C_i^o\right)}{C_i^o}\times 100\%$	Less than ±15% for 1-hour and 8-hour average ozone concentration and ±20% in peak 1-hour and 8-hour average ozone concentration
Mean Normalized Error	$\frac{1}{N}\sum_{i=1}^{N}\frac{\left\|C_i^s - C_i^o\right\|}{C_i^o}\times 100\%$	Less than 35% for 1-hour and 8-hour averaged ozone concentration

The above-mentioned statistical analysis is followed by visual inspection of predicted concentrations fields. This helps in identifying dynamics of pollutant plumes in the region, and interpreting the performance issues related to individual monitors. For example, poor model performance at a monitoring station might be related to displacement of a plume due to error in wind direction. Finally, time series plots of predicted and observed hourly concentrations provide a stringent test of how well the model replicates the observed hourly concentration at the same time and location as the observed value. Problems with diurnal variation in predicted concentrations are readily apparent in a time series plot.

Modeling Results at The 12-Km Grid Resolution

One hundred and six monitoring stations are located within the 12-km modeling domain (Table A-4a, Attachment A). Averaged over all monitoring stations, the Daily Mean Normalized Bias and Error in hourly O_3 predictions (Table 4-12) meets the EPA performance criteria on all episode days (i.e., August 13-19th 2000). Episode average MNB and MNE in hourly O_3 concentration at all monitoring stations located in the 12-km grid resolution domain are provided in Table A-5a, Attachment A. The cumulative probability distribution curves (Figure 4-12) indicate that for 95 percent of all monitoring stations, the episode-average MNB is within ±15 percent. The MNE for almost all monitoring stations is less than 35 percent (Figure 4-13).

Table 4-12: Daily Mean Normalized Bias and Error in Hourly O_3 Concentration Averaged over All Monitoring Stations (12-km grid resolution simulation)

Date	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
8/13/2000	1265	0.690	14.830
8/14/2000	1285	0.100	16.900
8/15/2000	1328	0.910	18.030
8/16/2000	1448	4.510	18.880
8/17/2000	1571	-3.290	19.680
8/18/2000	1583	-2.850	19.490
8/19/2000	1664	9.640	21.220

Figure 4-12: Cumulative Probability Distribution Curves of Episode-Average Mean Normalized Bias in Hourly O_3 Concentration (12-km grid resolution simulation)

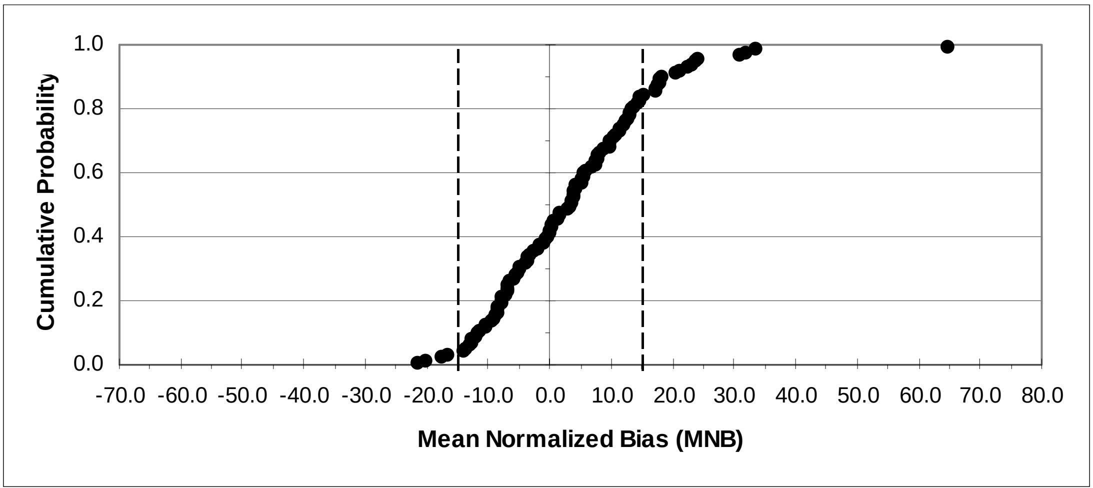
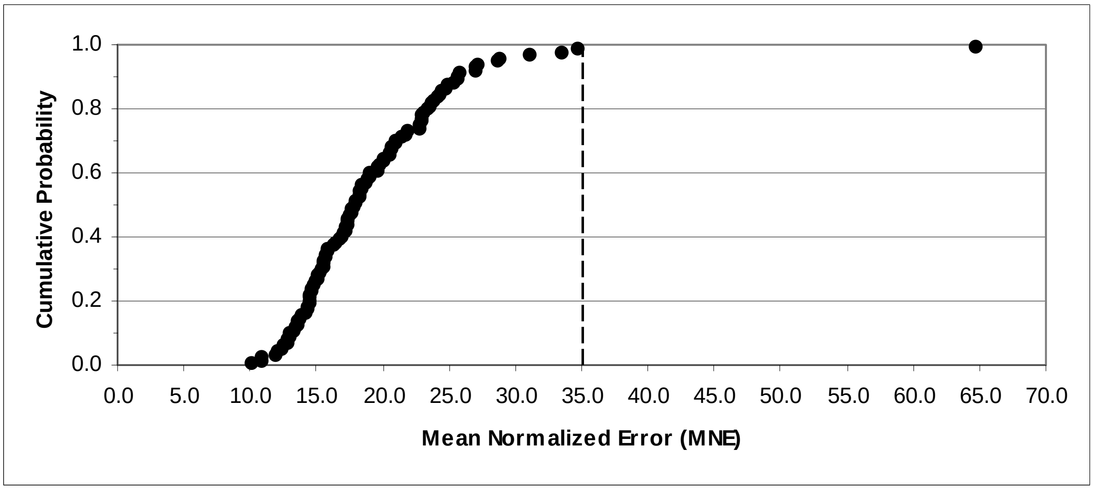


Figure 4-13: Cumulative Probability Distribution Curves of Episode-Average Mean Normalized Error in Hourly O_3 Concentration (12-km grid resolution simulation)



The daily Mean Normalized Bias and Error daily in peak O_3 concentration averaged over all monitoring station is provided in Table 4-13. The results meet the EPA criteria on all episode days. Episode average MNB and MNE in peak O_3 concentrations at all monitors located in the 12-km grid resolution domain are provided in Table A-5b, Attachment A.

Table 4-13: Daily Mean Normalized Bias and Error in Peak O_3 Concentration Averaged Over All Monitoring Stations (12-km grid resolution simulation)

Date	Number of stations	Mean Normalized Bias (MNB) in Peak O_3 Prediction	Mean Normalized Error (MNE) in Peak O_3 Prediction
8/13/2000	104	2.76	9.29
8/14/2000	104	-0.46	12.65
8/15/2000	104	1.03	12.54
8/16/2000	105	3.78	13.86
8/17/2000	105	-4.49	12.36
8/18/2000	105	1.16	15.22
8/19/2000	104	11.49	17.26

Time series plots of ozone concentrations observed at monitoring stations in the Chattanooga area and predicted by the model at 12-km grid resolution are provided in Figure 4-14. With the exception of August 16, when the peak ozone concentration at the Chattanooga monitor is under predicted by 40ppb, the daily peak and diurnal variation is ozone concentration is well simulated on all modeling days. The model tends to over predict the nighttime ozone concentrations at all monitoring stations.

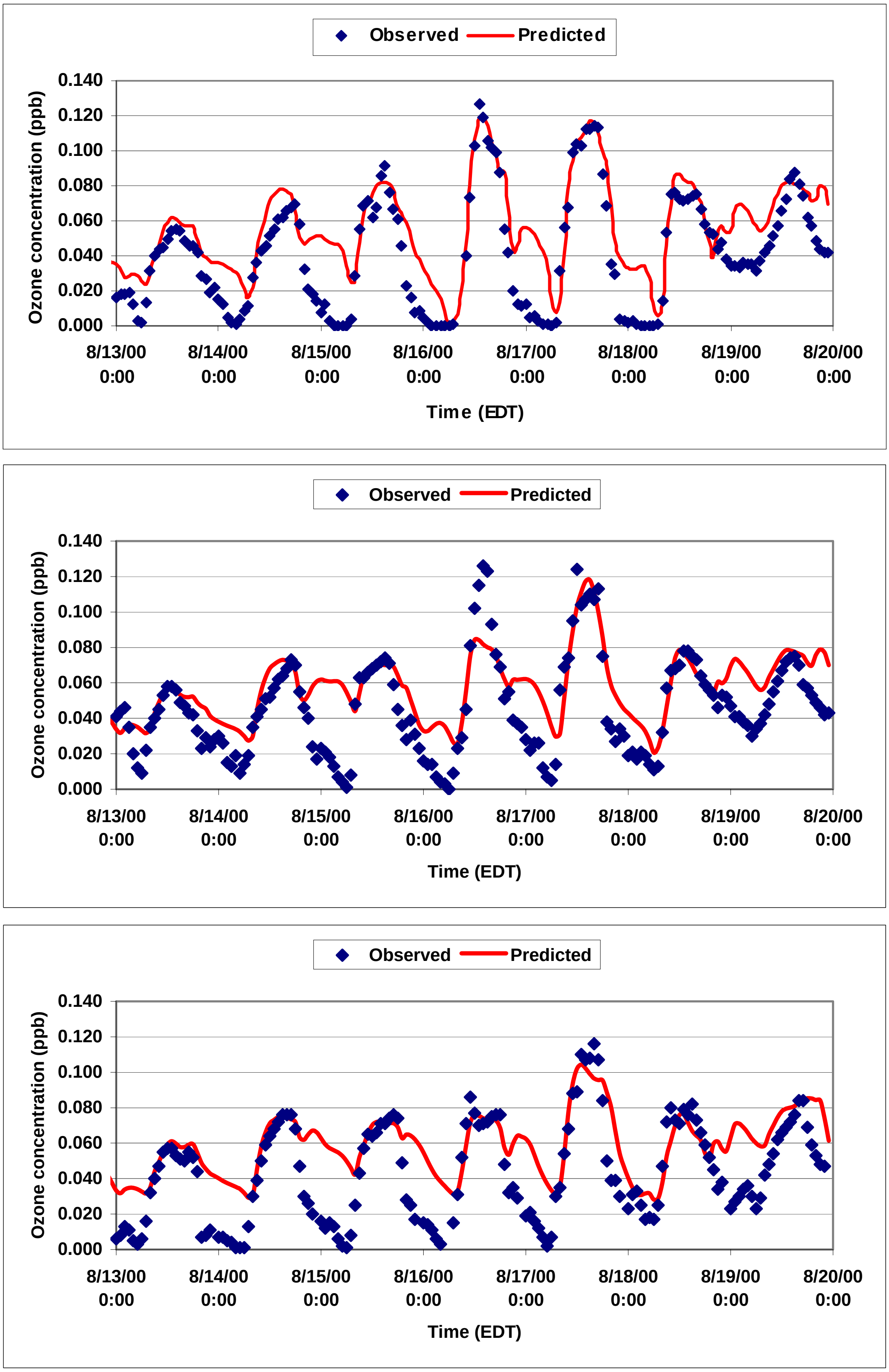


Figure 4-14: Predicted (At 12-Km Grid Resolution) and Observed Hourly Ozone Concentration at Monitoring Stations in Ridge Trail Road (Top) and Chattanooga (Middle) in Hamilton and Meigs (Bottom) County Tennessee, Respectively

Modeling Results at The 4-Km Grid Resolution

Thirty-one monitoring stations are located within the 4-km modeling domain (Table A-4b, Attachment A). Averaged over all monitoring stations, the Daily Mean Normalized Bias and Error in hourly O_3 predictions (Table 4-14) meets the EPA performance criteria on all episode days (i.e., August 13-19th 2000). Episode average MNB and MNE in hourly O_3 concentration at all monitoring stations located in the 4-km grid resolution domain are provided in Table A-6a, Attachment A.

Table 4-14: Daily Mean Normalized Bias and Error in Hourly O_3 Concentration Averaged Over All Monitoring Stations (4-km grid resolution simulation)

Date	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
8/13/2000	412	-0.07	10.78
8/14/2000	402	2.79	15.65
8/15/2000	415	3.38	16.23
8/16/2000	427	4.80	18.05
8/17/2000	468	1.47	19.37
8/18/2000	509	1.71	16.38
8/19/2000	560	7.67	18.37

The daily Mean Normalized Bias and Error daily in peak O_3 concentration averaged over all monitoring stations is provided in Table 4-15. The results meet the EPA criteria on all episode days. Episode average MNB and MNE in peak O_3 concentrations at all monitors located in the 4-km grid resolution domain are provided in Table A-6b, Attachment A.

Table 4-15: Daily Mean Normalized Bias and Error in Peak O_3 Concentration Averaged Over All Monitoring Stations (4-km grid resolution simulation)

Date	Number of stations	Mean Normalized Bias (MNB) in Peak O_3 Prediction	Mean Normalized Error (MNE) in Peak O_3 Prediction
8/13/2000	30	0.84	9.55
8/14/2000	26	-5.23	13.74
8/15/2000	30	1.90	15.42
8/16/2000	29	-4.19	16.70
8/17/2000	31	-7.15	15.61
8/18/2000	30	0.89	11.66
8/19/2000	30	-1.29	12.96

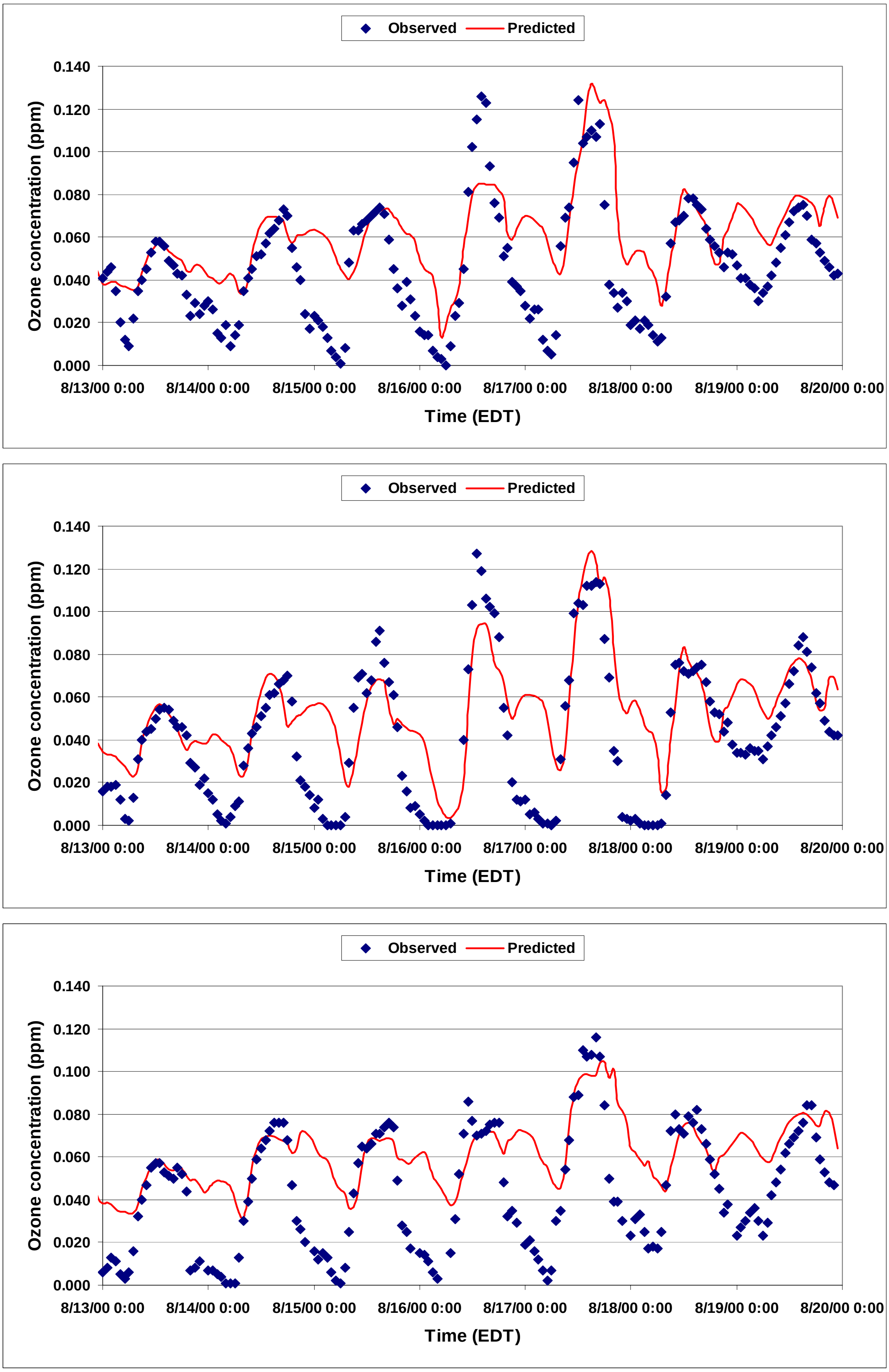


Figure 4-15: Predicted (At 4-Km Grid Resolution) and Observed Hourly Ozone Concentration at Monitoring Stations in Ridge Trail Road (Top) and Chattanooga (Middle) in Hamilton and Meigs (Bottom) County Tennessee, Respectively

4.9 Attainment Demonstration

4.9.1 Methodology

Attainment demonstration is a procedure laid down by EPA that assesses the attainment status of a region through analyses of air quality modeling results. The procedure is comprised of two sets of analyses. The first test, referred to in the guidance as the model attainment test, is an exercise in which a monitor-specific Future Design Value (FDV) is computed and compared with 84 ppb. If the FDV is less than or equal to 84 ppb, the monitor is in attainment. The FDV is computed by multiplying the ratio of future and current concentrations predicted “near” the monitor with the Base Design Value (BDV) of the monitor. The ratio is referred to as Relative Reduction Factor (RRF), and the BDV at the monitor is computed as the 3-year average of the fourth highest daily maximum 8-hour observed O_3 concentration. BDV is the design value of the year that straddles the episode year. The term “near” refers to the “stencil” of grid-cells that are within a 15-km radius of the monitoring station. This corresponds to a 7x7 grid-cell stencil for a 4-km, and a 3x3 grid-cell stencil for a 12-km resolution grid. The guidance recommends that the highest predicted concentration in the stencil be selected for computing the RRF. It further suggests that the BDV for the monitor should straddle the modeling episode year.

The second test, referred to in the EPA guidance as the screening test, is intended to insure attainment of the standard at locations where there is currently no monitor (these are referred to in the guidance document as “un-monitored locations”). First, one or more “un-monitored” locations are selected where the current predicted concentration (8-hour daily maximum) is found to be consistently higher than the concentration predicted “near” the monitor. If the predicted value is greater than 5 percent on 50 percent or more of the modeled days, a future design value is calculated following the procedure outlined in the guidance document. As before, for the region to be in attainment, the FDV at these “un-monitored” locations should be below 84 ppb.

Air quality model simulations for two future years (i.e., 2007 and 2012) were conducted in order to demonstrate attainment and maintenance of the 8-hour ozone NAAQS in the Chattanooga area. The BDV at monitoring stations located in Chattanooga were computed from observations recorded during the 1999 to 2001 ozone seasons.

Table 4-16: Base Design Value at Monitoring Stations in Chattanooga

Monitor/County/State	AIRS ID	8-hour O_3 Design Value in 2001
Ridge Trail Road, Hamilton, TN	470651011	0.092
Chattanooga, Hamilton, TN	470650028	0.092
Meigs, Meigs, TN	471210104	0.093

4.9.2 Attainment Demonstration Calculations for 2007 and 2012

Model Attainment Test

Model attainment test calculations are shown in Table 4-17 and 4-18. The predicted concentrations from the modeling simulation at 4-km grid resolution have been used for these calculations. The results indicate that emission reductions from Federal and State emission controls reduce the daily maximum 8-hour O_3 concentration in the Chattanooga area by 12 ppb on average. The FDV for all monitoring stations are predicted to be well below 84 ppb.

Screening Test

The screening test was performed for all monitors located in the Chattanooga area. Specifically, daily-maximum 8-hour average ozone concentrations predicted within a 96 square kilometer centered over the grid cell that contains the monitoring station (represents "un-monitored areas") were compared with predictions within a 36 square kilometer area centered over the monitor (which represents concentrations "near" the monitor).

Since current predicted 8-hour average ozone concentrations near the monitor were found to be higher than predicted concentrations in the un-monitored areas on all modeling days, the screening test is passed and no further analysis is required. The screening test calculations have been provided in Attachment A.

Table 4-17: Attainment Status of Monitors in Chattanooga in 2007

Date	Observed (2001) Design Value	Max 8-hour Observed	Max 8-hour predicted 2000	Max 8-hour predicted 2007	If Max-8hr predicted > 70ppb	Relative Reduction Factor	Future (2007) Design Value
Ridge Trail Road							
13th		0.050	0.059	0.052	0		
14th		0.061	0.079	0.070	1		
15th		0.074	0.093	0.082	1		
16th		0.102	0.113	0.101	1		
17th		0.106	0.145	0.127	1		
18th		0.073	0.081	0.073	1		
19th		0.073	0.092	0.081	1		
	0.092		0.100	0.089		0.886	0.0815
Chattanooga							
13th		0.051	0.058	0.052	0		
14th		0.063	0.080	0.069	1		
15th		0.068	0.093	0.082	1		
16th		0.098	0.113	0.099	1		
17th		0.104	0.145	0.127	1		
18th		0.072	0.079	0.072	1		
19th		0.067	0.087	0.077	1		
	0.092		0.099	0.088		0.882	0.0812
Meigs							
13th		0.054	0.060	0.052	0		
14th		0.070	0.080	0.069	1		
15th		0.070	0.084	0.073	1		
16th		0.075	0.086	0.075	1		
17th		0.101	0.120	0.105	1		
18th		0.076	0.074	0.067	1		
19th		0.073	0.086	0.075	1		
	0.093		0.088	0.077		0.876	0.0815

Table 4-18: Attainment Status of Monitors in Chattanooga in 2012

Date	Observed (2001) Design Value	Max 8-hour Observed	Max 8-hour predicted 2000	Max 8-hour predicted 2012	If Max-8hr predicted > 70ppb	Relative Reduction Factor	Future (2012) Design Value
RidgeRrail							
13th		0.050	0.059	0.051	0		
14th		0.061	0.079	0.069	1		
15th		0.074	0.093	0.080	1		
16th		0.102	0.113	0.097	1		
17th		0.106	0.145	0.122	1		
18th		0.073	0.081	0.071	1		
19th		0.073	0.092	0.079	1		
	0.092		0.100	0.086		0.860	0.0791
Chattanooga							
13th		0.051	0.058	0.051	0		
14th		0.063	0.080	0.069	1		
15th		0.068	0.093	0.080	1		
16th		0.098	0.113	0.096	1		
17th		0.104	0.145	0.122	1		
18th		0.072	0.079	0.071	1		
19th		0.067	0.087	0.076	1		
	0.092		0.099	0.086		0.862	0.0793
Meigs							
13th		0.054	0.060	0.051	0		
14th		0.070	0.080	0.068	1		
15th		0.070	0.084	0.071	1		
16th		0.075	0.086	0.073	1		
17th		0.101	0.120	0.102	1		
18th		0.076	0.074	0.066	1		
19th		0.073	0.086	0.074	1		
	0.093		0.088	0.076		0.857	0.0797

4.9.3 Conclusions

In spite of rapid population and economic growth, Georgia and the surrounding states will witness a significant reduction in ozone precursor emissions due to technological advancement and already legislated Federal, State and Local emission controls. These reductions will contribute significantly towards improvement in regional air quality. Atmospheric modeling conducted to-date and described in this section demonstrates that the Chattanooga area will attain the 8-hour ozone standard in 2007 and maintain this classification until 2012.

4.10 References

Coats, C. J., Jr. and Houyoux, M. R., 1996, “Fast Emissions Modeling with the Sparse Matrix Operator Kernel Emissions Modeling System”, Presented at the Emissions Inventory: Key to planning, Permits, Compliance and Reporting, Air and Waste Management Association, New Orleans, Louisiana

Dennis, R. L., Byun, D. W., Novak, J. H., Galluppi, K. J., Coats, C. J., and Vouk, M. A., 1996, The next generation of integrated air quality modeling: EPA’s Models-3, *Atmos. Environ.*, 20, 12, 1925-1936

Dudhia, J., 1993, A non-hydrostatic version of the Penn State / NCAR mesoscale model: Validation tests and simulation of an Atlantic cyclone and cold front. *Mon. Wea. Rev.*, 121, 1493-1513

Fall line Air Quality Study Alliance, 1999, Fall line Air Quality Study: An outline for assessing urban and regional air pollution, identifying the sources of pollutants and pollutant precursors, and recommending solutions to realized and potential poor air quality in the Augusta, Macon, and Columbus, Georgia metropolitan areas

Grell, G.A., Dudhia, J., and Stauffer, D.R., 1994, The Penn State/NCAR Mesoscale Model (MM5). NCAR Technical Note, NCAR/TN-398+STR, 138 pp

Deuel H.P., and Douglas S.G., 1998, Episode Selection for the Integrated Analysis of Ozone, Visibility, and Acid Deposition for the Southern Appalachian Mountains, SYSAPP_98/07r1, Systems Applications International, Inc., San Rafael, CA

Douglas S.G., Hudischewskyj A.B., Glass G.L., and Alvarez A.R. 2002, Ozone Episode Selection for Urban Areas in Northern Georgia and Northern Alabama (1995-2001), Systems Applications International, Inc., San Rafael, CA.

Hu et al., 2003, Meteorological modeling of the August 11-20 air pollution episode, *Report* to the Georgia Department of Natural Resources, Atlanta, Georgia

Hu et al., 2004, Air quality modeling of the August 11-20, 2000 air pollution episode, *Draft report* to the Georgia Department of Natural Resources, Atlanta, Georgia

EPA, 1999, Draft guidance on the use of models and other analyses in the attainment demonstrations for the 8-hour ozone NAAQS, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, EPA-454/R-99-004

5. Control Strategy and Emission Budgets

The NOx SIP Call modeling simulations conducted by EPA, the FAQS modeling simulations and ATMOS modeling simulations, all indicate that the Chattanooga area will attain the 8-hour ozone standard by 2007. This section presents the controls that will be implemented at the state and local levels to help the Chattanooga area comply with the 8-hour ozone NAAQS.

5.1 State-wide Emission Controls

At the state level, two controls that will be implemented are an open burning ban during the ozone season and stage I vapor recovery as identified in Attachment E. Because the requirements of EPA's transportation conformity rule (40 CFR Parts 51 and 93)[7] will not apply to early action compact (EAC) areas that meet their milestones, no motor vehicle emissions budgets are being established with this SIP revision.

5.1.1 Open Burning

An open burning ban will be implemented at the state level in Catoosa and Walker Counties. The open burning ban will be in effect for the duration of the ozone season, which is May 1 through September 30. Some types of open burning have always been prohibited by the Georgia Rules for Air Quality Control. This will prohibit several additional types of burning during the ozone season such as the following:

- Burning of leaves, tree limbs, or other yard wastes or storm debris;
- Burning of vegetative waste from land clearing (includes a ban on the use of air curtain destructors); and
- Burning for the purpose of weed abatement, disease, and pest prevention.

A few types of open fires are still allowed provided there are no local ordinances that prohibit them. These include:

- Specified burning over of forestland by the owners of the land as permitted by the Georgia Forestry Commission with restriction during conditions conducive to ozone formation;
- Fires for carrying out recognized agricultural practices;
- Fires for recreational purposes or for cooking food; and
- Fires for training fire-fighting personnel, except acquired structure burns are prohibited.

Emissions reductions estimates from open burning in Walker and Catoosa Counties are estimated to be 0.18 tpd of NOx and 0.64 tpd of VOC.

[7] http://www.epa.gov/fedrgstr/EPA-AIR/1997/August/Day-15/a20968.htm

5.1.2 Stage I Vapor Recovery

Stage I vapor recovery will be implemented at the state level in Catoosa and Walker Counties. Stage I vapor recovery is used during the refueling of gasoline storage tanks to reduce emissions of VOCs. Vapors in storage tanks that are displaced by incoming gasoline would be routed into the gasoline tank truck and therefore captured, instead of being vented to the atmosphere. Emissions reductions estimates from stage I vapor recovery in Walker and Catoosa Counties are estimated to be 0.81 tpd of VOCs in 2007 and 0.93 tpd of VOCs in 2012.

5.2 Local Emission Controls

In addition to the open burning bans and Stage I vapor recovery measures discussed above, Catoosa and Walker Counties may consider pursuing local measures, such as truck stop electrification projects, school bus conversions and retrofits, however, there are currently no plans for these measures at present. Catoosa and Walker Counties will use Chattanooga's voluntary smog alert program.

6. Maintenance for Growth

6.1 Overview

The attainment demonstration detailed in *Section 4* of this document titled *Atmospheric and Modeling and Attainment Demonstration* for the Chattanooga EAC includes an attainment demonstration for the five-year period between 2007-2012 for the entire 5 county Chattanooga Area. This five-year period, which is the maintenance for growth period, demonstrates a modeled design value below 85 ppb (the NAAQS for 8-hour ozone) at all monitors located in the EAC area. In addition, since the State of Tennessee has committed to 10 year maintenance for growth time frame, 5 years in excess of the time committed by the State of Georgia, EPD will continue to work with the State of Tennessee to resolve growth related emission increases beyond 2012 that will result in exceedances of the design value.

The continuing planning process required by the maintenance for growth plan commits to the tracking of the design value (three year average) for the entire EAC area. It provides a response plan (air quality analyses, modeling and adopting additional controls) to be performed to address any exceedance of the 8-hour ozone design value. Any resulting modeling updates and planning processes will include new point sources, impacts from potential new source growth and future transportation patterns in a manner consistent with the most current adopted Long Term Transportation Plan, and the most current trend and projections of local motor vehicle emissions

While tracking the design value, as quality assured monitoring data become available, the maintenance for growth for the State of Georgia commits to adopt and implement additional control measures based on the results of analyses such that this obligation will last throughout the maintenance for grown period (2007 – 2012). All control strategy development will involve cooperation with the State of Tennessee during this time frame and beyond. These commitments are in force unless the 8- hour ozone standard is revoked in the future.

6.2 Detailed Continuing Planning Process

The maintenance for growth provides for the continued evaluation of the 8-hour ozone design value. EPD will annually review actual, quality assured ambient monitoring data for the entire EAC area as an indicator or trigger to determine whether these response measures would be implemented.

If there has been a corresponding increase in the ozone levels in the area such that the latest 3-year design value is greater than 0.084 ppm, the Division will analyze the data and will then implement additional controls as necessary. EPD will evaluate any exceedances of the design value to determine if the trend is likely to continue. If it is determined, through the comprehensive procedures outlined below, that additional emission reductions are necessary, EPD will adhere to the schedule below to implement any required measures as expeditiously as practicable, taking into consideration the ease of implementation and the technical and economic feasibility of selected measures. Implementation will be conducted as expeditiously as practicable, again taking into consideration the ease of implementation and the technical and economic feasibility of selected measures.

EPD will conduct a comprehensive study to determine the causes of any exceedances of the design value, and the control measures necessary to mitigate the problem. The comprehensive analysis will examine:

- the number, location, and severity of the ambient ozone concentrations above the standard;
- the weather patterns contributing to ozone levels;
- potential, contributing emission sources;
- the geographic applicability of possible additional control measures;
- emission trends, including implementation timelines of scheduled control measures;
- current and recently identified control technologies; and
- air quality contributions from outside the maintenance for growth area.

The analysis may involve additional modeling runs before control measures are adopted. Any additional rules would be effective as soon as practicable, but no later than 18 months after finding that emissions growths were exceeding those used in the air quality modeling analyses. Any voluntary measures would be effective as soon as practicable.

Table 6.1 below provides the following time line of actions and submittals for the maintenance for growth from December 2004 to December 2012.

Table 6-1 Timeline for the development of required regulations

Timeline begins when a determination is made based on quality-assured data that a trigger has occurred.	
Identify potential sources for reductions.	3 months
Identify applicable control measures.	3 months
Initiate a stakeholder process.	3 months
Draft SIP regulations.	3 months
Initiate rulemaking process (including public comment period, hearing, Board adoption and final submission to EPA). This process may be initiated simultaneous with drafting of regulations.	6 months
Completion no later than:	18 months

The resulting control measures will be selected from any measure deemed appropriate and effective at the time the selection is made. The selection among measures will be based upon cost effectiveness, emission reduction potential, economic and social considerations, ease and timing of implementation, and other appropriate factors.

Adoption of additional control measures is subject to necessary administrative and legal processes. EPD will solicit input from all interested and affected persons (stakeholders) in the area prior to selecting appropriate additional control measures. No additional control measure will be implemented without providing the opportunity for full public participation. This process will include publication of notices, an opportunity for public hearing, and other measures required by Georgia law.

ATTACHMENT A: Supporting Information for Atmospheric Modeling

Figure A-1: Atmospheric Modeling Process

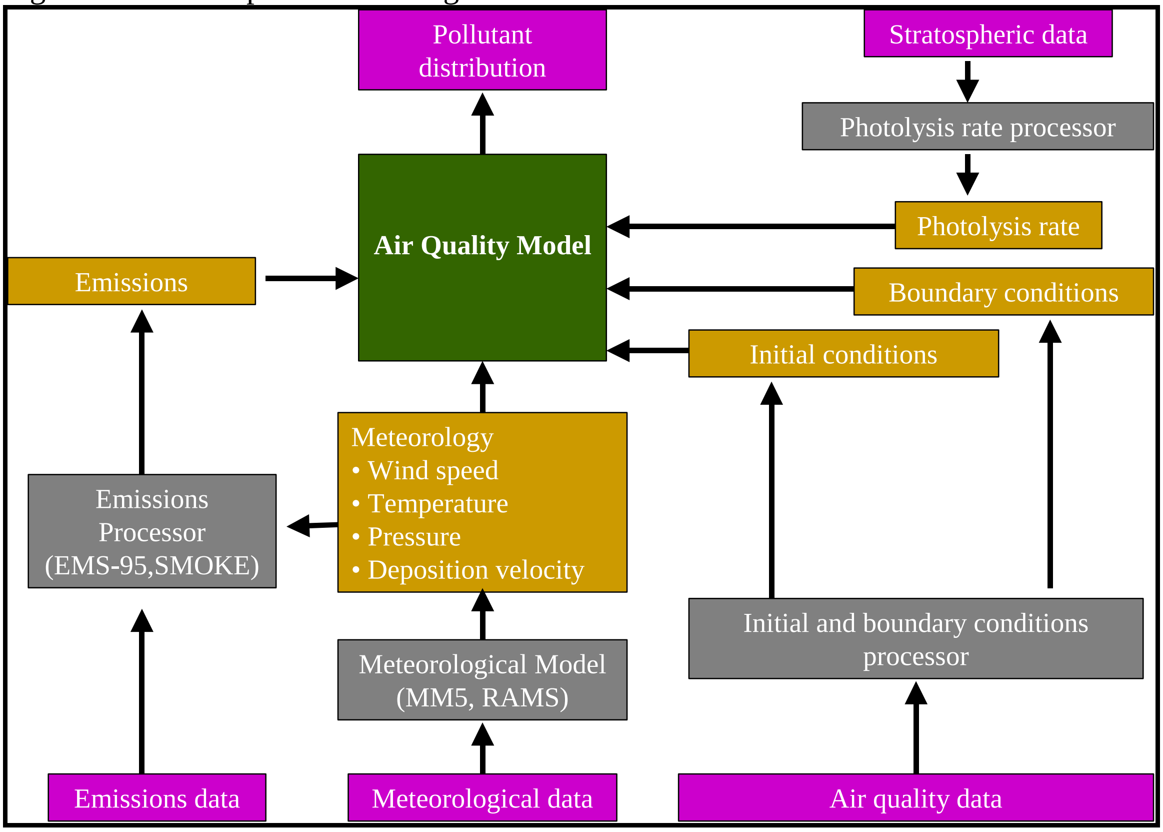


Figure A-2: Atmospheric Modeling and Emissions Control Strategy Development

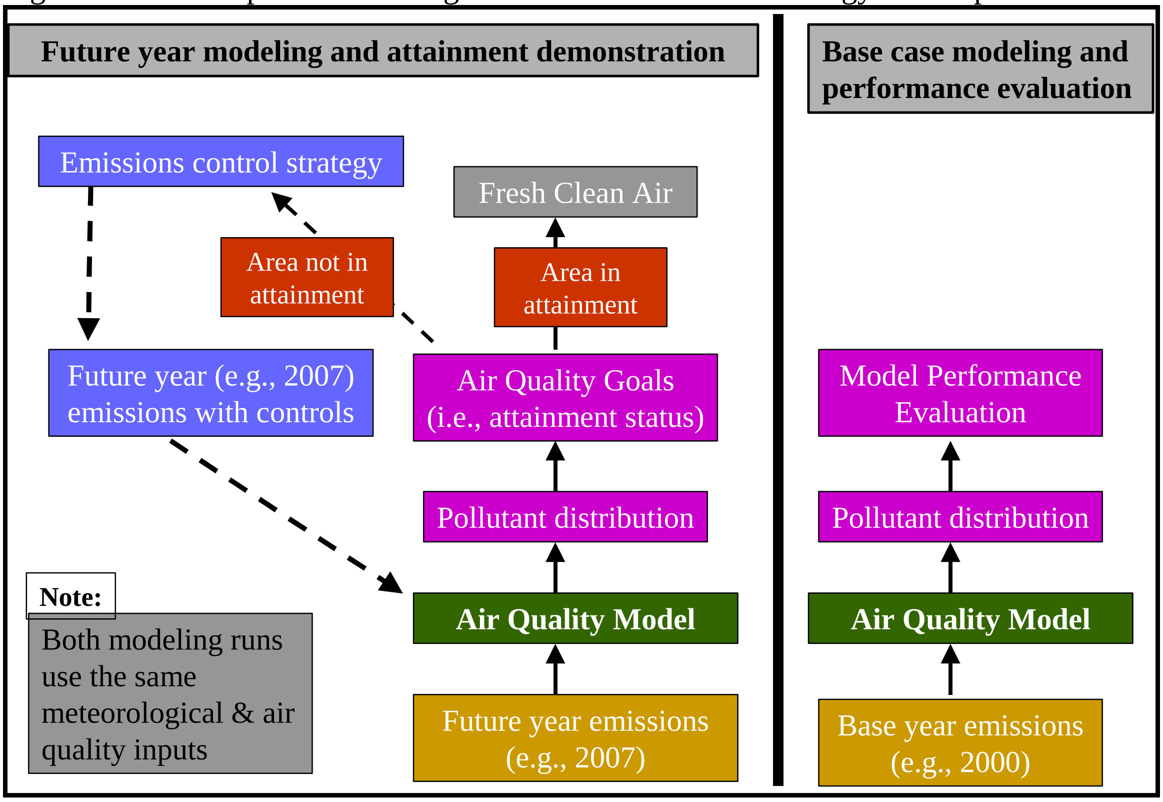


Table A-1: List of meteorological modeling stations within the 12-km resolution grid

Station Name	Latitude (degrees)	Longitude (degrees)	Station Name	Latitude (degrees)	Longitude (degrees)
K40J	30.0720	-83.5740	KHRT	30.5170	-86.3000
K6A3	35.1900	-83.8600	KHSV	34.6500	-86.7670
KABY	31.5330	-84.1830	KINT	36.1330	-80.2330
KAGS	33.3670	-81.9670	KJAX	30.5000	-81.7000
KAHN	33.9500	-83.3170	KLSF	32.3330	-85.0000
KAKH	35.2000	-81.1500	KMAI	30.8370	-85.1840
KAMG	31.5330	-82.5170	KMCN	32.7000	-83.6500
KANB	33.5910	-85.8470	KMGE	33.9170	-84.5170
KAND	34.5000	-82.7170	KMGM	32.3000	-86.4000
KATL	33.6500	-84.4330	KMQY	36.0000	-86.5000
KAUO	32.5830	-85.5000	KMRN	35.8200	-81.6100
KAVL	35.4330	-82.5500	KMRX	36.1690	-83.4020
KBFM	30.6330	-88.0670	KMSL	34.7500	-87.6170
KBHM	33.5670	-86.7500	KMWK	36.4600	-80.5500
KBNA	36.1170	-86.6830	KMXF	32.3830	-86.3670
KBQK	31.2500	-81.4670	KNBC	32.4830	-80.7170
KBUY	36.0300	-79.4700	KNIP	30.2330	-81.6830
KCAE	33.9500	-81.1170	KNPA	30.3500	-87.3170
KCCO	33.3100	-84.7700	KNRB	30.4000	-81.4170
KCEW	30.7830	-86.5170	KOGB	33.4640	-80.8540
KCHA	35.0330	-85.2000	KOHX	36.2470	-86.5630
KCHS	32.9000	-80.0330	KOQT	36.0200	-84.2300
KCLT	35.2130	-80.9490	KOZR	31.2670	-85.7170
KCRG	30.3330	-81.5170	KPAM	30.0670	-85.5830
KCSG	32.5170	-84.9330	KPDK	33.8830	-84.3000
KCSV	35.9500	-85.0830	KPFN	30.2000	-85.6830
KCTY	29.6170	-83.1000	KPNS	30.4670	-87.2000
KCUB	33.9700	-80.9900	KRMG	34.3500	-85.1670
KDCU	34.6500	-86.9400	KSAV	32.1330	-81.2000
KDNL	33.4670	-82.0330	KSSC	33.9670	-80.4830
KDNN	34.7200	-84.8700	KSSI	31.1500	-81.3830
KDTS	30.4000	-86.4700	KSVH	35.7600	-80.9600
KEET	33.1780	-86.7820	KSVN	32.0170	-81.1330
KEQY	35.0200	-80.6200	KTCL	33.2330	-87.6170
KFFC	33.3500	-84.5670	KTLH	30.3830	-84.3670
KFLO	34.1830	-79.7170	KTRI	36.4830	-82.4000
KFQD	35.4300	-81.9400	KTYS	35.8170	-83.9830
KFTY	33.7830	-84.5170	KUZA	34.9800	-81.0600
KGAD	33.9670	-86.0830	KVAD	30.9670	-83.2000
KGMU	34.8500	-82.3500	KVDI	32.1900	-82.3700
KGNV	29.6830	-82.2670	KVJI	36.6800	-82.0300
KGSO	36.0830	-79.9500	KVLD	30.7830	-83.2830
KGSP	34.9000	-82.2170	KVPS	30.4830	-86.5170
KGVL	34.2670	-83.8330	KWRB	32.6330	-83.6000
KGZH	31.4200	-87.0500			
KHKY	35.7500	-81.3830			
KHOP	36.6670	-87.5000			

Table A-2: List of meteorological modeling stations within the 4-km resolution grid

Station Name	Latitude (degrees)	Longitude (degrees)
K6A3	35.19	-83.86
KAHN	33.95	-83.32
KANB	33.59	-85.85
KATL	33.65	-84.43
KBHM	33.57	-86.75
KCCO	33.31	-84.77
KCHA	35.03	-85.20
KCSV	35.95	-85.08
KDNN	34.72	-84.87
KFFC	33.35	-84.57
KFTY	33.78	-84.52
KGAD	33.97	-86.08
KGVL	34.27	-83.83
KHSV	34.65	-86.77
KMGE	33.92	-84.52
KMQY	36.00	-86.50
KPDK	33.88	-84.30
KRMG	34.35	-85.17
KTYS	35.82	-83.98

Table A-3: List of SMOKE Input Files for Emissions Processing

Category	SMOKE Logical name	Base year	Future year (i.e., 2007 & 2012)
Emissions inventory	PTINV	ptinv.faqs2000.ida.txt	ptinv.faqs2007.ida.txt, ptinv.faqs2012.ida.txt
	PTHOUR	cem.faqs.aug2000.txt	cem.faqs.aug2007.txt cem.faqs.aug2012.txt
	ARINV	arinv.faqs2000.ida.txt arinv.nonroad.faqs2000.ida.txt	arinv.faqs2007.ida.txt arinv.nonroad.faqs2012.ida.txt
	MBINV	mbinv.vmt.faqs2000.txt	mbinv.vmt.faqs2007.txt mbinv.vmt.faqs2012.txt
Spatial surrogates	AGPRO	agpro.36km.census2000.txt, agpro.12km. census2000.txt, agpro.4km. census2000.txt	
	MGPRO	mgpro.36km.census2000.txt, mgpro.12km.census2000.txt, mgpro.4km.census2000.txt	
	AGREF	agref.faqs2000.txt	
	MGREF	mgref.faqs2000.txt	
Temporal profiles	ATPRO/PTPRO	aptpro.faqs2000.txt	
	ATREF/PTREF	aptref.faqs2000.txt	
	MTPRO	mtpro.faqs2000.txt	
	MTREF	mtref.faqs2000.txt	
Speciation profiles	GSPRO	gspro.saprc99.faqs2000.txt	
	GSREF	gsref.sparc99.faqs2000.txt	
MOBILE6 inputs	M6LIST	m6list.faqs2000.2000.txt	m6list.faqs2007.txt m6list.faqs2012.txt
	MCREF	mcref.faqs2000.txt	mcref.faqs2007.txt mcref.faqs2007.txt
	MVREF	mvref.faqs2000.txt	mvref.faqs2007.txt mvref.faqs2007.txt
BEIS3 inputs	BELD3_A	LAND_A.faqs36, LAND_A.faqs12, LAND_A.faqs4	
	BELD3_B	LAND_B.faqs36, LAND_B.faqs12, LAND_B.faqs4	
	BELD3_TOT	LAND_T.faqs36, LAND_T.faqs12, LAND_T.faqs4	
Meteorological Inputs	GRID_CRO2D	GRIDCRO2D_faqs36.aug00, GRIDCRO2D_faqs12.aug00, GRIDCRO2D_faqs4.aug00	
	GRID_CRO3D	GRIDCRO3D_faqs36.aug00, GRIDCRO3D_faqs12.aug00, GRIDCRO3D_faqs4.aug00	
	MET_CRO2D	METCRO2D_faqs36.aug00, METCRO2D_faqs12.aug00, METCRO2D_faqs4.aug00	
	MET_CRO3D	METCRO3D_faqs36.aug00, METCRO3D_faqs12.aug00, METCRO3D_faqs4.aug00	
	MET_DOT3D	METDOT3D_faqs36.aug00, METDOT3D_faqs12.aug00, METDOT3D_faqs4.aug00	

Table A-4a: Location of ozone monitoring stations within the 12-km grid

County Name	State Name	AIRS ID	ICOLS	IROWS
Clay	AL	10270001	15	30
Elmore	AL	10510001	12	23
Jefferson	AL	10731003	6	32
Jefferson	AL	10731005	5	31
Jefferson	AL	10732006	7	31
Jefferson	AL	10735002	8	34
Jefferson	AL	10736002	7	33
Lawrence	AL	10790002	3	40
Madison	AL	10890014	8	43
Montgomery	AL	11011002	11	22
Morgan	AL	11030011	5	41
Shelby	AL	11170004	7	30
Baker	FL	120030002	43	4
Bay	FL	120050006	17	3
Duval	FL	120310077	49	7
Duval	FL	120311003	49	5
Escambia	FL	120330004	5	5
Escambia	FL	120330018	4	3
Escambia	FL	120330024	4	3
Holmes	FL	120590004	17	8
Leon	FL	120730012	28	5
Santa	FL	121130014	17	2
Bibb	GA	130210012	32	27
Bibb	GA	130219999	30	27
Chatham	GA	130510021	52	22
Cherokee	GA	130570001	23	41
Cobb	GA	130670003	23	38
Coweta	GA	130770002	23	32
Dawson	GA	130850001	27	41
DeKalb	GA	130890002	26	35
DeKalb	GA	130893001	26	36
Douglas	GA	130970004	22	35
Fayette	GA	131130001	25	33
Fulton	GA	131210055	25	35
Glynn	GA	131270006	49	14
Gwinnett	GA	131350002	27	38
Henry	GA	131510002	27	33
Murray	GA	132130003	23	45
Muscogee	GA	132150008	22	24
Muscogee	GA	132151003	22	24
Paulding	GA	132230003	20	37
Richmond	GA	132450091	43	34
Richmond	GA	132459999	43	35
Rockdale	GA	132470001	28	34
Sumter	GA	132611001	29	19
Alexander	NC	370030003	47	57
Avery	NC	370110002	42	57
Buncombe	NC	370210030	37	52
Caldwell	NC	370270003	45	57
Davie	NC	370590002	52	57
Forsyth	NC	370670022	54	60
Forsyth	NC	370671008	55	59
Haywood	NC	370870004	34	52
Haywood	NC	370870035	36	51
Haywood	NC	370870036	34	53
Jackson	NC	370990005	32	52
Lincoln	NC	371090004	47	53
Mecklenburg	NC	371190041	51	51
Mecklenburg	NC	371191005	50	50
Mecklenburg	NC	371191009	51	52
Rowan	NC	371590021	53	55
Rowan	NC	371590022	51	54
Swain	NC	371730002	31	51
Union	NC	371790003	53	49
Yancey	NC	371990003	39	55
Abbeville	SC	450010001	40	42
Aiken	SC	450030003	45	33
Anderson	SC	450070003	39	46
Barnwell	SC	450110001	48	33
Cherokee	SC	450210002	43	50
Chester	SC	450230002	48	47
Colleton	SC	450290002	52	31
Edgefield	SC	450370001	44	37
Greenville	SC	450450009	40	47
Oconee	SC	450730001	33	46
Pickens	SC	450770002	36	45
Richland	SC	450790007	51	41
Richland	SC	450790021	52	39
Richland	SC	450791002	51	41
Richland	SC	450791006	52	38
Spartanburg	SC	450830009	41	48
Union	SC	450870001	46	44
York	SC	450910006	48	48
Anderson	TN	470010101	25	56
Blount	TN	470090101	27	53
Blount	TN	470090102	28	53
Davidson	TN	470370011	6	57
Davidson	TN	470370026	7	56
Hamilton	TN	470650028	19	47
Hamilton	TN	470651011	18	48
Jefferson	TN	470890002	29	57
Knoxville	TN	470930021	28	57
Knoxville	TN	470931020	27	56
Knoxville	TN	470931030	27	55
Lawrence	TN	470990002	1	47
Meigs	TN	471210104	20	49
Montgomery	TN	471251010	3	60
Putnam	TN	471410004	16	57
Roane	TN	471451020	24	55
Rutherford	TN	471490101	8	52
Sevier	TN	471550101	30	54
Sevier	TN	471550102	30	52
Sumner	TN	471650007	7	58
Sumner	TN	471650101	8	59
Williamson	TN	471870106	4	54
Wilson	TN	471890103	10	56

Table A-4b: Location of ozone monitoring stations within the 4-km grid

County Name	State Name	AIRS ID	ICOLS	IROWS
Clay	AL	10270001	25	1
Jefferson	AL	10732006	2	2
Jefferson	AL	10735002	4	11
Jefferson	AL	10736002	2	8
Madison	AL	10890014	5	38
Shelby	AL	11170004	1	1
Cherokee	GA	130570001	51	31
Cobb	GA	130670003	51	22
Coweta	GA	130770002	49	5
Dawson	GA	130850001	63	33
De	GA	130890002	59	14
De	GA	130893001	60	18
Douglas	GA	130970004	47	14
Fayette	GA	131130001	56	7
Fulton	GA	131210055	57	14
Gwinnett	GA	131350002	63	22
Henry	GA	131510002	62	7
Murray	GA	132130003	49	43
Paulding	GA	132230003	41	19
Rockdale	GA	132470001	64	11
Jackson	NC	370990005	78	66
Swain	NC	371730002	74	63
Oconee	SC	450730001	80	46
Blount	TN	470090101	62	67
Blount	TN	470090102	66	67
Hamilton	TN	470650028	37	50
Hamilton	TN	470651011	36	52
Meigs	TN	471210104	41	56
Rutherford	TN	471490101	4	66
Sevier	TN	471550101	70	70
Sevier	TN	471550102	72	66

Table A-5a: Episode Average Mean Normalized Bias and Error in Hourly Ozone Concentration at Monitoring Stations Located within the 12-Km Modeling grid

State/County	Monitor Type	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
AL Clay	RURAL	10270001	142	2.85	10.10
AL Elmore	RURAL	10510001	171	-17.67	25.60
AL Jefferson	SUBURBAN	10731003	114	17.73	28.75
AL Jefferson	RURAL	10731005	104	24.05	27.19
AL Jefferson	SUBURBAN	10732006	124	-5.05	22.91
AL Jefferson	RURAL	10735002	119	3.78	12.04
AL Jefferson	SUBURBAN	10736002	106	20.36	24.79
AL Lawrence	RURAL	10790002	177	-8.51	15.52
AL Madison	SUBURBAN	10890014	129	8.20	15.55
AL Montgomery	SUBURBAN	11011002	128	0.61	14.43
AL Morgan	URBAN	11030011	140	-11.43	17.65
AL Shelby	RURAL	11170004	134	-14.00	18.88
FL Baker	RURAL	120030002	115	12.88	16.48
FL Bay	RURAL	120050006	208	-20.32	24.08
FL Duval	RURAL	120310077	105	3.71	28.71
FL Duval	SUBURBAN	120311003	100	17.35	25.59
FL Escambia	SUBURBAN	120330004	117	-10.34	23.86
FL Escambia	SUBURBAN	120330018	182	-3.67	14.20
FL Escambia	SUBURBAN	120330024	158	-0.31	14.28
FL Holmes	RURAL	120590004	117	5.12	14.53
FL Leon	SUBURBAN	120730012	107	12.85	15.82
FL Santa Rosa	SUBURBAN	121130014	142	-11.75	15.29
GA Bibb	RURAL	130210012	142	-6.89	17.11
GA Bibb	NA	130219999	164	-6.94	18.34
GA Chatham	SUBURBAN	130510021	150	10.29	18.95
GA Cherokee	RURAL	130570001	43	64.74	64.74
GA Cobb	SUBURBAN	130670003	135	7.52	15.67
GA Coweta	SUBURBAN	130770002	147	-9.00	19.75
GA Dawson	RURAL	130850001	119	22.53	23.12
GA De Kalb	SUBURBAN	130890002	107	13.77	20.67
GA De Kalb	RURAL	130893001	131	3.46	20.99
GA Douglas	SUBURBAN	130970004	190	-2.64	18.66
GA Fayette	SUBURBAN	131130001	82	-3.27	19.01
GA Fulton	SUBURBAN	131210055	131	-7.94	25.86
GA Glynn	SUBURBAN	131270006	149	9.68	17.66
GA Gwinnett	SUBURBAN	131350002	128	-2.04	11.85
GA Henry	RURAL	131510002	128	-8.63	17.22
GA Murray	RURAL	132130003	229	-5.01	14.28
GA Muscogee	SUBURBAN	132150008	147	3.33	20.04

State/County	Monitor Type	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
GA Muscogee	RURAL	132151003	128	-0.75	16.76
GA Paulding	RURAL	132230003	183	0.11	15.11
GA Richmond	SUBURBAN	132450091	108	12.21	18.20
GA Richmond	NA	132459999	45	-0.87	12.79
GA Rockdale	RURAL	132470001	131	1.48	16.97
GA Sumter	RURAL	132611001	157	-16.64	19.59
NC Alexander	SUBURBAN	370030003	135	0.15	12.86
NC Avery	RURAL	370110002	106	14.52	17.54
NC Bunmbe	SUBURBAN	370210030	101	21.13	24.46
NC Caldwell	URBAN	370270003	114	4.20	13.21
NC Davie	SUBURBAN	370590002	115	-8.52	12.92
NC Forsyth	URBAN	370670022	109	11.22	21.82
NC Forsyth	RURAL	370671008	113	-1.54	21.37
NC Haywood	SUBURBAN	370870004	98	12.00	15.35
NC Haywood	RURAL	370870035	221	5.51	14.68
NC Haywood	RURAL	370870036	215	1.19	15.63
NC Jackson	RURAL	370990005	233	9.83	17.28
NC Lincoln	RURAL	371090004	120	-12.65	16.27
NC Mecklenburg	URBAN	371190041	118	5.54	22.80
NC Mecklenburg	RURAL	371191005	122	-5.10	27.06
NC Mecklenburg	RURAL	371191009	127	-13.08	25.35
NC Rowan	RURAL	371590021	131	-3.48	13.69
NC Rowan	SUBURBAN	371590022	137	-3.85	17.34
NC Swain	SUBURBAN	371730002	90	18.28	20.46
NC Union	SUBURBAN	371790003	113	12.65	21.01
NC Yancey	RURAL	371990003	222	7.64	18.27
SC Abbeville	RURAL	450010001	106	30.81	31.01
SC Aiken	SUBURBAN	450030003	116	-5.77	13.38
SC Anderson	SUBURBAN	450070003	170	-12.83	23.50
SC Barnwell	RURAL	450110001	122	-7.33	13.63
SC Cherokee	RURAL	450210002	153	-6.39	17.89
SC Chester	RURAL	450230002	122	15.10	18.02
SC Colleton	RURAL	450290002	111	10.67	14.78
SC Edgefield	RURAL	450370001	128	7.57	12.40
SC Greenville	SUBURBAN	450450009	153	-12.15	22.83
SC Oconee	RURAL	450730001	224	4.12	15.16
SC Pickens	RURAL	450770002	130	3.60	10.79
SC Richland	SUBURBAN	450790007	138	-9.32	20.46
SC Richland	RURAL	450790021	80	22.94	24.86
SC Richland	RURAL	450791002	159	-10.59	22.91

State/County	Monitor Type	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
SC Richland	RURAL	450791006	29	33.52	33.52
SC Spartanburg	RURAL	450830009	119	6.69	17.25
SC Union	RURAL	450870001	97	13.40	15.58
TN Blount	RURAL	470090101	227	-7.94	14.96
TN Blount	RURAL	470090102	84	17.84	19.54
TN Davidson	URBAN	470370011	83	31.90	34.72
TN Davidson	RURAL	470370026	111	11.30	22.86
TN Hamilton	RURAL	470650028	116	14.56	18.45
TN Hamilton	RURAL	470651011	140	8.80	17.79
TN Jefferson	RURAL	470890002	109	5.17	14.70
TN Knox	RURAL	470930021	115	-0.02	12.97
TN Knox	SUBURBAN	470931020	119	5.77	21.72
TN Knox	SUBURBAN	470931030	103	9.60	17.31
TN Lawrence	RURAL	470990002	124	1.49	10.82
TN Meigs	RURAL	471210104	116	7.86	14.45
TN Montgomery	RURAL	471251010	131	-5.50	18.19
TN Putnam	RURAL	471410004	218	-21.61	26.96
TN Roane	RURAL	471451020	94	23.57	24.33
TN Rutherford	RURAL	471490101	125	-7.75	13.87
TN Sevier	RURAL	471550101	234	-6.85	14.46
TN Sevier	RURAL	471550102	234	-8.98	13.65
TN Sumner	RURAL	471650007	113	3.88	12.45
TN Sumner	RURAL	471650101	96	14.29	20.09
TN Williamson	RURAL	471870106	163	-13.63	23.38
TN Wilson	RURAL	471890103	113	0.32	15.82

Table A-5b: Episode Average Mean Normalized Bias and Error in Peak Ozone Concentration at Monitoring Stations Located within the 12-Km Modeling grid

State/County	Monitor Type	AIRS ID	Mean Normalized Bias (MNB) in peak prediction	Mean Normalized Error (MNE) in peak prediction
AL Clay	RURAL	10270001	-3.850	4.440
AL Elmore	RURAL	10510001	-2.930	9.720
AL Jefferson	SUBURBAN	10731003	19.800	23.320
AL Jefferson	RURAL	10731005	12.780	14.500
AL Jefferson	SUBURBAN	10732006	4.910	11.750
AL Jefferson	RURAL	10735002	-2.370	11.730
AL Jefferson	SUBURBAN	10736002	14.380	19.600
AL Lawrence	RURAL	10790002	-12.680	15.420
AL Madison	SUBURBAN	10890014	2.410	7.440
AL Montgomery	SUBURBAN	11011002	-0.280	11.790
AL Morgan	URBAN	11030011	-7.920	12.420
AL Shelby	RURAL	11170004	-6.370	8.520
FL Baker	RURAL	120030002	-1.100	10.790
FL Bay	RURAL	120050006	-11.160	12.700
FL Duval	RURAL	120310077	8.910	20.110
FL Duval	SUBURBAN	120311003	6.980	11.450
FL Escambia	SUBURBAN	120330004	2.640	15.190
FL Escambia	SUBURBAN	120330018	-15.480	18.010
FL Escambia	SUBURBAN	120330024	-12.970	14.650
FL Holmes	RURAL	120590004	-4.800	8.170
FL Leon	SUBURBAN	120730012	3.090	6.440
FL Santa Rosa	SUBURBAN	121130014	-17.890	17.890
GA Bibb	RURAL	130210012	-15.820	15.820
GA Bibb	NA	130219999	-7.990	10.850
GA Chatham	SUBURBAN	130510021	19.120	19.850
GA Cherokee	RURAL	130570001	66.300	66.300
GA Cobb	SUBURBAN	130670003	-0.490	8.350
GA Coweta	SUBURBAN	130770002	-1.660	10.940
GA Dawson	RURAL	130850001	15.120	17.350
GA De Kalb	SUBURBAN	130890002	2.270	11.030
GA De Kalb	RURAL	130893001	5.130	9.400
GA Douglas	SUBURBAN	130970004	-7.330	17.600
GA Fayette	SUBURBAN	131130001	133.460	145.280
GA Fulton	SUBURBAN	131210055	-2.160	10.740
GA Glynn	SUBURBAN	131270006	6.770	14.840
GA Gwinnett	SUBURBAN	131350002	-5.030	7.600
GA Henry	RURAL	131510002	-14.880	16.560
GA Murray	RURAL	132130003	-3.720	8.450
GA Muscogee	SUBURBAN	132150008	5.950	15.290

State/County	Monitor Type	AIRS ID	Mean Normalized Bias (MNB) in peak prediction	Mean Normalized Error (MNE) in peak prediction
GA Muscogee	RURAL	132151003	-1.620	9.870
GA Paulding	RURAL	132230003	4.690	9.920
GA Richmond	SUBURBAN	132450091	-2.900	9.180
GA Richmond	NA	132459999	961.600	973.110
GA Rockdale	RURAL	132470001	-6.450	14.180
GA Sumter	RURAL	132611001	-12.810	13.420
NC Alexander	SUBURBAN	370030003	-6.420	12.400
NC Avery	RURAL	370110002	9.120	14.490
NC Bunmbe	SUBURBAN	370210030	12.480	15.600
NC Caldwell	URBAN	370270003	-3.470	9.200
NC Davie	SUBURBAN	370590002	-10.440	11.730
NC Forsyth	URBAN	370670022	13.310	20.190
NC Forsyth	RURAL	370671008	10.940	18.310
NC Haywood	SUBURBAN	370870004	8.260	9.250
NC Haywood	RURAL	370870035	-1.930	4.740
NC Haywood	RURAL	370870036	-3.490	4.840
NC Jackson	RURAL	370990005	-0.690	5.650
NC Lincoln	RURAL	371090004	-14.590	14.590
NC Mecklenburg	URBAN	371190041	7.960	15.410
NC Mecklenburg	RURAL	371191005	9.340	15.760
NC Mecklenburg	RURAL	371191009	-1.020	12.730
NC Rowan	RURAL	371590021	0.170	7.270
NC Rowan	SUBURBAN	371590022	0.770	12.440
NC Swain	SUBURBAN	371730002	8.390	9.640
NC Union	SUBURBAN	371790003	11.130	16.990
NC Yancey	RURAL	371990003	1.060	10.410
SC Abbeville	RURAL	450010001	29.700	29.700
SC Aiken	SUBURBAN	450030003	4.530	23.630
SC Anderson	SUBURBAN	450070003	2.550	9.550
SC Barnwell	RURAL	450110001	-13.750	15.970
SC Cherokee	RURAL	450210002	-0.760	8.840
SC Chester	RURAL	450230002	17.890	20.650
SC Colleton	RURAL	450290002	2.890	9.380
SC Edgefield	RURAL	450370001	1.310	7.290
SC Greenville	SUBURBAN	450450009	0.920	11.100
SC Oconee	RURAL	450730001	0.810	6.430
SC Pickens	RURAL	450770002	-0.050	5.100
SC Richland	SUBURBAN	450790007	-1.470	9.640
SC Richland	RURAL	450790021	15.880	20.580
SC Richland	RURAL	450791002	-3.240	9.980
SC Richland	RURAL	450791006	34.700	34.700

State/County	Monitor Type	AIRS ID	Mean Normalized Bias (MNB) in peak prediction	Mean Normalized Error (MNE) in peak prediction
SC Spartanburg	RURAL	450830009	2.350	13.600
SC Union	RURAL	450870001	7.090	11.230
SC York	SUBURBAN	450910006	10.720	11.940
TN Anderson	RURAL	470010101	4.550	14.500
TN Blount	RURAL	470090101	-4.550	7.120
TN Blount	RURAL	470090102	9.920	12.700
TN Davidson	URBAN	470370011	37.140	37.140
TN Davidson	RURAL	470370026	19.390	20.710
TN Hamilton	RURAL	470650028	4.550	9.980
TN Hamilton	RURAL	470651011	-3.740	6.940
TN Jefferson	RURAL	470890002	1.190	7.410
TN Knox	RURAL	470930021	0.400	6.620
TN Knox	SUBURBAN	470931020	12.330	17.070
TN Knox	SUBURBAN	470931030	10.320	12.790
TN Lawrence	RURAL	470990002	-4.530	7.710
TN Meigs	RURAL	471210104	-2.130	6.690
TN Montgomery	RURAL	471251010	4.380	10.390
TN Putnam	RURAL	471410004	-6.580	8.850
TN Roane	RURAL	471451020	13.660	16.860
TN Rutherford	RURAL	471490101	-6.110	8.800
TN Sevier	RURAL	471550101	-7.700	9.190
TN Sevier	RURAL	471550102	-14.540	16.570
TN Sumner	RURAL	471650007	9.500	12.800
TN Sumner	RURAL	471650101	37.100	43.900
TN Williamson	RURAL	471870106	-4.380	10.880
TN Wilson	RURAL	471890103	-1.270	8.110

Table A-6a: Episode Average Mean Normalized Bias and Error in Hourly Ozone Concentration at Monitoring Stations Located within the 4-Km Modeling grid

County Name	State Name	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
Clay	AL	10270001	122	3.02	12.25
Jefferson	AL	10732006	108	-7.18	14.77
Jefferson	AL	10735002	106	3.53	12.67
Jefferson	AL	10736002	94	1.87	21.04
Madison	AL	10890014	112	3.85	14.24
Shelby	AL	11170004	118	-1.43	13.92
Cherokee	GA	130570001	42	63.17	63.17
Cobb	GA	130670003	113	-0.78	13.66
Coweta	GA	130770002	136	-8.59	17.38
Dawson	GA	130850001	105	16.19	17.22
De	GA	130890002	89	2.5	16.75
De	GA	130893001	108	6.73	17.7
Douglas	GA	130970004	170	-2.9	16.24
Fayette	GA	131130001	64	0.88	17.16
Fulton	GA	131210055	109	-3.44	25.78
Gwinnett	GA	131350002	105	-0.8	13.34
Henry	GA	131510002	104	-7.52	17.52
Murray	GA	132130003	202	-4.64	11.9
Paulding	GA	132230003	160	5.73	14.92
Rockdale	GA	132470001	105	2.47	19.1
Jackson	NC	370990005	203	10.96	17.01
Swain	NC	371730002	86	13.52	19.84
Oconee	SC	450730001	197	7.02	13.8
Blount	TN	470090101	200	-4.22	13.4
Blount	TN	470090102	83	10.31	18.04
Hamilton	TN	470650028	102	-3.92	15.66
Hamilton	TN	470651011	122	6.21	15.68
Meigs	TN	471210104	102	1.32	11.75
Rutherford	TN	471490101	113	-4.03	14.53
Sevier	TN	471550101	204	-7.92	14.26
Sevier	TN	471550102	204	-7.05	13.82

Table A-6b: Episode Average Mean Normalized Bias and Error in Peak Ozone Concentration at Monitoring Stations Located within the 4-Km Modeling grid

County Name	State Name	AIRS ID	Number of days	Mean Normalized Bias in peak prediction	Mean Normalized Error in peak prediction
Clay	AL	10270001	7	-4.22	6.08
Jefferson	AL	10732006	7	-3.92	13.2
Jefferson	AL	10735002	7	-6.01	13.17
Jefferson	AL	10736002	7	2.56	15.69
Madison	AL	10890014	7	-3.99	7.75
Shelby	AL	11170004	6	-0.85	6.76
Cherokee	GA	130570001	6	62.72	62.72
Cobb	GA	130670003	7	-0.17	8.94
Coweta	GA	130770002	7	-9.01	10.3
Dawson	GA	130850001	7	12.91	12.97
De	GA	130890002	7	-1.3	15.41
De	GA	130893001	7	4.43	12.09
Douglas	GA	130970004	7	-6.88	19.56
Fayette	GA	131130001	4	-10.72	15.38
Fulton	GA	131210055	7	4.73	14.19
Gwinnett	GA	131350002	7	-1.6	10.13
Henry	GA	131510002	6	-21.67	22.18
Murray	GA	132130003	6	-6.89	7.64
Paulding	GA	132230003	6	0.7	12.9
Rockdale	GA	132470001	6	-10.01	17.55
Jackson	NC	370990005	7	0.29	6.14
Swain	NC	371730002	7	6.11	7.18
Oconee	SC	450730001	6	4.2	5.81
Blount	TN	470090101	7	-7.69	8.99
Blount	TN	470090102	7	5.14	10.16
Hamilton	TN	470650028	7	-2.59	11.79
Hamilton	TN	470651011	7	-2.94	8.23
Meigs	TN	471210104	6	-6.02	8.27
Rutherford	TN	471490101	7	-9.11	9.11
Sevier	TN	471550101	7	-10.97	11.76
Sevier	TN	471550102	7	-16.57	16.57

Table A-7a: Episode Average Mean Normalized Bias and Error in 8-hour average ozone Concentration at Monitoring Stations Located within the 12-Km Modeling grid

County Name	State Name	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
Clay	AL	10270001	104	9.00	11.98
Elmore	AL	10510001	150	-19.81	22.23
Jefferson	AL	10731003	84	20.78	26.25
Jefferson	AL	10731005	76	26.85	27.11
Jefferson	AL	10732006	93	-3.46	16.92
Jefferson	AL	10735002	88	9.04	12.65
Jefferson	AL	10736002	77	20.25	22.06
Lawrence	AL	10790002	121	-4.19	14.57
Madison	AL	10890014	89	10.50	13.35
Montgomery	AL	11011002	102	2.46	12.54
Morgan	AL	11030011	100	-8.60	14.26
Shelby	AL	11170004	103	-12.16	14.32
Baker	FL	120030002	85	13.97	15.50
Bay	FL	120050006	149	-21.06	23.01
Duval	FL	120310077	73	3.36	19.53
Duval	FL	120311003	79	18.56	20.87
Escambia	FL	120330004	97	-10.24	18.52
Escambia	FL	120330018	134	-5.40	12.86
Escambia	FL	120330024	117	2.49	14.48
Holmes	FL	120590004	88	11.64	15.42
Leon	FL	120730012	68	17.35	18.02
Santa	FL	121130014	109	-5.48	14.83
Bibb	GA	130210012	109	-6.36	13.35
Bibb	GA	130219999	125	-4.34	16.76
Chatham	GA	130510021	120	11.32	15.34
Cherokee	GA	130570001	31	67.59	67.59
Cobb	GA	130670003	92	9.24	14.89
Coweta	GA	130770002	112	-6.32	19.15
Dawson	GA	130850001	74	25.20	25.20
DeKalb	GA	130890002	76	16.12	18.30
DeKalb	GA	130893001	91	4.78	14.79
Douglas	GA	130970004	157	-3.06	16.37
Fayette	GA	131130001	46	-0.08	17.04
Fulton	GA	131210055	85	-11.92	22.42
Glynn	GA	131270006	115	12.14	15.18
Gwinnett	GA	131350002	80	1.70	9.09
Henry	GA	131510002	89	-7.43	12.08
Murray	GA	132130003	168	-6.17	11.14
Muscogee	GA	132150008	121	5.12	16.31
Muscogee	GA	132151003	99	3.13	10.86
Paulding	GA	132230003	156	0.36	9.69
Richmond	GA	132450091	70	12.02	14.89
Richmond	GA	132459999	17	-1.69	6.55
Rockdale	GA	132470001	90	2.48	11.85
Sumter	GA	132611001	127	-15.51	18.05

County Name	State Name	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
Alexander	NC	370030003	81	4.26	13.19
Avery	NC	370110002	70	23.72	24.41
Buncombe	NC	370210030	67	31.30	32.10
Caldwell	NC	370270003	80	11.44	14.13
Davie	NC	370590002	82	-6.23	10.41
Forsyth	NC	370670022	76	10.61	15.92
Forsyth	NC	370671008	82	-0.86	17.95
Haywood	NC	370870004	63	21.85	22.52
Haywood	NC	370870035	168	4.93	11.57
Haywood	NC	370870036	168	2.44	12.24
Jackson	NC	370990005	168	9.03	13.91
Lincoln	NC	371090004	85	-10.76	14.33
Mecklenburg	NC	371190041	85	6.77	22.06
Mecklenburg	NC	371191005	79	-0.73	23.43
Mecklenburg	NC	371191009	88	-13.14	22.53
Rowan	NC	371590021	93	-2.74	12.13
Rowan	NC	371590022	101	-4.28	14.85
Swain	NC	371730002	61	26.33	26.64
Union	NC	371790003	86	14.04	19.79
Yancey	NC	371990003	168	5.82	13.36
Abbeville	SC	450010001	67	34.81	34.81
Aiken	SC	450030003	93	-4.21	10.01
Anderson	SC	450070003	119	-11.70	18.46
Barnwell	SC	450110001	81	-5.90	11.89
Cherokee	SC	450210002	108	-6.44	15.45
Chester	SC	450230002	83	17.11	17.34
Colleton	SC	450290002	78	14.57	16.18
Edgefield	SC	450370001	89	10.26	11.39
Greenville	SC	450450009	110	-12.73	18.41
Oconee	SC	450730001	156	3.10	11.55
Pickens	SC	450770002	85	4.83	8.16
Richland	SC	450790007	93	-6.97	16.45
Richland	SC	450790021	44	26.75	26.75
Richland	SC	450791002	120	-14.87	20.55
Richland	SC	450791006	19	47.72	47.72
Spartanburg	SC	450830009	77	7.63	13.03
Union	SC	450870001	71	22.30	22.97
York	SC	450910006	97	18.85	19.31
Anderson	TN	470010101	70	21.25	22.54
Blount	TN	470090101	168	-7.77	12.95
Blount	TN	470090102	67	33.48	33.65
Davidson	TN	470370011	48	31.85	32.18
Davidson	TN	470370026	73	12.32	18.37
Hamilton	TN	470650028	79	14.99	15.17

County Name	State Name	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
Hamilton	TN	470651011	95	11.51	15.38
Jefferson	TN	470890002	75	8.29	13.26
Knoxville	TN	470930021	69	1.95	10.15
Knoxville	TN	470931020	91	7.07	19.78
Knoxville	TN	470931030	71	15.70	21.14
Lawrence	TN	470990002	84	6.44	10.59
Meigs	TN	471210104	83	12.92	15.26
Montgomery	TN	471251010	104	-4.25	14.90
Putnam	TN	471410004	168	-22.37	26.57
Roane	TN	471451020	61	32.18	32.18
Rutherford	TN	471490101	90	-5.93	11.29
Sevier	TN	471550101	168	-8.18	12.41
Sevier	TN	471550102	168	-10.13	11.62
Sumner	TN	471650007	75	8.00	11.54
Sumner	TN	471650101	65	15.62	19.45
Williamson	TN	471870106	139	-14.75	21.58
Wilson	TN	471890103	76	4.39	11.71

Table A-7b: Episode Average Mean Normalized Bias and Error in daily 8-hour peak ozone Concentration at Monitoring Stations Located within the 12-Km Modeling grid

County Name	State Name	AIRS ID	Number of days	Mean Normalized Bias in 8-hour peak prediction	Mean Normalized Error in 8-hour peak prediction
Clay	AL	10270001	5	0.15	3.4
Elmore	AL	10510001	5	0.48	3.16
Jefferson	AL	10731003	5	24.03	24.03
Jefferson	AL	10731005	5	12.53	12.53
Jefferson	AL	10732006	5	8.45	12.58
Jefferson	AL	10735002	5	-1.61	8.43
Jefferson	AL	10736002	5	17.12	20.62
Lawrence	AL	10790002	3	-12.92	12.92
Madison	AL	10890014	5	5.93	7.59
Montgomery	AL	11011002	5	3.79	8.3
Morgan	AL	11030011	5	-11.37	11.37
Shelby	AL	11170004	5	-3.05	7.74
Baker	FL	120030002	5	0.89	5.57
Bay	FL	120050006	5	-5.05	8.07
Duval	FL	120310077	4	12.07	19.23
Duval	FL	120311003	5	16.58	16.58
Escambia	FL	120330004	5	-2.26	12.47
Escambia	FL	120330018	5	-5.59	10.69
Escambia	FL	120330024	5	-2.25	7.6
Holmes	FL	120590004	5	-2.02	4.8
Leon	FL	120730012	4	5.66	5.66
Santa	FL	121130014	5	-8.86	10.78
Bibb	GA	130210012	5	-15.29	15.29
Bibb	GA	130219999	5	-1.85	6.6
Chatham	GA	130510021	5	20.49	20.49
Cherokee	GA	130570001	5	69.04	69.04
Cobb	GA	130670003	5	9.82	9.82
Coweta	GA	130770002	5	4.58	9.23
Dawson	GA	130850001	5	23.93	23.93
DeKalb	GA	130890002	5	15.87	17.81
DeKalb	GA	130893001	5	10.44	13.24
Douglas	GA	130970004	5	6.47	16.84
Fayette	GA	131130001	2	5.15	8.57
Fulton	GA	131210055	4	8.92	9.08
Glynn	GA	131270006	5	16.2	16.2
Gwinnett	GA	131350002	5	-0.29	7.06
Henry	GA	131510002	5	-13.73	13.88
Murray	GA	132130003	5	-4.5	6.05
Muscogee	GA	132150008	5	11.69	16.38
Muscogee	GA	132151003	5	5.03	5.85
Paulding	GA	132230003	5	14.68	15.05
Richmond	GA	132450091	5	6.75	11.15
Richmond	GA	132459999	1	-4.23	4.23
Rockdale	GA	132470001	5	-5.93	12.18
Sumter	GA	132611001	5	-15.16	15.16

County Name	State Name	AIRS ID	Number of days	Mean Normalized Bias in 8-hour peak prediction	Mean Normalized Error in 8-hour peak prediction
Alexander	NC	370030003	5	-6.45	12.28
Avery	NC	370110002	5	6.89	9.69
Buncombe	NC	370210030	5	23.06	26.31
Caldwell	NC	370270003	4	-4.81	4.86
Davie	NC	370590002	5	-10.9	10.9
Forsyth	NC	370670022	5	9.29	11.31
Forsyth	NC	370671008	5	5.6	7.14
Haywood	NC	370870004	5	10.26	12.07
Haywood	NC	370870035	5	-1.5	10.27
Haywood	NC	370870036	5	-4.33	4.33
Jackson	NC	370990005	5	2.13	8.37
Lincoln	NC	371090004	4	-20.73	20.73
Mecklenburg	NC	371190041	5	6.27	13.77
Mecklenburg	NC	371191005	5	6.97	15.21
Mecklenburg	NC	371191009	5	-7.77	10.27
Rowan	NC	371590021	5	1.32	5.23
Rowan	NC	371590022	5	-1.31	11.7
Swain	NC	371730002	5	15.25	15.5
Union	NC	371790003	5	10	12.04
Yancey	NC	371990003	5	-2.04	7.39
Abbeville	SC	450010001	5	31.12	31.12
Aiken	SC	450030003	4	-1.02	13.06
Anderson	SC	450070003	5	1.65	7.94
Barnwell	SC	450110001	4	-10.62	11.09
Cherokee	SC	450210002	5	-5.9	11.33
Chester	SC	450230002	3	13.27	13.27
Colleton	SC	450290002	4	11.65	11.65
Edgefield	SC	450370001	5	6.27	7.92
Greenville	SC	450450009	5	3.04	10.43
Oconee	SC	450730001	4	0.99	4.21
Pickens	SC	450770002	5	0.68	6.16
Richland	SC	450790007	5	1.71	6.68
Richland	SC	450790021	5	27.81	27.81
Richland	SC	450791002	5	-0.02	7.71
Richland	SC	450791006	2	40.91	40.91
Spartanburg	SC	450830009	5	6.48	12.83
Union	SC	450870001	5	9.59	12.37
York	SC	450910006	5	14.54	14.54
Anderson	TN	470010101	5	21.05	21.05
Blount	TN	470090101	5	-9.95	9.95
Blount	TN	470090102	5	17.69	17.69
Davidson	TN	470370011	5	45.22	45.22
Davidson	TN	470370026	5	11.56	13.27
Hamilton	TN	470650028	5	7.59	7.59

County Name	State Name	AIRS ID	Number of days	Mean Normalized Bias in 8-hour peak prediction	Mean Normalized Error in 8-hour peak prediction
Hamilton	TN	470651011	5	-1.6	6.51
Jefferson	TN	470890002	5	3.35	3.35
Knoxville	TN	470930021	5	2.39	4.64
Knoxville	TN	470931020	5	15.42	15.42
Knoxville	TN	470931030	5	13.9	13.9
Lawrence	TN	470990002	5	-1.29	4.65
Meigs	TN	471210104	5	0.29	2.48
Montgomery	TN	471251010	5	-3.59	6.55
Putnam	TN	471410004	5	-10.23	12.42
Roane	TN	471451020	5	24.46	24.46
Rutherford	TN	471490101	5	-9.65	9.65
Sevier	TN	471550101	5	-9.58	9.58
Sevier	TN	471550102	5	-15.47	15.47
Sumner	TN	471650007	5	10.9	11.1
Sumner	TN	471650101	3	33.4	33.4
Williamson	TN	471870106	5	-10.55	10.6
Wilson	TN	471890103	3	-1.7	4.4

Table A-8a: Episode Average Mean Normalized Bias and Error in 8-hour average ozone Concentration at Monitoring Stations Located within the 4-Km Modeling grid

County Name	State Name	AIRS ID	Number of Observations greater than 40 ppb	Mean Normalized Bias (MNB)	Mean Normalized Error (MNE)
Clay	AL	10270001	124	9.21	13.92
Jefferson	AL	10732006	108	-4.37	12.66
Jefferson	AL	10735002	97	11.3	15.72
Jefferson	AL	10736002	88	5.71	16.22
Madison	AL	10890014	108	7.88	12.63
Shelby	AL	11170004	118	2.71	9.99
Cherokee	GA	130570001	28	65.04	65.04
Cobb	GA	130670003	110	3.55	13.62
Coweta	GA	130770002	138	-5.65	16.85
Dawson	GA	130850001	87	21.67	21.74
De	GA	130890002	88	7.96	16.45
De	GA	130893001	107	8.77	14.54
Douglas	GA	130970004	178	-1.73	14.99
Fayette	GA	131130001	61	6.26	14.76
Fulton	GA	131210055	104	-4.1	19.32
Gwinnett	GA	131350002	97	6.1	13.64
Henry	GA	131510002	103	-2.1	15.12
Murray	GA	132130003	196	-5.32	9.67
Paulding	GA	132230003	171	7.71	13.04
Rockdale	GA	132470001	106	7.99	16.49
Jackson	NC	370990005	196	10.29	14.24
Swain	NC	371730002	74	21.04	24.33
Oconee	SC	450730001	184	6.27	10.29
Blount	TN	470090101	196	-3.57	11.37
Blount	TN	470090102	80	24.89	28.26
Hamilton	TN	470650028	93	2.88	13.42
Hamilton	TN	470651011	118	12.34	16.68
Meigs	TN	471210104	98	11.38	15.92
Rutherford	TN	471490101	105	-0.05	11.91
Sevier	TN	471550101	196	-8.36	12.74
Sevier	TN	471550102	196	-7.57	11.04

Table A-8b: Episode Average Mean Normalized Bias and Error in daily 8-hour peak ozone Concentration at Monitoring Stations Located within the 4-Km Modeling grid

County Name	State Name	AIRS ID	Number of days	Mean Normalized Bias in peak prediction	Mean Normalized Error in peak prediction
Clay	AL	10270001	7	-1.33	2.95
Jefferson	AL	10732006	7	-3.42	9.52
Jefferson	AL	10735002	7	-1.07	9.53
Jefferson	AL	10736002	7	2.91	14.14
Madison	AL	10890014	7	2.68	7.87
Shelby	AL	11170004	7	1.36	8.81
Cherokee	GA	130570001	7	74.25	74.25
Cobb	GA	130670003	7	2.2	5.67
Coweta	GA	130770002	7	-5.69	8.04
Dawson	GA	130850001	7	20.2	20.2
De	GA	130890002	7	3.48	13.49
De	GA	130893001	7	7.56	14.07
Douglas	GA	130970004	7	3.71	16.16
Fayette	GA	131130001	3	-0.87	10.9
Fulton	GA	131210055	6	6.84	9.75
Gwinnett	GA	131350002	7	2.68	7.42
Henry	GA	131510002	7	-15.04	16.58
Murray	GA	132130003	7	-4.95	5.21
Paulding	GA	132230003	7	9.62	14.91
Rockdale	GA	132470001	7	-3.66	12.26
Jackson	NC	370990005	7	4.8	7.75
Swain	NC	371730002	7	13.28	13.28
Oconee	SC	450730001	6	6	6
Blount	TN	470090101	7	-7.84	9.69
Blount	TN	470090102	7	12.41	12.41
Hamilton	TN	470650028	7	1.24	11.93
Hamilton	TN	470651011	7	8.33	12.8
Meigs	TN	471210104	7	2.47	7.07
Rutherford	TN	471490101	7	-8.5	8.5
Sevier	TN	471550101	7	-8.74	8.94
Sevier	TN	471550102	7	-12.87	12.87

ATTACHMENT B: Letters of Support from Catoosa and Walker Counties

CATOOSA COUNTY BOARD OF COMMISSIONERS
7694 Nashville Street
Ringgold, Georgia 30736
Phone (706) 965-2500
Fax (706) 965-5107

December 23, 2002

Mr. Harold Reheis
Director, Georgia Environmental Protection Division
205 Jesse Hill, Jr. Drive, SE, Suite 1152
Atlanta, GA 30334-4100

Dear Mr. Reheis:

A request was made of Catoosa County to join in "Tennessee's Eight Hour Ozone Early Action Compact for the greater Chattanooga Area" (the "Early Action Compact"). Catoosa County is vitally interested in clean high quality air. The purpose of this letter is to express to you Catoosa County's support for activities to improve the quality of the air in the greater Chattanooga Area of which Catoosa County is a part.

Catoosa County supports the action provided for in the Early Action Compact because it will obtain cleaner air sooner, helping the entire region. Catoosa County will continue to be an active participant and will continue to work with Tennessee on the development of an early action plan for Chattanooga. We understand that Georgia EPD has recommended that none of the Georgia counties that are part of the greater Chattanooga area be designated as nonattainment for the 8-hour ozone standard, and we support that recommendation. Catoosa County feels strongly that it should not be designated as a nonattainment area. By continuing to participate in the local planning process, Catoosa County is not suggesting in any way that Catoosa County should be included in the boundaries of any nonattainment area that is designated for the Chattanooga area.

We trust that this adequately explains Catoosa County's position in support of action to improve air quality and the reasons why it has not joined in the Early Action Compact. If you have any questions concerning this, please contact Bill Allen, the Catoosa County Public Works Administrator.

Very truly yours,

Catoosa County, Georgia

By: Winford H. Long

Mr. Winford Long, Chairman, Board of Commissioners

Bebe Heiskell
Walker County Commissioner

101 South Duke Street
Post Office Box 445
LaFayette, Georgia 30728

RECEIVED
DEC 27 2002
ENVIRONMENTAL PROTECTION DIVISION
DIRECTOR'S OFFICE

December 20, 2002

Mr. Harold Reheis
Director, Georgia Environmental Protection Division
205 Jesse Hill, Jr. Drive, SE, Suite 1152
Atlanta, GA 30334-4100

RECEIVED
JAN 06 2003
AIR PROTECTION BRANCH

Dear Mr. Reheis:

A request was made of Walker County to join in "Tennessee's Eight Hour Ozone Early Action Compact for the greater Chattanooga Area" (the "Early Action Compact"). Walker County is vitally interested in clean high quality air. The purpose of this letter is to express to you Walker County's support for activities to improve the quality of the air in the greater Chattanooga Area of which Walker County is a part.

Walker County supports the action provided for in the Early Action Compact because it will obtain cleaner air sooner, helping the entire region. Walker County will continue to be an active participant and will continue to work with Tennessee on the development of an early action plan for Chattanooga. We understand that Georgia EPD has recommended that none of the Georgia counties that are part of the greater Chattanooga area be designated as nonattainment for the 8-hour ozone standard, and we support that recommendation. Walker County feels strongly that it should not be designated as a nonattainment area. By continuing to participate in the local planning process, Walker County is not suggesting in any way that Walker County should be included in the boundaries of any nonattainment area that is designated for the Chattanooga area.

We trust that this adequately explains Walker County's position in support of action to improve air quality and the reasons why it has not joined in the Early Action Compact. If you have any questions concerning this, please contact Mr. David Ashburn, the Walker County Coordinator.

Very truly yours,

Walker County, Georgia

By: Bebe Heiskell
Ms. Bebe Heiskell, Sole Commissioner

Phone: (706) 638-1437 • Fax: (706) 638-1453 • www.co.walker.ga.us

ATTACHMENT C: Highway Mobile Source Documentation

C. Mobile Source Activity and Controls

The Georgia Environmental Protection Division (EPD) supplied the air quality modelers with motor vehicle activity data -- vehicle miles traveled (VMT) and speeds -- from two sources: respectively, the Georgia Department of Transportation (GDOT) and the Atlanta Regional Commission (ARC). The information was provided at the county and Federal Highway Administration (FHWA) Highway Performance Monitoring System (HPMS) functional classification level of detail. There are typically 12 HPMS functional classifications, shown below with their respective numerical HPMS codes:

1	Rural Interstate
2	Rural Principal Arterial
6	Rural Minor Arterial
7	Rural Major Collector
8	Rural Minor Collector
9	Rural Local
11	Urbanized Interstate
12	Urbanized Freeway and Expressway
14	Urbanized Principal Arterial
16	Urbanized Minor Arterial
17	Urbanized Collector
19	Urbanized Local

In addition to VMT and speeds, EPD provided the modelers with MOBILE6[8] inputs and supporting files containing other information needed to develop mobile source emissions inventories.

C.1 Vehicle Miles Traveled

The annual average daily vehicle miles traveled (AADVMT) estimates that GDOT reports to FHWA every year as part of HPMS include a third area type, "small urban." Per GDOT, the VMT for the "Small Urban" and "Rural" classifications were combined as follows to get the usual 12 functional classifications:

1	Rural Interstate = Rural Interstate + Small Urban Interstate + Small Urban Freeway
2	Rural Principal Arterial = Rural Principal Arterial + Small Urban Principal Arterial
6	Rural Minor Arterial = Rural Minor Arterial + Small Urban Minor Arterial
8	Rural Minor Collector = Rural Minor Collector + Small Urban Collector
9	Rural Local = Rural Local + Small Urban Local

The 2000 VMT supplied were summer-adjusted versions of the "actual" 2000 VMT from GDOT's "445 report" for 2000, available here:
http://www.dot.state.ga.us/dot/plan-prog/transportation_data/400reports/index.shtml

[8] The U.S. Environmental Protection Agency's mobile source emission factor model, http://www.epa.gov/otaq/m6.htm#m60

The VMT in the "445 reports" are count-based estimates that are reported to FHWA each year[9] as part of HPMS. The summer-adjustment factors used were provided by GDOT.

The VMT for 2007 and 2012 were forecast using the linear regression methodology described in section 4.3 of the U.S. Environmental Protection Agency's (EPA) Section 187 guidance,[10] with summer-adjusted 1996 through 2001 "actual" VMT substituted for 1985 through 1990 VMT. Zeroes were entered where the regression generated negative VMT values.

C.2 Speeds

The speeds processing guidance used for the county-and-functional-classification-level MOBILE6 input files was the "Highway Performance Monitoring System (HPMS) Roadway Classification Approach," described below, from EPA's "Volume IV" guidance: [11]

"[U]se FHWA's Highway Performance Monitoring System (HPMS) roadway classification scheme to group portions of VMT by the functional classification of the roadways on which they occur. This results in 12 subsets of VMT. Within each subset, speed is weighted by VMT to calculate an average speed...."

The speeds supplied to the modelers were VMT-weighted averages of congested link speeds from travel demand model loaded highway networks (with HPMS codes added) received from ARC in the fall of 2002. These loaded network files had been exported from a significantly revised and updated travel demand model used for the Limited Update to the 2025 Regional Transportation Plan (RTP). The link-level speeds in these networks reflect the results of both a fall 2000 nonattainment area speed study[12] and a second study[13] conducted in the fall of 2001. The networks were processed to:

a. Apply an HPMS adjustment factor (HPMS VMT / travel model VMT = adjustment factor) to the volume on each link;
b. Calculate the VMT on each link; and
c. VMT-weight the congested speeds on each link into average speeds by HPMS functional classification.

---

[9] A state's HPMS data are required to be submitted annually, by June 15 of the year following the data year, and to represent conditions through December 31 of the data year.
[10] *Section 187 VMT Forecasting and Tracking Guidance*, US EPA, January 1992, http://www.epa.gov/oms/transp/vmttrack/vmtguide.zip
[11] *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, EPA-420-R-92-009, US EPA, Office of Air and Radiation, Office of Mobile Sources, 1992 (http://www.epa.gov/otaq/invntory/r92009.pdf), section 3.3.5.1.
[12] A report on the 2000 speed study is available here: http://www.dnr.state.ga.us/dnr/environ/plans_files/plans/Speed_Study.pdf
[13] A technical memorandum on the 2001 speed study is available here: http://www.dnr.state.ga.us/dnr/environ/plans_files/plans/ARC_2001_pbsj_speedstudyTechMemo.pdf

Where necessary, speeds were interpolated between those from available network years. Due to the absence of speeds data elsewhere in the state, the nonattainment area speeds were used statewide.

C.3 Mobile Source Controls Modeled

The MOBILE6 inputs[14] provided to the air quality modelers specified the mobile source emissions controls in the state of Georgia.

In 1999 and 2000, there were three "mobile source control areas" in Georgia:

a. The 13-county Atlanta one-hour ozone nonattainment area, where controls included an enhanced vehicle inspection and maintenance (I/M) program, Stage II gasoline vapor recovery and Phase 1 Georgia gasoline;[15]
b. 12 attainment area counties around Atlanta where Phase 1 Georgia gasoline was required as of 1999; and
c. The rest of the state (134 counties).

The enhanced I/M program in 1999 was a biennial program covering 1975 and newer gasoline-powered cars and light trucks (the MOBILE6 aggregated vehicle types LDGV, LDGT12, and LDGT34).[16] Vehicles of the newest two model years were exempt from inspection. "Newer vehicles," those six model years through three model years old, were tested with a 2500 rpm/idle inspection. Older vehicles, those of model years 1975 through seven models years old, were tested with a single mode ASM (acceleration simulation mode) test. All vehicles were given a gas cap pressure test and a check for catalytic converter tampering.

Annual inspections began in calendar year (CY) 2000. Beginning in CY 2001, the new-vehicle exemption from testing was extended from the two newest to the three newest model years and "newer vehicles" were redefined as 1996 and newer model years. In CY 2002, single-mode ASM on "older vehicles" (1995 and older) was replaced with 2-mode ASM. Newer vehicles were tested with an onboard diagnostics (OBD II) test.

The vehicles covered by I/M are effectively those in a 25-model-year "rolling window" because "an antique or collector car or truck 25 years old and older" is exempt from inspection [Enhanced Inspection and Maintenance Rules, Chapter 391-3-20-.03(9)(b)]. However, from CY 2000 on there is no difference in emission factors whether specifying that 1975 and newer vehicles are subject or that vehicles 25 model years old and older are exempt -- MOBILE6 only calculates emission factors for, effectively, 25 model years.

---

[14] These inputs files were subsequently edited and reformatted by the air quality modelers to incorporate updated information and to meet the requirements of SMOKE, the emissions processing software they used.
[15] Phase 1 gasoline was a state program to limit the sulfur content and Reid vapor pressure (RVP) of gasoline in June, July, August, and September. Sulfur was limited to a 150 parts per million (ppm) average and RVP to 7.0 pounds per square inch (psi).
[16] LDGV = passenger cars, LDGT12 = "light trucks" up to 6000 pounds gross vehicle weight rating (GVWR), and LDGT34 = light trucks 6001 to 8500 GVWR.

The Federal Information Processing Standards (FIPS) codes[17] and names of the 13 nonattainment area counties under the one-hour ozone national ambient air quality standard (NAAQS) are shown below:

13057 Cherokee
13063 Clayton
13067 Cobb
13077 Coweta
13089 DeKalb
13097 Douglas
13113 Fayette
13117 Forsyth
13121 Fulton
13135 Gwinnett
13151 Henry
13223 Paulding
13247 Rockdale

Besides the nonattainment area counties listed above, the 25 counties with Phase 1 Georgia gasoline in 1999 included the following 12 attainment counties:

13013 Barrow
13015 Bartow
13035 Butts
13045 Carroll
13085 Dawson
13139 Hall
13143 Haralson
13157 Jackson
13217 Newton
13227 Pickens
13255 Spalding
13297 Walton

Phase 2 Georgia gasoline[18] will begin in time for ozone season 2004. The 20 additional attainment area counties subject to Phase 2 Georgia gasoline regulation are:

13011 Banks
13055 Chattooga
13059 Clarke
13115 Floyd
13129 Gordon
13149 Heard
13159 Jasper
13169 Jones
13171 Lamar
13187 Lumpkin

[17] http://www.census.gov/geo/www/fips/fips.html
[18] Phase 2 gasoline includes an expansion to 20 additional attainment counties, an annual average sulfur level of 30 ppm, and a seasonal RVP limit of 7.0 psi.

13191 Madison
13199 Meriwether
13207 Monroe
13211 Morgan
13219 Oconee
13231 Pike
13233 Polk
13237 Putnam
13285 Troup
13293 Upson

Because Atlanta failed to attain the 1-hour ozone NAAQS by November 15, 1999, the area was reclassified[19] from a "serious" to a "severe" ozone nonattainment area effective January 1, 2004. One year later, federal reformulated gasoline (RFG) will be required in the 13-county nonattainment area.

C.4 Fleet Age Distribution

In 2000, EPD had a 13-county local vehicle age distribution by age extracted from a 1999 vehicle registration database received from the Georgia Department of Revenue, Division of Motor Vehicles. The extraction involved designating vehicles in the registration data to MOBILE5 categories using weight, fuel, and general vehicle type. These characteristics were derived in part by decoding the vehicle identification number (VIN), a 17-character string embedded with codes representing individual vehicle specifications. For details of the development of the 1999 registration distribution by age, see "Vehicle Registration Records Analysis and Model Year Distribution Report" (http://www.dnr.state.ga.us/dnr/environ/plans_files/plans/Registration_Distribution.pdf). Comments on the report from a consultant to litigants and responses to those comments can be found here:
http://www.dnr.state.ga.us/dnr/environ/plans_files/plans/Registration_Distribution_comments.pdf
In response to one comment, that there are only 6,031 heavy-duty diesel vehicles (HDDVs) among the 3.5 million vehicles in the database and that EPA guidance recommends use of MOBILE defaults in "areas having relatively few local HDDV registrations, but significant interstate trucking activity within the local area," EPD retained the MOBILE5b default registration distribution by age for HDDVs. The MOBILE5 format local age distribution was then converted to MOBILE6 format using the methodology in section 5.3.2 of the MOBILE6 user guide.

Default registration distribution by age was used outside the 13-county nonattainment area.

[19] EPA's final rulemaking action was published in the September 26, 2003, Federal Register (68 FR 55469).

C.5 Transportation Conformity

Because the requirements of EPA's transportation conformity rule (40 CFR Parts 51 and 93)[20] will not apply to early action compact (EAC) areas that meet their milestones, no motor vehicle emissions budgets are being established with this SIP revision.

This quote from section III. C. of EPA's proposed "Transportation Conformity Rule Amendments for the New 8-Hour Ozone and PM2.5 National Ambient Air Quality Standards and Miscellaneous Revisions for Existing Areas [68 FR 62690, November 5, 2003]" describes EPA's plans for the applicability of transportation conformity in EAC areas:

> "For areas participating in an EAC, EPA plans to provisionally defer the effective date of the area's 8-hour ozone nonattainment designation into the future. The deferral of the 8-hour designation effective date is contingent upon the participating area's adherence to all the terms and milestones of its EAC. If the EAC area attains the 8-hour ozone standard by December 2007, EPA would take action in Spring 2008 to end the deferred nonattainment designation effective date and replace it with an attainment designation that would become effective shortly thereafter. If, however, an area misses a key EAC milestone, ...EPA would retract its deferral, and the nonattainment designation would be effective shortly after the missed milestone...
>
> A deferred effective date for 8-hour ozone designations in areas that opted into an EAC has certain implications for when conformity applies for both the 8-hour and 1-hour ozone standards. Consistent with the current conformity rule § 93.102(d) and Clean Air Act section 176(c)(6), conformity for the 8-hour ozone standard would not apply until one year after the effective date of an EAC area's 8-hour nonattainment designation. Therefore, conformity for the 8-hour ozone standard would apply in an EAC area only if the area fails to meet all the terms and milestones of its compact and the nonattainment designation becomes effective. In this case, conformity for the 8-hour standard would be required one year after the effective date of EPA's nonattainment designation that would occur shortly after a missed EAC milestone. Conversely, if the area meets all of the EAC milestones and attains the 8-hour ozone standard by December 2007, conformity for the 8-hour ozone standard would never apply since the area's ultimate effective designation would be attainment for the 8-hour ozone standard."

[20] http://www.epa.gov/fedrgstr/EPA-AIR/1997/August/Day-15/a20968.htm

ATTACHMENT D: Public Notices

CORRECTION NOTICE FOR LEGAL AD #WM933 PUBLISHED 11/17/04

DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION NOTICE OF PROPOSED STATE IMPLEMENTATION PLAN
AND NOTICE OF PUBLIC HEARING TO ALL INTERESTED PERSONS AND PARTIES:

Notice is hereby given that, pursuant to the authority set forth below, the Environmental Protection Division (hereinafter, "EPD") of the Georgia Department of Natural Resources proposes a State Implementation Plan (SIP) for proactively reducing ozone levels in the Catoosa and Walker County portion of the Chattanooga area for the purpose of achieving the eight-hour ozone National Ambient Air Quality Standard (NAAQS) in the Chattanooga Ozone Nonattainment area, which includes Catoosa County.

On December 24, 2002, Georgia EPD submitted to the Environmental Protection Agency (hereinafter, "EPA") Letters of Support from Catoosa and Walker Counties supporting Tennessee's 8-hour Ozone Early Action Compact (EAC) for the greater Chattanooga 8-hour Ozone non-attainment area. The EAC is a Memorandum of Agreement between the local governments, EPD, and the EPA. The purpose of the EAC is to incorporate early abatement measures for the ozone precursor pollutants, Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx), for early attainment of the NAAQS. With this commitment to the EAC process and timely planning and implementation of these measures, the EPA will defer the mandatory nonattainment area requirements.

For Catoosa and Walker Counties, these measures include Stage I Gasoline Vapor Recovery for the reduction of VOCs and a seasonal Open Burning Ban for the reduction of both VOCs and NOx during the months of May through September of each year. The rules pertaining to these measures have already been proposed and the public comment period has ended. Comments are now being reviewed, with the rules scheduled to be adopted by the Board of Natural Resources on December 7, 2004. The full EAC SIP, which details how these measures will contribute to early attainment of the 8-hour ozone standard, is to be submitted to EPA by December 31, 2004.

The notice, together with an exact copy of the proposed Chattanooga EAC SIP may be viewed at http://www.air.dnr.state.ga.us/airpermit/. A copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours of 8:00 a.m. to 4:30 p.m. at the Georgia Environmental Protection Division, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354. In addition, a copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours at the Catoosa Public Library, 108 Catoosa Circle, Ringgold Georgia 30736, and the LaFayette Walker County Library, 305 South Duke Street, LaFayette, Georgia 30728. Copies may also be requested by contacting the Air Protection Branch at 404/363-7000. To provide the public an opportunity to comment upon and provide input into the proposed EAC, a public hearing will be held at 7:00 p.m. on December 21, 2004, at the Walker County Civic Center, 10052 Highway 27, Rock Spring, Georgia 30739. At the public hearing anyone may present data, make a statement, comment or offer a viewpoint or argument either orally or in writing. Lengthy statements or statements of a considerable technical or economic nature, as well as previously recorded messages, must be submitted in writing for the official record. Oral statements should be concise. Written comments are welcomed. To ensure their consideration, written comments must be received by close of business on December 21, 2004, or during the public hearing scheduled for the same date. Written comments should be addressed to: Chief, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354. This notice is issued pursuant to authority contained in Georgia Air Quality Act, O.C.G.A. Section 12-9-1 et seq. For further information, contact the Air Protection Branch at 404/363-7000.

CORRECTION NOTICE FOR LEGAL AD #CN1577 PUBLISHED 11/17/04

DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION NOTICE OF PROPOSED STATE IMPLEMENTATION PLAN
AND NOTICE OF PUBLIC HEARING TO ALL INTERESTED PERSONS AND PARTIES:

Notice is hereby given that, pursuant to the authority set forth below, the Environmental Protection Division (hereinafter, "EPD") of the Georgia Department of Natural Resources proposes a State Implementation Plan (SIP) for proactively reducing ozone levels in the Catoosa and Walker County portion of the Chattanooga area for the purpose of achieving the eight-hour ozone National Ambient Air Quality Standard (NAAQS) in the Chattanooga Ozone Nonattainment area, which includes Catoosa County.

On December 24, 2002, Georgia EPD submitted to the Environmental Protection Agency (hereinafter, "EPA") Letters of Support from Catoosa and Walker Counties supporting Tennessee's 8-hour Ozone Early Action Compact (EAC) for the greater Chattanooga 8-hour Ozone non-attainment area. The EAC is a Memorandum of Agreement between the local governments, EPD, and the EPA. The purpose of the EAC is to incorporate early abatement measures for the ozone precursor pollutants, Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx), for early attainment of the NAAQS. With this commitment to the EAC process and timely planning and implementation of these measures, the EPA will defer the mandatory nonattainment area requirements.

For Catoosa and Walker Counties, these measures include Stage I Gasoline Vapor Recovery for the reduction of VOCs and a seasonal Open Burning Ban for the reduction of both VOCs and NOx during the months of May through September of each year. The rules pertaining to these measures have already been proposed and the public comment period has ended. Comments are now being reviewed, with the rules scheduled to be adopted by the Board of Natural Resources on December 7, 2004. The full EAC SIP, which details how these measures will contribute to early attainment of the 8-hour ozone standard, is to be submitted to EPA by December 31, 2004.

The notice, together with an exact copy of the proposed Chattanooga EAC SIP may be viewed at http://www.air.dnr.state.ga.us/airpermit/. A copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours of 8:00 a.m. to 4:30 p.m. at the Georgia Environmental Protection Division, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354. In addition, a copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours at the Catoosa Public Library, 108 Catoosa Circle, Ringgold Georgia 30736, and the LaFayette Walker County Library, 305 South Duke Street, LaFayette, Georgia 30728. Copies may also be requested by contacting the Air Protection Branch at 404/363-7000. To provide the public an opportunity to comment upon and provide input into the proposed EAC, a public hearing will be held at 7:00 p.m. on December 21, 2004, at the Walker County Civic Center, 10052 Highway 27, Rock Spring, Georgia 30739. At the public hearing anyone may present data, make a statement, comment or offer a viewpoint or argument either orally or in writing. Lengthy statements or statements of a considerable technical or economic nature, as well as previously recorded messages, must be submitted in writing for the official record. Oral statements should be concise. Written comments are welcomed. To ensure their consideration, written comments must be received by close of business on December 21, 2004, or during the public hearing scheduled for the same date. Written comments should be addressed to: Chief, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354. This notice is issued pursuant to authority contained in Georgia Air Quality Act, O.C.G.A. Section 12-9-1 et seq. For further information, contact the Air Protection Branch at 404/363-7000.

DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

NOTICE OF PROPOSED STATE IMPLEMENTATION PLAN AND NOTICE OF PUBLIC HEARING

TO ALL INTERESTED PERSONS AND PARTIES:

Notice is hereby given that, pursuant to the authority set forth below, the Environmental Protection Division (hereinafter, "EPD") of the Georgia Department of Natural Resources proposes a State Implementation Plan (SIP) for proactively reducing ozone levels in the Catoosa and Walker County portion of the Chattanooga Ozone Non-attainment Area for the purpose of achieving the eight-hour ozone National Ambient Air Quality Standard (NAAQS).

On December 24, 2002, Georgia EPD submitted to the Environmental Protection Agency (hereinafter, "EPA") a Letter of Support from Catoosa and Walker Counties supporting Tennessee's 8-hour Ozone Early Action Compact (EAC) for the greater Chattanooga 8-hour NAAQS non-attainment area. On March 31, EPD submitted an EAC to EPA for the affected counties. The purpose of the EAC is to incorporate early abatement measures for the ozone precursor pollutants, Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx), for early attainment of the NAAQS. These measures include Stage I Vapor Recovery for the reduction of VOCs and a seasonal Open Burning Ban for the reduction of both VOCs and NOx during the months of May through September of each year. The rules pertaining to these measures are to be adopted by the Board of Natural Resources on December 7, 2004 and an EAC SIP is to be submitted to EPA by December 31, 2004..

The notice, together with an exact copy of the proposed Chattanooga EAC SIP may be viewed at http://www.air.dnr.state.ga.us/airpermit/. A copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours of 8:00 a.m. to 4:30 p.m. at the Georgia Environmental Protection Division, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354. In addition, a copy of this notice, together with an exact copy of the proposed Chattanooga EAC SIP, may be reviewed during normal business hours at the Catoosa Public Library, 108 Catoosa Circle, Ringgold Georgia 30736, and the LaFayette Walker County Library, 305 South Duke Street, LaFayette, Georgia 30728. Copies may also be requested by contacting the Air Protection Branch at 404/363-7000.

To provide the public an opportunity to comment upon and provide input into the proposed Air rule amendments, a public hearing will be held at 7:00 p.m. on December 21, 2004, at the Walker County Civic Center, 10052 Highway 27, Rock Spring, Georgia 30739. At the public hearing anyone may present data, make a statement, comment or offer a viewpoint or argument either orally or in writing. Lengthy statements or statements of a considerable technical or economic nature, as well as previously recorded messages, must be submitted in writing for the official record. Oral statements should be concise.

Written comments are welcomed. To ensure their consideration, written comments must be received by close of business on December 21, 2004, or during the public hearing scheduled for the same date. Written comments should be addressed to: Chief, Air Protection Branch, 4244 International Parkway, Suite 120, Atlanta, Georgia, 30354.

This notice is issued pursuant to authority contained in Georgia Air Quality Act, O.C.G.A. Section 12-9-1 et seq.

For further information, contact the Air Protection Branch at 404/363-7000.

ATTACHMENT E: State Implementation Plan Rule Revisions for Open Burning and Stage I Vapor Recovery

CERTIFICATION OF ADMINISTRATIVE RULES
FILED WITH THE SECRETARY OF STATE
CATHY COX

(Pursuant to O.C.G.A. Secs. 50-13-3-, 50-13-4, 50-13-6.)

I do hereby certify that the attached amendments are correct copies as promulgated a d adopted on the 7th day of December 2004.

GEORGIA DEPARTMENT OF NATURAL RESOURCES

Filed ________________

Rule 391-3-1.01, Rule 391-3-1-.02 and the Procedures for Monitoring and Testing are hereby amended; and read as attached hereto.

Authority: O.C.G.A. Section 12-9-1 et seq.

CAROL A. COUCH, PH.D.
Environmental Protection Division

Sworn to and subscribed before me this 17th day of December 2004.

Notary Public
MY COMMISSION EXPIRES 2/28/06

JOHN G. WALDEN
Legal Executive Assistant

GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

RULES FOR AIR QUALITY CONTROL, CHAPTER 391-3-1

Rule 391-3-1-.02(2) Provisions. Amended.

(2) Emission Limitations and Standards

(pp) Bulk Gasoline Plants.

1. After the compliance date specified in paragraph 6. of this subsection, no owner or operator of a bulk gasoline plant may permit the receiving or dispensing of gasoline by its stationary storage tanks unless:

   (i) Each tank is equipped with a submerged fill pipe, approved by the Director; or

   (ii) Each tank is equipped with a fill line whose discharge opening is at the tank bottom.

   (iii) Each tank has a vapor balance system consisting of the following major components:

      (I) A vapor space connection on the stationary storage tank equipped with fittings which are vapor tight and will automatically and immediately close upon disconnection so as to prevent release of gasoline or gasoline vapors; and

      (II) A connecting pipe or hose equipped with fittings which are vapor tight and will automatically and immediately close upon disconnection so as to prevent release of gasoline or gasoline vapors.

2. After the compliance date specified in paragraph 6. of this subsection, no owner or operator of a bulk gasoline plant, or the owner or operator of a tank truck or trailer may permit the transfer of gasoline between the tank truck or trailer and stationary storage tank unless:

   (i) The vapor balance system is in good working order and is connected and operating;

   (ii) The gasoline transport vehicle is maintained to prevent the escape of fugitive vapors and gasses during loading operations;

   (iii) A means is provided to prevent liquid drainage from the loading device when it is not in use or to accomplish complete drainage before the loading device is disconnected; and

(iv) The pressure relief valves on storage vessels and tank trucks or trailers are set to release at 0.7 psia or greater unless restricted by state or local fire codes or the National Fire Prevention Association guidelines in which case the pressure relief valve must be set to release at the highest possible pressure allowed by these codes or guidelines.

3. The requirements of this subsection shall not apply to stationary storage tanks of less than 2,000 gallons.

4. Sources and persons affected under this subsection shall comply with the vapor collection and control system requirements of subsection 391-3-1-.02(2)(ss).

5. For the purpose of this subsection, the following definitions shall apply:

(i) “Bottom filling” means the filling of a tank truck or stationary storage tank through an opening that is located at the tank bottom.

(ii) “Bulk gasoline plant” means a gasoline storage and distribution facility with an average daily throughput of more than 4,000 gallons but less than 20,000 gallons which receives gasoline from bulk terminals by rail and/or trailer transport, stores it in tanks, and subsequently dispenses it via account trucks to local farms, businesses, and service stations.

(iii) “Bulk gasoline terminal” means a gasoline storage facility which receives gasoline from refineries primarily by pipeline, ship, or barge, and delivers gasoline to bulk gasoline plants or to commercial or retail accounts primarily by tank truck and has an average daily throughput of more than 20,000 gallons of gasoline.

(iv) “Gasoline” means any petroleum distillate having a Reid vapor pressure of 4.0 psia or greater.

(v) “Submerged filling,” means the filling of a tank truck or stationary tank through a pipe or hose whose discharge opening is not more than six inches from the tank bottom.

(vi) “Vapor balance system” means a combination of pipes or hoses that create a closed system between the vapor spaces of an unloading tank and a receiving tank such that vapors displaced from the receiving tank are transferred to the tank being unloaded.

6. Compliance Dates.

(i) All bulk gasoline plants located in Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding and Rockdale counties shall be in compliance.

(ii) All bulk gasoline plants located in Catoosa, Richmond and Walker counties shall be in compliance with this subsection by May 1, 2006.

6. For the purpose of this subsection "Stationary Storage Tank" means all underground vessels and any aboveground vessels never intended for mobile use.

Authority: O.C.G.A. Section 12-9-1 et seq., as amended.

(rr) Gasoline Dispensing Facility - Stage I.

1. After the compliance date specified in paragraph 2. of this subsection, no person may transfer or cause or allow the transfer of gasoline from any delivery vessel into any stationary storage tank subject to this subsection, unless:

(i) The tank is equipped with all of the following:

(I) A submerged fill pipe; and

(II) A Division approved Stage I vapor recovery system that shall remain in good working condition, such as keeping the vapor return opening free of liquid or solid obstructions, and that also shall be leak tight as determined by tests conducted in accordance with test procedures as approved by the Division; and

(III) Vents that shall be at least 12 feet in height from the ground and shall have a Pressure/Vacuum vent valve with minimum settings of 8 ounces of pressure and 1/2 ounce of vacuum unless the facility has a CARB certified Stage II vapor recovery system where the CARB executive order explicitly states the settings for the vent valve; and

(ii) The vapors displaced from the storage tank during filling are controlled by one of the following:

(I) A vapor-tight vapor return line from the stationary gasoline storage tank(s) to the delivery vessel for each product delivery line that is connected from the delivery vessel to the storage tank(s) and a system that will ensure the vapor line(s) is connected before gasoline can be transferred into the tank(s); or

(II) If a manifold connects all stationary gasoline storage tanks vent lines, a vapor tight vapor return line from a tank being filled to the delivery vessel with sufficient return capacity to control vapors from all tanks being filled at the time and to prevent release of said vapors from the vent line(s) or other tank openings; or

(III) A refrigeration-condensation system or a carbon adsorption system is utilized and recovers at least 90 percent by weight of the organic compounds in the displaced vapor.

2. Compliance Dates.

(i) All gasoline dispensing facilities located in Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding and Rockdale counties shall be in compliance.

(ii) All gasoline dispensing facilities located in Catoosa, Richmond and Walker counties that dispense more than 50,000 gallons of gasoline per month shall be in compliance with this subsection by May 1, 2006.

(iii) All gasoline dispensing facilities located in Catoosa, Richmond and Walker counties that dispense 50,000 gallons or less of gasoline per month shall be in compliance with this subsection by May 1, 2007.

3. For the purpose of this subsection, the following definitions shall apply:

(i) "Gasoline" means a petroleum distillate having a Reid vapor pressure of 4.0 psia or greater.

(ii) "Delivery vessel" means tank trucks or trailers equipped with a storage tank and used for the transport of gasoline from sources of supply to stationary storage tanks of gasoline dispensing facilities.

(iii) "Submerged fill pipe" means any fill pipe with a discharge opening which is within a nominal distance of 6 inches from the tank bottom.

(iv) "Gasoline dispensing facility" means any site where gasoline is dispensed to motor vehicle gasoline tanks from stationary storage tanks.

(v) "Stationary storage tank" means all underground vessels and any aboveground vessels never intended for mobile use.

(vi) "CARB" means the California Air Resources Board.

(vii) "Division approved" means any Stage I gasoline vapor recovery system properly certified under the CARB vapor recovery certification procedures effective on or before March 31, 2001, excepting the coaxial drop tube requirement exempted by paragraph 6., or any Stage I gasoline vapor recovery system properly certified under the CARB enhanced vapor recovery certification procedures effective April 1, 2001, or any Stage I gasoline vapor recovery system whose design has been submitted to the Division, has passed any required certification tests, and has received a written approval from the Division. The submitted design shall include but may not be limited to drawings detailing all components of the system and a written narrative describing the components and their use. Mixing of equipment components certified under separate certification procedures may be allowed when supported by manufacturer or independent third-party certification that the configuration meets or exceeds the applicable performance standards and has received prior written approval from the Division.

4. The requirements contained in this subsection shall apply to all stationary storage tanks with capacities of 2,000 gallons or more which were in place before January 1, 1979, and stationary storage tanks with capacities of 250 gallons or more which were in place after December 31, 1978, located at gasoline dispensing facilities located in those counties of Catoosa, Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, Richmond, Rockdale and Walker.

5. The requirements of this subsection shall not apply to stationary storage tanks of less than 550 gallons capacity used exclusively for the fueling of implements of husbandry or to gasoline dispensing facilities that dispense no more than 10,000 gallons of gasoline per month, provided the tanks are equipped with submerged fill pipes.

6. Stage I gasoline vapor recovery systems installed prior to January 1, 1993 that currently utilize a co-axial Stage I vapor recovery system in which the gasoline tanks are not manifolded in any manner and that are utilized at a facility that is not required to have a Stage II vapor recovery system shall be exempted from installing a co-axial poppetted drop tube.

7. All Stage I vapor recovery systems at gasoline dispensing facilities shall be certified by the equipment owner as being properly installed and properly functioning. Certification testing shall be conducted by a qualified technician who has a thorough knowledge of the system. Tests shall be conducted in accordance with test procedures as approved by the Division. The fill cap and vapor cap must be removed when performing certification testing.

8. Testing may be conducted by the Division or by an installation or testing company that meets the minimum criteria established by the Division for conducting such tests. In the case where a party other than the Division will be conducting the testing, the owner or

operator shall notify the Division at least five days in advance as to when the testing will occur and what party will conduct the testing.

9. Certification and recertification testing and compliance reporting.

(i) For those gasoline dispensing facilities subject to Chapter 391-3-1-.02(2)(zz) Gasoline Dispensing Facilities - Stage II, no additional certification or recertification testing or compliance reporting will be required under paragraph 7.

(ii) Certification and recertification testing and compliance reporting for all other Stage I systems shall be required according to the following schedule:

(I) Certification testing will be required on or before December 31, 2002, for all existing Stage I systems, or within 30 days of system installation for new systems.

(II) Recertification testing will be required every five years following the initial certification.

(III) Compliance reporting shall be required within 30 days of the certification or recertification test. This report shall be submitted to the Division and shall include results of either:

I. A vapor tightness test as required by the Division; or

II. A procedure or procedures equivalent to 1. above as approved by the Division.

10. Facilities equipped with Stage I vapor controls shall be subject to annual compliance inspections and functional testing by the Environmental Protection Division personnel which include but are not limited to the following:

(i) Verification that all equipment is present and maintains a certified system configuration.

(ii) Inspection of all Stage I related files to ensure that the facility has complied with maintenance requirements and other record keeping requirements such as inspection, compliance and volume reports.

(iii) Observation of the use of equipment by facility operators and product suppliers.

(iv) Verification that the facility has complied with the vapor recovery testing requirements.

11. The owner or operator shall maintain the Stage I vapor recovery system in proper operating condition as specified by the manufacturer and free of defects that could impair the effectiveness

of the system. For the purposes of this paragraph, the following is a list of equipment defects in Stage I vapor recovery systems that substantially impair the effectiveness of the systems in reducing gasoline bulk transfer vapor emissions:

(i) Absence or disconnection of any component that is a part of the approved system;

(ii) Pressure/vacuum relief valves or dry breaks that are inoperative; and

(iii) Any visible product leaks.

12. Upon identification of any of the defects as described above, the owner or operator shall immediately schedule and implement repair, replacement or adjustment by the company's repair representative as necessary.

13. The following records shall be maintained on-site for two years:

(i) Maintenance records including any repaired or replacement parts and a description of the problems;

(ii) Compliance records including warnings or notices of violation issued by the Division; and

(iii) Gasoline throughput records that will allow the average monthly gasoline throughput rate to be continuously determined.

14. Record disposal may be approved by the Division upon a written request by the owner or operator of the facility. Approval may be granted on a case-by-case basis considering volume of records, number of times the records have been inspected by the Division; and the value of maintaining the records. In no case, shall the time be extended beyond the requirements of this subsection.

Authority: O.C.G.A. Section 12-9-1 et seq., as amended.

(ss) Gasoline Transport Vehicles and Vapor Collection Systems.

1. After the compliance date specified in paragraph 3. of this subsection, no person shall cause, let, permit, suffer, or allow the loading or unloading of gasoline from a gasoline transport vehicle of any size capacity unless:

(i) The tank sustains a pressure change of not more than 3 inches of water in 5 minutes when pressurized to 18 inches of water and evacuated to 6 inches of water as tested at least once per year in accordance with test procedures specified by the Division;

(ii) Displays a marking on the right front (passenger) side of the tank, in characters at least 2 inches high, which reads either P/V TEST DATE or EPA27 and the date on which the gasoline transport tank was last tested;

(iii) The tank has no visible liquid leaks and no gasoline vapor leaks as measured by a combustible gas detector;

(iv) The owner or operator of the gasoline transport vehicle has submitted to the Division within 30 days of the test date a data sheet in the format specified by the Division containing at a minimum the following information: name of person(s) or company that conducted the test, date of test, test results including a list of any repairs made to the transport vehicle to bring it into compliance and the manufacturer's vehicle identification number (VIN) of the tank truck or frame number of a trailer-mounted tank; and

(v) The transport vehicle has been equipped with fittings which are vapor tight and will automatically and immediately close upon disconnection so as to prevent release of gasoline or gasoline vapors, with a vapor return line and hatch seal designed to prevent the escape of gasoline or gasoline vapors while loading.

2. The owner or operator of a vapor collection or control system shall:

(i) Design and operate the vapor collection and control system and the gasoline loading equipment in a manner that prevents:

(I) Gauge pressure from exceeding 18 inches of water and vacuum from exceeding 6 inches of water in the gasoline tank truck;

(II) A reading equal to or greater than 100 percent of the lower explosive limit (LEL, measured as propane) at 1 inch from all points on the perimeter of a potential leak source when measured (in accordance with test procedures specified by the Division) during loading or unloading operations at gasoline dispensing facilities, bulk gasoline plants and bulk gasoline terminals; and

(III) Avoidable visible liquid leaks during loading and unloading operations at gasoline dispensing facilities, bulk gasoline plants and bulk gasoline terminals.

(ii) Within 15 days, repair and retest a vapor collection or control system that exceeds the limits in (i) above.

3. Compliance Dates.

(i) All gasoline transport vehicles and vapor collection systems operating in Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding and Rockdale counties shall be in compliance.

(ii) All gasoline transport vehicles and vapor collection systems operating in Catoosa, Richmond and Walker counties shall be in compliance with this subsection by May 1, 2006.

4. The Division may require a pressure/vacuum retest or leak check for any transport vehicle or vapor collection or control system subject to this subsection.

(i) A transport vehicle or vapor collection or control system for which the Division has required a pressure/vacuum retest or leak check shall:

(I) Cease loading and unloading operations within fourteen (14) days of the date of the initial retest or leak check request unless the retest or leak check has been completed to the satisfaction of the Division;

(II) Provide written advance notification to the Division of the scheduled time and place of the test in order to provide the Division an opportunity to have an observer present; and

(III) Supply a copy of the results of all such tests to the Division within 30 days of the test date.

5. For the purpose of this subsection, the following definitions shall apply:

(i) “Combustible Gas Detector” means a portable VOC gas analyzer with a minimum range of 0-100 percent of the LEL as propane.

(ii) “Gasoline Transport Vehicle” means any mobile storage vessel including tank trucks and trailers used for the transport of gasoline from sources of supply to stationary storage tanks of gasoline dispensing facilities, bulk gasoline plants or bulk gasoline terminals.

(iii) “Gasoline Vapor Leak” means a reading of 100 percent or greater of the Lower Explosive Limit (LEL) of gasoline when measured as propane at a distance of one inch.

(iv) “Vapor Collection System” means a vapor transport system, including any piping, hoses and devices, which uses direct displacement by the gasoline being transferred to force vapors from the vessel being loaded into either a vessel being unloaded or vapor control system or vapor holding tank.

(v) “Vapor Control System” means a system, including any piping, hoses, equipment and devices, that is designed to control the release of volatile organic compounds displaced from a vessel during transfer of gasoline.

6. The requirements of this subsection shall apply only to those transport vehicles which load or unload gasoline at bulk gasoline terminals, bulk gasoline plants, and gasoline dispensing facilities subject to VOC vapor control requirements contained in other subsections of this Rule.

Authority: O.C.G.A. Section 12-9-1 et seq., as amended.

(5) Open Burning.

(a) No person shall cause, suffer, allow, or permit open burning in any area of the State except as follows:

1. Reduction of leaves on the premises on which they fall by the person in control of the premises, unless prohibited by local ordinance and/or regulation.

2. Carrying out recognized agricultural procedures necessary for production or harvesting of crops.

3. The “prescribed burning” of any forest land by the owners or the owner’s designee.

4. The “slash burning” of any forest land by the owners or the owner’s designee.

5. For recreational purposes or cooking food for immediate human consumption.

6. Fires set for purposes of training fire-fighting personnel when authorized by the appropriate governmental entity.

7. Acquired structure burns provided that an Authorization to Burn certificate has been issued by the Division.

8. Disposal of vegetative debris from storm damage.

9. For weed abatement, disease, and pest prevention.

10. Operation of devices using open flames such as tar kettles, blow torches, welding torches, portable heaters and other flame-making equipment.

11. Open burning for the purpose of land clearing or construction or right-of-way maintenance provided the following conditions are met:

    (i) Prevailing winds at the time of the burning are away from the major portion of the area's population;

    (ii) The location of the burning is at least 1,000 feet from any occupied structure, or lesser distance if approved by the Division;

    (iii) The amount of dirt on or in the material being burned is minimized;

    (iv) Heavy oils, asphaltic materials, items containing natural or synthetic rubber, or any materials other than plant growth are not being burned; and

    (v) No more than one pile 60 feet by 60 feet, or equivalent, is being burned within a 9-acre area at one time.

12. Disposal of all packaging materials previously containing explosives, in accordance with U.S. Department of Labor Safety Regulations.

13. Open burning of vegetative material for the purpose of land clearing using an air curtain destructor provided the following conditions are met:

    (i) Authorization for such open burning is received from the fire department, if required, having local jurisdiction over the open burning location prior to initiation of any open burning at such location;

    (ii) The location of the air curtain destructor is at least 300 feet from any occupied structure or public road. Air curtain destructors used solely for utility line clearing or road clearing may be located at a lesser distance upon approval by the Division;

(iii) No more than one air curtain destructor is operated within a ten (10) acre area at one time or there must be at least 1000 feet between any two air curtain destructors;

(iv) Only wood waste consisting of trees, logs, large brush and stumps which are relatively free of soil are burned in the air curtain destructor;

(v) Tires or other rubber products, plastics, heavy oils or asphaltic based or impregnated materials are not used to start or maintain the operation of the air curtain destructor;

(vi) The air curtain destructor is constructed, installed and operated in a manner consistent with good air pollution control practice for minimizing emissions of fly ash and smoke;

(vii) The cleaning out of the air curtain destructor pit is performed in a manner to prevent fugitive dust; and

(viii) The air curtain destructor cannot be fired before 10:00 a.m. and the fire must be completely extinguished, using water or by covering with dirt, at least one hour before sunset.

(b) Specific County Restrictions.

1. In the counties of Bartow, Carroll, Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Hall, Henry, Newton, Paulding, Rockdale, Spalding and Walton, the only legal exceptions to the general prohibition against open burning during the months of May, June, July, August and September shall be exceptions numbers 2, 5, 6, 10 and 12 under subsection (a) above provided, however, that such burning, whenever feasible, be conducted between 10:00 a.m. and one hour before sunset.

2. In the counties of Banks, Barrow, Butts, Chattooga, Clarke, Dawson, Floyd, Gordon, Haralson, Heard, Jackson, Jasper, Jones, Lamar, Lumpkin, Madison, Meriwether, Monroe, Morgan, Oconee, Pickens, Pike, Polk, Putnam, Troup and Upson, the only legal exceptions to the general prohibition against open burning during the months of May, June, July, August and September shall be exceptions numbers 2, 3, 5, 6, 10 and 12 under subsection (a) above provided, however, that such burning, whenever feasible, be conducted between 10:00 a.m. and one hour before sunset.

3. In the counties of Bibb, Catoosa, Columbia, Crawford, Houston, Peach, Richmond, Twiggs, and Walker, the only legal exceptions to the general prohibition against open burning during the months of May, June, July, August and September shall be exceptions

numbers 2, 3, 4, 5, 6, 10 and 12 under subsection (a) above provided, however, that such burning, whenever feasible, be conducted between 10:00 a.m. and one hour before sunset.

4. Except as noted in subsections 1, 2, and 3 above, in the counties whose total population, as listed in the latest census, exceeds 65,000, the only legal exceptions to the general prohibition against open burning shall be exceptions numbers 1, 2, 3, 4, 5, 6, 7, 10, 12, and 13 under subsection (a) above, provided, however, that such burning, whenever feasible, be conducted between 10:00 a.m. and one hour before sunset and does not cause air pollution in quantities or characteristics or of a duration which is injurious or which unreasonably interferes with the enjoyment of life or use of property in such area of the state as is affected thereby.

(c) Except for a reasonable period to get a fire started, no smoke the opacity of which is equal to or greater than 40 percent shall be emitted from any source of open burning listed in subsections (a) and (b) above, except as follows. Prescribed burning, slash burning, agricultural burning and acquired structure burning are not subject to the 40 percent opacity standard in this paragraph.

(d) The Director may allow open burning prohibited under paragraphs (a) and (b), upon a determination that such open burning is necessary to protect the public health, safety or welfare of the people of the state of Georgia, or there are no reasonable alternatives to the open burning.

(e) Prescribed burning and slash burning of forest land conducted under subparagraph (b)2 and (b)3 are subject to authorization by the Georgia Forestry Commission to include burning restrictions during air pollution episodes or periods when weather conditions are conducive to formation of air pollution episodes.

(f) Definitions.

1. “Prescribed burning” is a fire set under controlled conditions to burn forest understory and used as a forest management practice to establish favorable seedbeds, remove competing underbrush, accelerate nutrient cycling, control tree pests, enhance wildlife habitat, and contribute to ecological benefits.

2. “Slash burning” is a fire used as a forest management practice and set to remove trunks, stumps, branches, residue, and other wastes left on land after the removal of timber.

3. “Acquired structure burn” is the burning of a house, building or structure for the exclusive purpose of providing training to fire fighting personnel or arson investigators.

Authority: O.C.G.A. Section 12-9-1 et seq., as amended.

ATTACHMENT F: Additional Supporting Documentation

(See attached compact disc).