REVISIONS TO THE STATE IMPLEMENTATION PLAN
FOR THE CONTROL OF OZONE AIR POLLUTION

AUSTIN AREA EARLY ACTION COMPACT
OZONE STATE IMPLEMENTATION PLAN REVISION

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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SECTION VI. CONTROL STRATEGY

A. Introduction (No Change)

B. Ozone (Revised)

1. *Dallas/Fort Worth* (No change.)
2. *Houston/Galveston* (No change.)
3. *Beaumont/Port Arthur* (No change since October 2004 revision.)
4. *El Paso* (No change.)
5. *Regional Strategies* **(**No change.**)**
6. *Northeast Texas*
7. *Austin Area*
   Chapter 1: General
   Chapter 2: Emissions Inventory
   Chapter 3: Photochemical Modeling
   Chapter 4: Data Analysis
   Chapter 5: Control Strategies
   Chapter 6: Maintenance for Growth
8. *San Antonio Area*

C. Particulate Matter (No change.)

D. Carbon Monoxide (No change.)

E. Lead (No change.)

F. Oxides of Nitrogen (No change.)

G. Sulfur Dioxide (No change.)

H. Conformity with the National Ambient Air Quality Standards (No Change)

I. Site Specific (No change.)

J. Mobile Sources Strategies (No change)

LIST OF ACRONYMS

AAA- Accelerated Attainment Area
AACOG- Alamo Area Council of Governments
ACAAP- Austin Clean Air Action Plan
AE- Austin Energy
AEAD - Austin EAC Attainment Demonstration
AER-Austin EAC Region
ARPDB- Acid Rain Program Data Base
CAC- Clean Air Coalition
CAF- CLEAN AIR Force of Central Texas
CAMPO- Capital Area Metropolitan Planning Organization
CAMS- Continuous Air Monitoring System
CAMx- Comprehensive Air Quality Model with Extensions
CAP- Clean Air Partners
CAPCO- Capital Area Planning Council
CB-IV- Carbon Bond Mechanism, version IV
CO- carbon monoxide
CTSIP- Central Texas Sustainability Indicators Project
DFW- Dallas/Fort Worth
DLC- Diagnostic Link Connector
DPS- Texas Department of Public Safety
EAC- Early Action Compact
EDMS- Emissions and Dispersion Modeling System
EGU- electric generating unit
EGAS- Economic Growth Analysis System
EI- emissions inventory
EIP- Early Implementation Plan
EIQ- Emissions Inventory questionnaires
EPA- Environmental Protection Agency
ESL- Energy Systems Laboratory
FCAA- Federal Clean Air Act
FPP- Fayette Power Project
GloBEIS- Global Biogenic Emissions Inventory System
HAP- hazardous air pollutant
HB- House Bill
HC-hydrocarbon
HGB- Houston/Galveston/Brazoria
HPMS- Highway Performance Monitoring System
I/M-inspection/maintenance
LCRA-Lower Colorado River Authority
LIRAP- Low Income Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program
MCR - Mid-Course Review
MFG- Maintenance for Growth
MM5- Fifth Generation Mesoscale Model
MPO- Metropolitan Planning Organization
MSA- Metropolitan Statistical Area

NAAQS- National Ambient Air Quality Standards
NEGU- non-electric generating unit
NNA-near nonattainment areas
NO_x- nitrogen oxides
OBD- Onboard Diagnostic
PiG- plume-in grid
PM- particulate matter
ppm- parts per million
ppb- parts per billion
PSDB- Point Source Data Base
Q-Q- Quantile Quantile plots
RRF- relative reduction factor
SB- senate bill
SEP- supplemental environmental project
SIP- State Implementation Plan
SO2- sulfur dioxide
SOS-Southern Oxidants Study
- SOV- single-occupancy vehicle
TCEQ- Texas Commission on Environmental Quality (formerly the TNRCC)
TERMs- Transportation Emission Reduction Measures
TERP- Texas Emission Reduction Plan
TexAQS 2000- Texas 2000 Air Quality Study
TNRCC- Texas Natural Resource Conservation Commission (renamed the TCEQ)
tpd- tons per day
tpy- tons per year
TSI- Two Speed Idle
TTI-Texas Transportation Institute
UAM- urban airshed model
UT-The University of Texas at Austin
VERP- Voluntary Emission Reduction Program
VMT- vehicle miles traveled
VOC- volatile organic compounds

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CHAPTER 1: GENERAL INFORMATION

1.1 BACKGROUND

In 1999, in response to the promulgation of the new 8-hour ozone National Ambient Air Quality Standards (NAAQS), the local elected officials and air quality planners in the San Antonio, Texas, near nonattainment (NNA) area proposed the Accelerated Attainment Area (AAA) concept to the former Texas Natural Resource Conservation Commission (TNRCC), renamed the Texas Commission on Environmental Quality (TCEQ), and to the federal Environmental Protection Agency (EPA). This concept, which San Antonio designed to help them voluntarily achieve the 8-hour ozone standard, eventually developed into the 'Early Implementation Plan (EIP)'. Neither concept was ever endorsed by EPA, although in 2001 EPA proposed the Ozone Flex program to allow areas to create voluntary plans to address the 1-hour ozone standard.

The TCEQ continued to be committed to the concept of voluntary, early action toward the 8-hour standard, however, and throughout the next year continued to work with EPA and members of the environmental community toward that end. In March 2002, the TNRCC approached EPA for approval of the concept of 'early action plans', to be established through a Compact between local, State and EPA officials for areas that are in attainment (including no monitored violations) of the 1-hour ozone standard, but are approaching or monitoring exceedances of the 8-hour standard.

This concept of early voluntary 8-hour air quality plans, or Early Action Compacts (EAC), was endorsed by EPA Region 6 in June 2002, then slightly modified and made available nationally in November. These plans include all the necessary elements of a comprehensive air quality plan, but will be tailored to local needs and driven by local decisions. An EAC is designed to develop and implement control strategies, account for growth, and achieve and maintain the 8-hour ozone standard. This approach offers a more expeditious time line for achieving emission reductions earlier than EPA's expected 8-hour implementation rule making, while providing "fail-safe" provisions for the area to revert to the traditional SIP process if milestones are not met.

The principles of the tri-party EAC, to be executed by local, State and EPA officials, are:

- Early planning, implementation, and 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 early action plan;
- Formal incorporation of the early action plan into the SIP;
- Deferral of the effective date of nonattainment designation and related requirements so long as all Compact terms and milestones are met; and
- Safeguards to return areas to traditional SIP requirements should Compact terms and/or milestones be unfulfilled, with appropriate credit given for emission reduction measures implemented.

Table 1.1-1 - Basic Time line for EACs under Protocol for Early Action Compacts

EAC Protocol Time line	
Year	**Task/Commitment**
2002	Compact detailing milestones for how an area will create their early action plan must be finished and signed
2003	Local area completes technical work and develops own 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 local reporting and review process, including plan updates as necessary
2007	Area reaches attainment of the 8-hour ozone standard
2008	EPA re-designates area as attainment, with no further requirements

Should the Austin area miss a milestone at anytime during the agreement, including attaining the 8-hour standard by 2007, the area will be designated nonattainment and will be subject to the same requirements and deadlines that would have been effective had they not participated in this program, with no delays or exemptions from EPA rules.

Local governments, community and business leaders, environmental groups, and concerned citizens in Austin EAC Region (AER), including Bastrop, Caldwell, Hays, Travis and Williamson Counties, have shown their commitment to improving regional air quality by acting to assure attainment and maintenance of the federal 8-hour standard for ground-level ozone in their area through their EAC. In accordance with the commitments made in the area's EAC, the AER prepared and submitted an Austin Clean Air Action Plan (ACAAP) to demonstrate attainment of the 8-hour ozone standard in the area by 2007 and maintenance of the standard until at least 2012.

1.1.1 Background

Central Texas has a history of proactive air quality initiatives. Since 1996, the Texas Legislature has provided near-nonattainment area funding for use in performing planning functions to reduce ozone concentrations in the area. The AER was among the first in the nation to adopt an O3 Flex Agreement. A precursor to the EAC program, O3 Flex was designed to help maintain compliance with the 1-hour ozone standard. Implementation of the O3 Flex emission reduction measures in the AER started in the 2002 ozone season.

In addition to the TCEQ monitoring network, the AER has installed and maintained two supplementary monitors in the area. The AER developed emissions inventories, following EPA guidance, for 1996 and 1999. They also developed photochemical modeling episodes for July 1995 and September 1999. Results from the 1995 episode have been used for air quality planning. The 1999 episode has been used to develop the ACAAP. Both episodes meet EPA photochemical model performance criteria.

Since 1993, the CLEAN AIR Force of Central Texas (CAF), a coalition of business, government, environmental and community leaders, has coordinated public awareness and education campaigns. Ten years of CAF outreach has provided a solid base of public understanding of air quality issues in the AER.

1.1.2 The Early Action Compact

A key point of the EAC is the flexibility it affords areas in selecting emission reduction measures. Based on sound science of the quality required for traditional SIPs, signatories choose the combination of measures that meet both local needs and emission reduction targets. The EAC recognizes that not every entity will implement every measure. See Appendix A for the full text of the Central Texas EAC document.

On December 18, 2002, the cities of Austin, Bastrop, Elgin, Lockhart, Luling, Round Rock, and San Marcos; the counties of Bastrop, Caldwell, Hays, Travis, and Williamson; the TCEQ and EPA, entered into an EAC for the AER. This compact commits the AER to developing and implementing the ACAAP in accordance with the following milestones:

Table 1.1-2 - Austin EAC Milestones

AER EAC Milestones	
June 16, 2003	Potential local emission reduction strategies identified and described
November 30, 2003	Initial modeling emissions inventory (EI) completed
	Conceptual modeling completed
	Base case modeling completed
December 31, 2003	Future year EI modeling completed
	EI comparison and analysis completed
	Future case modeling completed
January 31, 2004	Attainment maintenance analysis completed
	Schedule for development of further episodes completed
	One or more modeled control cases completed
	Local emission reduction strategies selected
	Submission of preliminary ACAAP to TCEQ and EPA
March 31, 2004	Final revisions to modeled control cases completed
	Final revisions to local emission reduction strategies completed
	Final revisions to attainment maintenance analysis completed
	Submission of final ACAAP to TCEQ and EPA
December 31, 2004	CAAP incorporated into the SIP; SIP adopted by TCEQ and Submitted to EPA
December 31, 2005	Local emission reduction strategies implemented no later than this date
December 31, 2007	Attainment of the 8-hour ozone standard

1.1.3 EAC Applicability to the AER
Participation in an EAC was available for areas that are in attainment of the 1-hour ozone standard but approach or monitor exceedances of the 8-hour ozone standard.

The AER has not exceeded the 1-hour ozone standard since 1985, and is currently designated attainment of the 1-hour standard. However, the AER has intermittently monitored violations of the 8-hour ozone standard from 1998 through 2004. As such, the AER meets the criteria for participation in an EAC.

In April 2004, the Austin area was designated attainment for the 8-hour ozone standard based on the design value calculated from the 2001-2003 period. In order to comply with the 8-hour standard, the three-year average of the annual fourth-highest 8-hour ozone readings for each monitor must be less than 85 ppb. This number is called the design value. Monitoring data from the 2004 ozone season, which has not yet been validated, indicates that the 2002-2004 average will result in a design value indicative of nonattainment for the area. Once the 2004 ozone season data is validated, it could form the basis for EPA to designate the Austin area as nonattainment. However, for such EAC areas, EPA has committed to not revising its April 2004 attainment designation to nonattainment if the AER continues to meet EAC milestones and obligations.

1.1.4 Geographic Coverage of the AEAD

The ACAAP applies to the five counties included in the AER. These are Bastrop, Caldwell, Hays, Travis, and Williamson counties. The U.S. Office of Management and Budget determines the Metropolitan Statistical Area (MSA) based on data generated by the U.S. Census Office. EPA's default assumption in defining nonattainment area boundaries is the MSA boundary. Therefore, the AER elected to use this boundary for air quality planning purposes. Sources of regional anthropogenic, or man-made, emissions reflect the growing urbanization of the area (e.g., population densities, urban/suburban growth, commuting patterns).

1.2 PUBLIC INVOLVEMENT AND HEARING INFORMATION

1.2.1 EAC Local Public Involvement

In January 2003, the CAF launched an extensive program to ensure widespread public and stakeholder participation in developing the AER's ACAAP. An established local opinion research company, NuStats Partners, was contracted to assist. Additional information on the CAF is found in Appendix B.

The involvement project had two goals: (1) to provide venues for participation by interested parties; and (2) to provide air quality information to the general public. Stakeholder involvement activities included those aspects of the project directly related to gathering input on the emission reduction strategies. Public involvement activities, while also soliciting input, focused on increasing public understanding of air quality issues and the EAC process.

The local EAC signatory jurisdictions played a key role in this process. They facilitated public participation by hosting public meetings. They also reviewed and selected ACAAP strategies. The Clean Air Coalition (CAC), composed of one elected-official representative from each of the local EAC signatory jurisdictions, bore primary responsibility for ACAAP development decisions. The EAC Task Force, composed of staff from local signatory jurisdictions, participating agencies, and business and environmental groups, developed and recommended the initial ACAAP for CAC and signatory consideration. The CAC met at least quarterly throughout the ACAAP development process and continues to meet regularly. The EAC Task Force met twice monthly during ACAAP development and continues to meet regularly. Both CAC and EAC Task Force meetings are open to the public. Additional information on the CAC and EAC Task Force can be found at http://www.capco.state.tx.us.

In addition to the public meetings held throughout the AER, NuStats provided the work plan for general public involvement. Outreach avenues included a website, hotline, presentations to organizations and community groups, distribution of comment cards at meetings and events, publishing the comment cards in the AER's daily newspaper and in over 15 community newspapers, and information kiosks in public areas (libraries, shopping malls, etc.). NuStats maintained a database of participating stakeholder groups and individuals. They coded and recorded responses to allow real-time evaluation of opinion trends and to identify segments of the AER that were under responding and in need of additional efforts. Appendices B and C contain details of outreach activities and comment card survey results. Appendix C contains documentation of all public comments. Appendix C includes resolutions of support from area jurisdictions that support the air quality goals of the EAC.

1.2.2 TCEQ Public Hearings

The commission held public hearings on proposed revisions to the SIP and related rules:

- Monday, August 23, 2004, 2 PM at TCEQ, Building F, Room 254S, at 12100 Park 35 Circle, Austin, Texas;
- Tuesday, August 24, 2004, 10 AM at Longview City Hall Council Chambers, located at 300 West Cotton Street, Longview, Texas; and
- Thursday, August 26, 2004, 10 AM and 7 PM at Alamo Area Council of Governments (AACOG) Board Room, located at 8700 Tesoro Dr. , San Antonio, Texas.

The comment period closed on August 30, 2004.

1.3 SOCIAL AND ECONOMIC CONSIDERATIONS

For detailed explanation of the social and economic issues involved with any of the state-assisted strategies, please refer to the preambles that precede each proposed rule package accompanying this SIP. Because the AER EAC SIP is a local voluntary initiative, the state has not performed an analysis of social and economic considerations for the locally-implemented strategies, although such analysis may be available from the CAC.

1.4 FISCAL AND MANPOWER RESOURCES

The state has determined that its fiscal and manpower resources are adequate and will not be adversely affected through implementation of this plan.

1.5 HEALTH EFFECTS OF OZONE

Health concerns are associated with poor air quality. In 1997, EPA revised the air quality standards for ozone to incorporate scientific data that indicated longer-term exposures to moderate levels of ozone could cause health effects. Ozone can cause acute respiratory effects and aggravate asthma. To support the 8-hour ozone standard, EPA provided information indicating ozone can temporarily decrease lung capacity in some healthy adults and cause inflammation of lung tissue. Exposure to elevated ozone levels contribute to hospital admissions and emergency room visits.

Children may be at higher risk from exposure to ozone. Children breathe more air per pound of body weight than adults. Since children's respiratory systems are still developing, they may be more susceptible than adults to changing air quality. The most likely time of year for elevated ozone readings in Texas is the last half of August to early October, which coincides with school starting and an increase school related activities.

Adults most at risk to ozone exposure are outdoor workers, people outside exercising, and individuals with preexisting respiratory diseases. Repeated ozone exposure is something like repeated sunburns of the lungs that potentially could change the quality of life in the future.

Ground-level ozone interferes with the ability of plants to produce and store food, so growth, reproduction and plant health are compromised. Ozone makes plants more susceptible to disease, pests, and other environmental stresses. Reduced agriculture yields from some crops (e.g. soybeans, kidney beans, wheat, and cotton) have been linked to ground-level ozone.

EPA believes the 8-hour ozone standard is more protective of human health than the 1-hour standard. As a result, EPA believes there will be fewer admissions to the hospital or trips to the emergency room by individuals with asthma. EPA states that a better quality of life will result from the reduced risks of more frequent childhood illnesses and of subtle effects such as repeated lung inflammation. EPA thinks that the reduced loss in agriculture crops will be significant.

CHAPTER 2: EMISSIONS INVENTORY

2.1 INTRODUCTION
The 1990 Amendments to the Federal Clean Air Act (FCAA) and 40 CFR §51.322 require emissions inventories be prepared statewide, particularly for ozone nonattainment areas. Ozone is photochemically produced in the atmosphere when VOCs are mixed with NO_X in the presence of sunlight, so the TCEQ must compile information on the important sources of these precursor pollutants. The role of the emissions inventory (EI) is to identify the source types present in an area, the amount of each pollutant emitted, and the types of processes and control devices employed at each plant or source category. The EI provides data for a variety of air quality planning tasks, including establishing baseline emission levels, calculating reduction targets, control strategy development for achieving the required emission reductions, emission inputs into air quality simulation models, and tracking actual emission reductions against the established emissions growth and control projections. The total inventory of emissions of VOC, NO_X, and CO for an area is summarized from the estimates developed for five general categories of emissions sources which are described below. Details for the development of the 1999 and 2007 EIs, developed according to EPA and EAC guidance, are found in Appendices D and E.

2.2 POINT SOURCES
Major point sources are defined for inventory reporting purposes in nonattainment areas as industrial, commercial, or institutional sources which emit actual levels of criteria pollutants at or above the following amounts: 10 tons per year (tpy) of VOC, 25 tpy of NO_X, or 100 tpy of any of the other criteria pollutants, which are carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (smaller than 10 microns—PM_{10}, and smaller than 2.5 microns – $PM_{2.5}$), and lead. For the attainment areas of the state, any company that emits a minimum of 100 tpy of any criteria pollutant must complete an inventory. Additionally, any source that generates or has the potential to generate at least 10 tpy of any single hazardous air pollutant (HAP) or 25 tpy of aggregate HAPs is also required to report emissions to the commission.

To collect emissions and industrial process operating data for these plants, the TCEQ annually mails emissions inventory questionnaires (EIQ) to all sources identified as having emissions that trigger the reporting requirements. Companies must report the previous year's type of emissions from all emission-generating units and emission points, as well as the amount of materials used in the processes that result in emissions. Information is also requested in the EIQ on process equipment descriptions, operation schedules, emissions control devices, abatement device control efficiency, and stack parameters such as location, height, and exhaust gas flow rate. All data submitted via the EIQ are subjected to quality assurance procedures and are entered into the Point Source Data Base (PSDB). This data was used for the point source portion of the EI.

2.3 AREA SOURCES
Area sources are defined as emission sources that fall below the point source reporting levels, and are too numerous or too small to identify individually. To estimate emissions from these sources, calculations are performed on the basis of source category or group. Area sources are commercial, small-scale industrial and residential categories of sources which use materials or operate processes which can generate emissions. Area sources can be divided into two groups, characterized by the emission mechanism: hydrocarbon evaporative emissions and fuel combustion emissions. Examples of evaporative losses include printing, industrial coatings, degreasing solvents, house paints, leaking underground storage tanks, gasoline service station underground tank filling, and vehicle refueling operations. Fuel combustion sources include stationary source fossil fuel combustion at residences and businesses, as well

as outdoor burning, structural fires, and wildfires. These emissions, with some exceptions, may be calculated by multiplication of an established emission factor (emissions per unit of activity) times the appropriate activity or activity surrogate responsible for generating emissions. Population is the most commonly used activity surrogate for many area source categories, while other activity data include amount of gasoline sold in an area, employment by industry type, and acres of cropland.

2.4 ON-ROAD MOBILE SOURCES

On-road mobile sources consist of automobiles, trucks, motorcycles, and other motor vehicles traveling on roadways in the nonattainment area. Combustion-related emissions are estimated for vehicle engine exhaust, and evaporative hydrocarbon emissions are estimated for the fuel tank and other evaporative leak sources on the vehicle. Emission factors have been developed using the EPA's mobile emission factor model, MOBILE 6.2. Various inputs are provided to the model to simulate the vehicle fleet driving in each particular nonattainment area. Inputs include such parameters as vehicle speeds by roadway type, vehicle registration by vehicle type and age, percentage of vehicles in cold start mode, percentage of miles traveled by vehicle type, type of Vehicle Inspection/Maintenance (I/M) program in place (where applicable), and gasoline vapor pressure. All of these inputs have an impact on the emission factor calculated by the MOBILE 6.2 model, and every effort is made to input parameters reflecting local conditions. To complete the emissions estimate, the emission factors calculated by the MOBILE 6.2 model are then multiplied by the level of vehicle activity or vehicle miles traveled (VMT). The level of vehicle travel activity is developed from the federal Highway Performance Monitoring System (HPMS) data compiled by the Texas Department of Transportation for each county. Finally, roadway speeds, which are required for the MOBILE 6.2 model's input, are obtained from an analysis for several roadway types performed by the Texas Transportation Institute (TTI).

VMT estimates use the Capital Area Metropolitan Planning Organization (CAMPO) travel demand model for Hays, Travis, and Williamson Counties. Future VMT estimates for Bastrop and Caldwell Counties use a GIS-based highway performance monitoring system methodology developed by TTI. The CAMPO travel model inputs include future population and employment estimates spatially allocated by traffic serial zone. Model inputs also include a roadway network of all regionally significant roads expected to be open and operational in the time frame modeled. The spatial allocation of the population and employment estimates takes into account all new roads that will be open and operational in the time frame modeled. This addresses development and induced demand created by new roads. The travel model estimates VMT associated with the transportation system as a whole. Additional information on the on-road mobile inventory can be found in Appendix F.

2.5 NON-ROAD MOBILE SOURCES

Non-road mobile sources are a subset of the area source category. This subcategory includes aircraft operations, recreational boats, railroad locomotives, and a very broad category of off-highway equipment that includes everything from 600-hp engines mounted on construction equipment to 1-hp string trimmers. Methods for calculating emissions from non-road engine sources are based on information about equipment population, engine horsepower, load factor, emission factor, and annual usage. Emission estimates for all sources in the non-road category except air-craft, locomotives, commercial marine vessels, diesel construction equipment, and airport support equipment were originally developed using the current version of EPA's nonroad model. Emissions were projected to later years by running the nonroad model for the required years.

Aircraft emissions have been estimated from landings and takeoff data for airports used in conjunction with the Emissions and Dispersion Modeling System (EDMS) aircraft emissions model. Locomotive emissions have been developed from fuel usage and track mileage data obtained from individual railroads.

2.6 BIOGENICS

Biogenic sources include hydrocarbon emissions from crops, lawn grass, and forests, as well as a small amount of NO_X emissions from soils. Plants are sources of VOC such as isoprene, monoterpene, and alpha-pinene. Tools for estimating emissions include satellite imaging for mapping of vegetative types, field biomass surveys, and computer modeling of emissions estimates based on emission factors by plant species. A locally specific biogenic EI was developed for the AER. This EI was initially prepared using an updated version of EPA's Biogenic Emissions Inventory System, version 2 (BEIS2) biogenic model called Global Biogenic Emissions Inventory System (GloBEIS), which allows locally specific data to be used. The final base case inventory used the GloBEIS2 model, which effectively reduced the estimated biogenic VOC emissions by 30%. Because emissions from biogenic sources are beyond the scope of reasonable emission reduction measures, the plan assumes that biogenic emissions will remain the same in the future and does not include biogenic emission reduction measures. However, the biogenic emissions are important in determining the overall emissions profile of an area, and therefore are required for photochemical grid modeling.

2.7 EMISSIONS SUMMARY

The 1999 VOC and NO_x base and future case emissions inventories for the AER are shown in Figures 2.7-1 through 2.7-4. This 1999 base case was used as the basis for modeling for the AER. The pie charts show that for NO_X, the largest man-made contribution is from on-road mobile sources, and for VOC, from area sources. While contributions from biogenic emissions are included in the modeling, they are not included in this summary because the SIP control strategies are limited to the reduction of man-made emissions only. Source contributions to the EI are as follows (details are found in Tables 2.7-1 through 2.7-4):

- The contributions from anthropogenic NO_X sources in the 1999 base case inventory, in descending order, are: 58 percent on-road, 20 percent point, 17 percent non-road, and 5 percent area.
- The contributions from VOC sources in the 1999 base case inventory, also in descending order, are as follows: 55 percent area, 30 percent on-road, 13 percent non-road, and 2 percent point.
- Sources of man-made NO_X for the 2007 base case EI comprise 48 percent on-road, 21 percent non-road, 23 percent point, and 8 percent area.
- Sources of man-made VOC for the 2007 base case EI comprise 64 percent area, 21 percent on-road, 12 percent non-road, and 3 percent point.

Each EAC area developed its own base case and future case emissions files for its own local area, and shared those files with the other areas. The TCEQ provided 4 km, 12 km, and 36 km emissions files for the base case for areas outside of the EAC areas. The emissions files outside of the EAC areas were the same as the emissions files being used for the HGB Mid-Course Review at the time the EAC's were developed. A sensitivity study based upon ozone modeling was conducted to evaluate the impact of Houston emissions upon the Austin and San Antonio areas also showed little impact. Based upon that study no adjustments to Houston VOC emissions were made in either the base case or future case modeling.

Table 2.7-1 Total daily (weekday) NO_X emissions in 1999 from anthropogenic sources in the AER

	Area Sources (tpd)	Nonroad Mobile Sources (tpd)	Onroad Mobile Sources (tpd)	Point Sources (tpd)	TOTAL (tpd)
Bastrop	0.60	1.72	3.95	7.25	13.52
Caldwell	0.54	1.42	2.32	3.55	7.82
Hays	0.54	1.88	11.44	7.28	21.14
Travis	3.17	16.69	63.06	15.34	98.27
Williamson	2.97	6.73	17.09	0.56	27.35
TOTAL (tpd)	**7.82**	**28.44**	**97.86**	**33.98**	**168.10**

Table 2.7-2 Total daily (weekday) VOC emissions in 1999 from anthropogenic sources in the AER

	Area Sources (tpd)	Nonroad Mobile Sources (tpd)	Onroad Mobile Sources (tpd)	Point Sources (tpd)	TOTAL (tpd)
Bastrop	4.52	0.92	2.54	0.42	8.40
Caldwell	15.29	0.61	1.30	0.47	17.67
Hays	5.47	1.53	4.85	0.34	12.19
Travis	50.60	15.59	32.61	2.13	100.93
Williamson	14.68	3.84	8.89	0.34	27.75
TOTAL (tpd)	**90.56**	**22.49**	**50.19**	**3.70**	**166.93**

Table 2.7-3 Total daily (weekday) NO_X emissions in 2007 from anthropogenic sources in the AER

	Area Sources (tpd)	Nonroad Mobile Sources (tpd)	Onroad Mobile Sources (tpd)	Point Sources(tpd)	TOTAL (tpd)
Bastrop	0.76	1.66	2.45	7.65	12.52
Caldwell	0.67	1.39	1.31	2.51	5.88
Hays	0.78	1.84	5.86	8.94	17.42
Travis	4.22	16.21	38.23	11.04	69.70
Williamson	3.81	6.36	12.68	0.00	22.85
TOTAL (tpd)	**10.24**	**27.46**	**60.53**	**30.15**	**128.38**

Table 2.7-4 Total daily (weekday) VOC emissions in 2007 from anthropogenic sources in the AER

	Area Sources (tpd)	Nonroad Mobile Sources (tpd)	Onroad Mobile Sources(tpd)	Point Sources (tpd)	TOTAL (tpd)
Bastrop	5.53	0.99	1.50	0.56	8.58
Caldwell	15.75	0.68	0.73	0.07	17.23
Hays	7.67	1.77	2.78	1.65	13.87
Travis	57.04	12.70	21.95	2.18	93.87
Williamson	20.44	3.73	6.83	0.18	31.17
TOTAL (tpd)	**106.42**	**19.88**	**33.79**	**4.63**	**164.72**

Figure 2.7-1 1999 Base Case Anthropogenic NO_X Emissions by Major Category

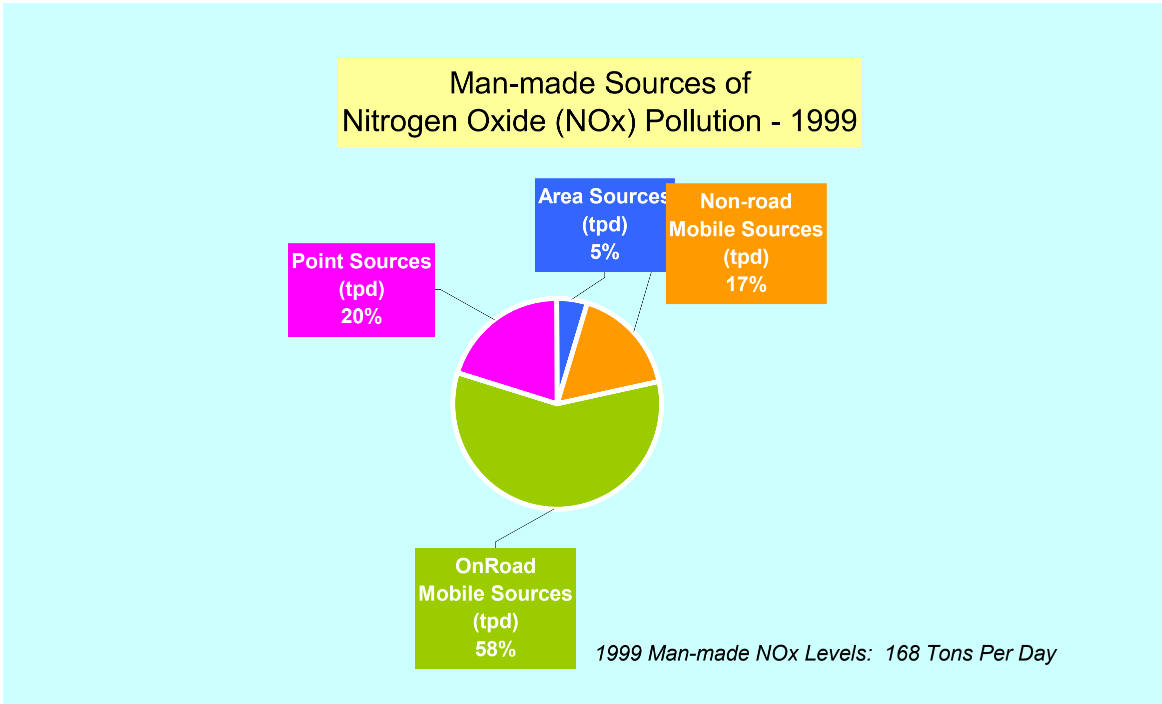


Figure 2.7-2 1999 Base Case Anthropogenic VOC Emissions by Major Category

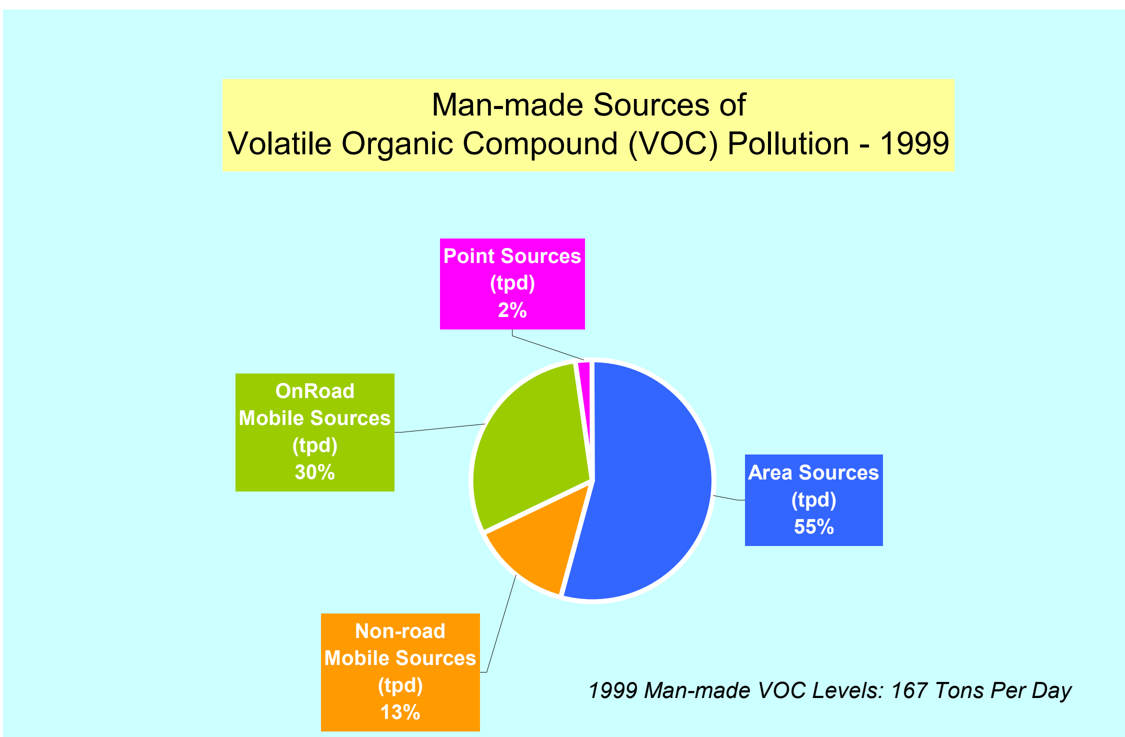


Figure 2.7-3 2007 Future Base Case Anthropogenic NO_X Emissions by Major Category

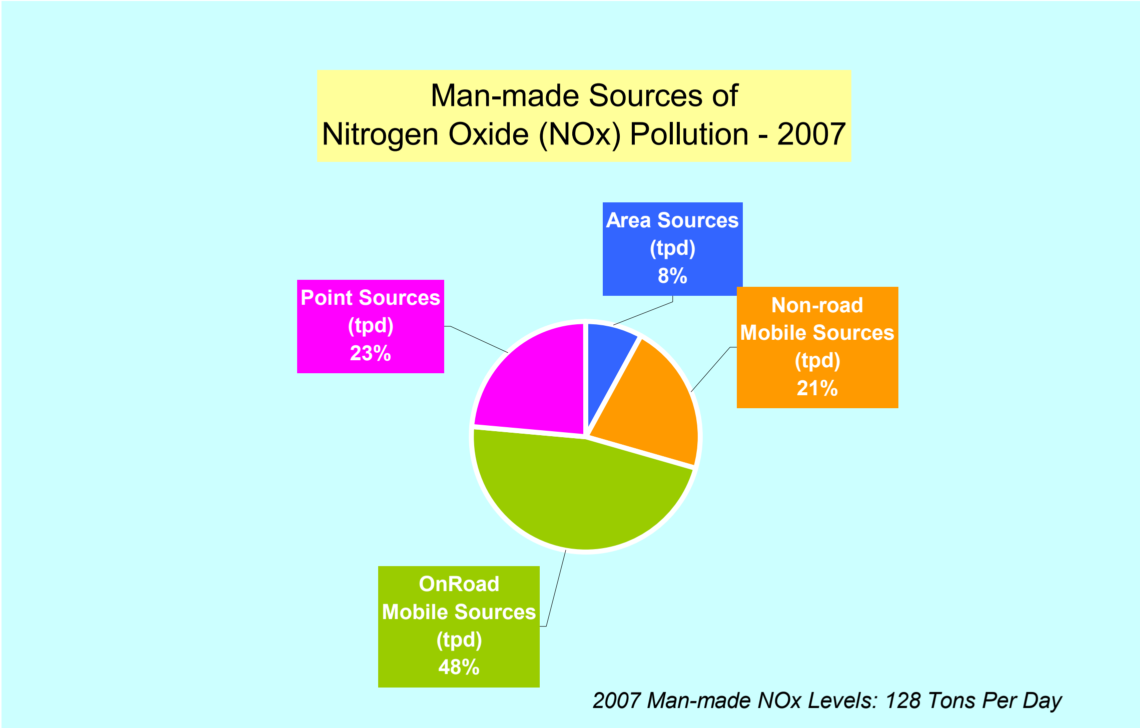
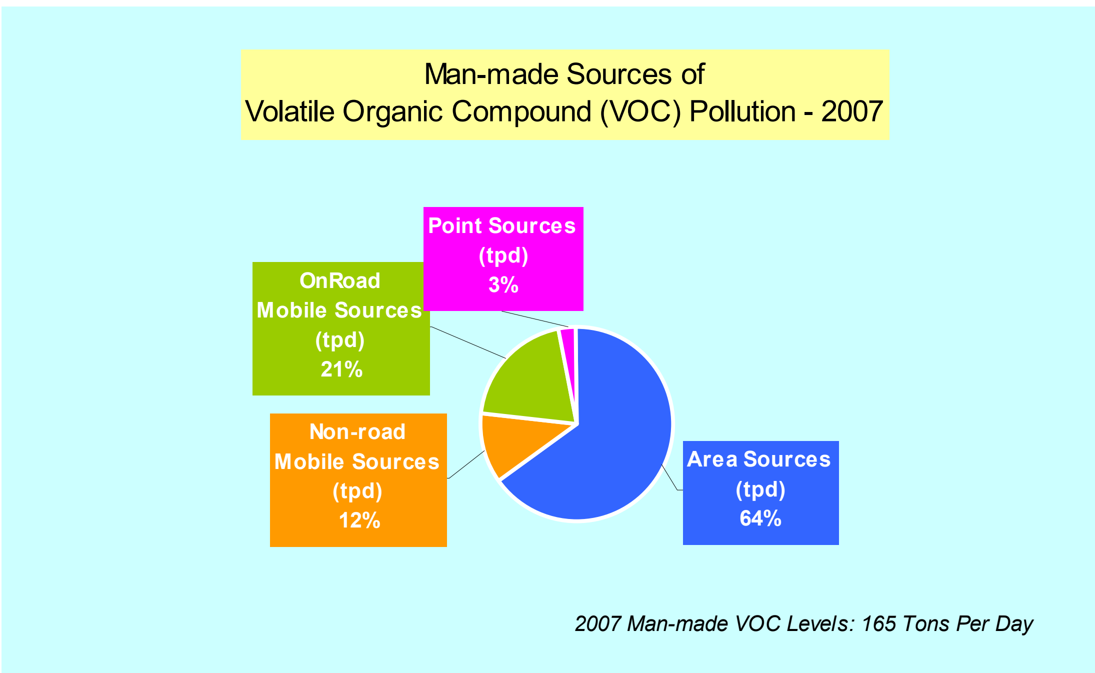


Figure 2.7-4 2007 Future Base Case Anthropogenic VOC Emissions by Major Category



CHAPTER 3: PHOTOCHEMICAL MODELING

3.1 INTRODUCTION

With near-nonattainment area funding from the Texas Legislature, the CAPCO coordinated development of three photochemical model base cases, including a 1999 South and Central Texas high ozone episode. The modeling provides a means of projecting air quality conditions into the future and testing emission reduction measure efficacy in the anticipated attainment year. The year 2007 coincides with the expected 1-hour ozone standard attainment dates for Dallas-Fort Worth and Houston. Because ambient ozone levels in the AER are affected by transport as well as local emissions, selecting a future date in which emission reduction strategies are in place for other large urban areas is an important modeling consideration.

A meteorological model is used to develop detailed meteorological data for each day in the episode. Also for each day in the episode, a day and hour-specific EI is used. The base case photochemical model uses the episode specific meteorological and EI data to calculate the ozone formed for each hour of the episode. The photochemical model's output is evaluated according to EPA Performance Criteria. If base case model performance, as evaluated by comparing model predictions to observed air pollution concentrations, is not acceptable, the meteorological modeling inputs and the EI are evaluated to determine if these data can be refined. Once the model performance meets EPA performance standards, the modeling effort moves to the future case. For future years, the base case emissions are replaced with emissions projections including the effect of growth as well as the state and federal controls mandated for the future year. The model is re-run with the future emissions to establish the future ozone patterns and to determine the emission reduction strategies that will be required to demonstrate attainment.

3.2 BACKGROUND

The first step in episode selection is the development of a conceptual model. The conceptual model describes the local meteorological conditions and large-scale weather patterns associated with periods of high ozone. Ozone formation in the AER is influenced by many of the same factors as in other areas of Texas. These factors include sunny skies, high temperatures, and low wind speeds. The ozone season occurs during the warm weather that predominates in the AER from April through October. The conceptual model for the AER relies on 1993-2002 ozone measurements and meteorological data. The conceptual model provided the information needed to allow staff to identify representative candidate episodes for modeling, and can be found in Appendix G. The AER has identified and successfully modeled two episodes, July 7-12, 1995, and September 13-20, 1999. This attainment demonstration is based on the more recent September 1999 episode.

EPA's 1999 draft modeling guidance recommends using four criteria, at a minimum, to select episodes appropriate for modeling. The minimum criteria include: 1) reviewing a mix of episodes that represent a variety of meteorological conditions associated with observed 8-hour ozone daily maxima in excess of 84 ppb; 2) selecting periods in which observed 8-hour ozone daily maxima approximate the average fourth highest 8-hour ozone concentrations; 3) reviewing periods for which extensive air quality/meteorological data exist; and 4) modeling a sufficient number of days to represent a complete ozone cycle.

An important consideration in selecting this episode was the high ozone concentrations observed throughout South and Central Texas. Thus, Austin, San Antonio, Corpus Christi, and Victoria, along with the TCEQ, could work jointly and combine resources to develop a new episode focusing on conditions associated with high ozone in South and Central Texas. The September 13-20, 1999, modeling episode fulfills the requirements of both EPA draft guidance and the EAC Protocol. The 1999 multi-day episode includes both transport and local contributions, and illustrates the development of high ozone episodes as described in the conceptual model for the AER. The episode covers, for both Austin and San Antonio, one complete synoptic cycle for ozone with two initialization days and six high ozone days. The episode also includes two weekend days (September 18th and 19th) so emission reduction strategies can also be evaluated for days with different emission characteristics.

This episode was chosen for the elevated ozone levels which occurred in South and Central Texas, however the modeling domain covers a much larger geographical area. The larger domain is necessary to simulate the effects of transport of precursors and background concentrations of ozone into the AER. The 32-hour back trajectories for the 1999 episode reached back into southeastern Missouri. The 36-km coarse grid used in the model simulation extends throughout much of the South and Central U.S. including the Ohio River Valley to the north and Atlanta to the east, as shown in Figure 3.2-1. This regional scale grid matches the TCEQ standard modeling domain. The grid formulation includes two nested grids: a 12-km grid domain that incorporates eastern Texas including the nonattainment areas of Dallas/Fort Worth, Houston/Galveston/Brazoria, and Beaumont/Port Arthur, and an urban scale 4-km grid that covers the four NNAs in South and Central Texas.

The EAC agreement also requires development of other episodes, as necessary, to fully represent the variety of situations that typically contribute to local ozone production. The AER and San Antonio region agreed in the EAC signed December, 2002, to investigate further episode development based on conceptual model updates. No additional candidate episodes were found.

The photochemical model used for this attainment demonstration is the public domain Comprehensive Air Quality Model with Extensions (CAMx). CAMx is a state of the science photochemical grid model with numerous improvements over the 1990-vintage Urban Airshed Model, version IV. CAMx uses the Carbon Bond Mechanism, version IV (CB-IV) chemistry package, nested grids, plume-in-grid (PiG) treatment for point sources, and three choices for advection schemes: Smolarkiewicz, Bott, or Piece-wise Parabolic Method (PPM). For this modeling exercise, PiG treatment was applied to major point sources, and the PPM advection scheme was used.

3.3 METEOROLOGICAL MODELING

Meteorological models use a standard set of measurements from U.S. weather stations as well as a computer model of the physical processes involved to predict the physical behavior of the atmosphere. The model develops a three dimensional simulation of wind speed, wind direction, and other parameters for every grid cell and hour being modeled to fill in the gaps between the stations in the meteorological monitoring network.

Meteorological modeling for the September, 1999, ozone episode used the Fifth Generation Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5), the standard meteorological model currently used by the TCEQ and recommended by EPA. The final MM5 application for the September 13-20,1999, modeling episode, known as Run5g, was the culmination of individual simulations and sensitivity studies performed during 2001-2003. Both Austin and San Antonio used Run5g for their EAC work. Details may be found in Appendices H and I.

Table 3.3-1 provides performance statistics for Met Run 5g. Four kilometer grid subdomains include Austin/San Antonio, Corpus Christi/Victoria, and a large region for the Houston/Galveston/Brazoria and the Beaumont/Port Arthur areas. The second column lists performance benchmarks for comparison purposes. The benchmarks represent state of the science performance goals established as the result of comparing statistical summaries of nearly thirty regional meteorological models developed for various areas of the country. The goals reflect the results of meteorological work that has been accepted and used in support of regulatory air quality photochemical modeling efforts.

The subdomain performance statistics listed in Table 3.3-1 are based on comparisons between observations obtained from ground-level monitoring stations and Met Run 5g predictions. As indicated by the results, Met Run 5g demonstrated excellent performance for wind speed and good performance for temperature and humidity over the 4-km domain. A few problems remain with the wind direction and gross error in Central Texas, as values in the table highlighted in bold demonstrate. Since the most important variables passed to the ozone model are wind speed and direction, MM5 performance on other variables is secondary. Details may be found in Appendix H.

Table 3.3-1. Comparisons of Mean Daily Statistics with Performance Benchmarks for Selected Urban Regions

Parameter	Benchmark	Episode Mean		
		Austin/ San Antonio	Corpus Christi/ Victoria	Houston/ Galveston/Brazoria and Beaumont/ Port Arthur
Wind Speed RMSE*	<2.0 m/s	1.2	1.3	1.3
Wind Speed Bias	± 0.5 m/s	0.0	0.5	0.4
Wind Speed IOA**	>0.60	0.68	0.81	0.63
Wind Direction Gross Error	<30 deg	**36**	23	30
Wind Direction Bias	± 10 deg	- 6	- 5	2
Temperature Gross Error	<2.0 K	**2.1**	1.3	1.5
Temperature Bias	± 0.5 K	**-1.3**	0.4	**-0.6**
Temperature IOA**	>0.80	0.92	0.92	0.95
Humidity Gross Error	<2.0 g/kg	1.4	**2.4**	1.1
Humidity Bias	± 1.0 g/kg	- 0.3	**-1.6**	-0.3
Humidity IOA**	>0.60	**0.47**	**0.53**	0.61

Note: Values in bold denote statistics outside the performance goals
*RMSE: root mean square error
**IOA: index of agreement

3.4 EMISSIONS INVENTORY

In addition to meteorological inputs, photochemical models require emissions inputs that are day- and hour-specific to the modeled time period, with the ozone season EI as a starting point for developing this episode-specific EI. For the September 1999 ozone episode, this required identifying and quantifying sources of VOC and NO_X emissions. Ozone forms as the result of chemical reactions between these chemical precursors in the presence of sunlight. In order to prepare emissions for use in an air quality model, the emissions were temporally allocated to account for seasonal differences in emission rates or activity and to apportion emissions to a particular day or hour, in accordance with EPA policy. Furthermore, the emissions were spatially allocated to each grid cell in the modeling domain, both horizontally and vertically. Details are found in Appendices D and H.

3.4.1 Local EI

The TCEQ provided local biogenic and point source emissions inventories for the AER. Area and nonroad inventories were developed using guidance from such documents as EPA's Air Chief, AP-42, and NONROAD model. Whenever possible, emission calculation methodologies were supplemented with data obtained from surveys. Specific sources that were surveyed in development of the local 1999 EI included quarry operations; power plants, construction operations, commercial, industrial, railroad, and agricultural equipment; bakeries; wineries; breweries; wastewater treatment plants; and asphalt paving operations.

The onroad inventories were developed by TTI for the September 17 – 20, 1999, time frame. TTI's documentation on development of NNA onroad emission inventories is included as Appendix F of this SIP. MOBILE 6.2 was used to develop the inventory. The process of converting TTI's EI from an abbreviated episode, September 17-20, 1999, to the complete episode including ramp-up period (September 13 – 20, 1999), is presented in Appendix D.

3.4.2 Texas and Regional Emissions Inventories

September 1999, area and nonroad modeling EIs were developed for three other urban areas within the 4 km subdomain (San Antonio and Austin, Corpus Christi, and Victoria) for inclusion in the photochemical model. Area/nonroad files for the remainder of Texas were based on the Texas 2000 Air Quality Study (TexAQS 2000) data set. In order to use this data set for modeling a September 1999 ozone episode, the data were backcast to 1999, using the ratio of emissions as determined by the Economic Growth Analysis System (EGAS) 4.0 and Nonroad 2000 models.

Non-electric generating unit (NEGU) point source emissions originated from the TCEQ's PSDB. Electric generating unit (EGU) point source emissions were taken from a September 1999 emissions package that was updated with data from the 1999 Acid Rain Program Data Base (ARPDB). This data set applied to all of Texas with the exception of Houston. The 11-county Houston point source file was based on a 2000 NEGU and EGU EI. No VOC adjustments were used for the Houston area for either the base or future case EIs.

On-road mobile EI data for Texas were developed by TTI. MOBILE6, version 1 was used to develop onroad emissions for the Houston area, Gregg County, and Smith County. Onroad EI files for the remainder of the state were developed using MOBILE5a_h.

In some cases, the Texas area, nonroad, and mobile EI data required additional refinement. The modeling EI for the Houston area, for example, was developed for an August 2000 ozone episode. Therefore, the emissions data were backcast from August 2000 to September 1999 using appropriate modeling software such as the EGAS, MOBILE6 and NONROAD models.

Except for point sources for the State of Louisiana, regional EI data for states outside of Texas were based on emission rates from EPA's 1999 National Emission Inventory (NEI v.2). The point source EI for Louisiana was obtained from the Louisiana Department of Environmental Quality, then quality assured and updated with September data from the ARPDB.

3.4.3 QA/QC Methodology and Preparation of EI Data for Photochemical Modeling

Several quality assurance/quality control methodologies were used to assess the reliability of the EI calculations, including "reality checks" in which calculations were evaluated for reasonableness, peer review of the EI by the TCEQ, replication of calculations for some emissions sources, statistical checks, and computerized checks. In addition to checking data for accuracy in terms of calculation methodologies and geographical allocation, data were also evaluated in terms of temporal allocation. More information can be found in Appendix D.

The original September 1999 model was developed by ENVIRON and further refined by collaboration between ENVIRON and the University of Texas at Austin (meteorological model and air quality input refinements). The model was then provided to the NNA partners (or their contractors) for further local refinement, including refinement of the EI inputs, development of the future case, and clean air strategy analyses. To ensure that the various regions' models would be similar and provide similar predictions for the base case, future case, and control strategy runs, several steps were taken, particularly to ensure that the Austin and San Antonio base and future cases contained identical input. This involved discussions between the two regions, as well as the TCEQ and the EPA, regarding the most appropriate model procedures and EI data for local and regional areas. Emissions input discrepancies were corrected prior to the final San Antonio and Austin runs.

As a result of this effort, the base and future cases refined and developed for Austin and San Antonio are nearly identical. An analysis of predictions made by the two models reveals that the difference in the models' predictions at the two Austin monitors is insignificant. The average differences, during the six-day episode, between peak predictions at the Murchison and Audubon monitors when comparing the San Antonio and Austin base cases were 0.00 ppb and 0.05 ppb, respectively. For the 2007 future cases, the average differences in peak concentrations were –0.06 ppb (Murchison) and –0.04 ppb (Audubon).

3.5 BASE CASE PERFORMANCE EVALUATION

In addition to refinement of the MM5 meteorological modeling and the 1999 modeling EI inputs, other model configurations were reviewed for suitability during an on-going test and evaluation process. This step entailed performing sensitivity analyses on various model parameters including dry deposition algorithms, chemistry data, and boundary/initial conditions. As a result of these studies, some model settings were changed including dry deposition algorithms (to account for mild drought conditions occurring in eastern Texas during September 1999) and boundary condition data. Sources of refined boundary/initial condition data included U.S. EPA's guidance on the Urban Airshed Model (UAM), measurements of rural oxidants collected during the Southern Oxidants Study (SOS), and data collected during the Gulf of Mexico Air Quality Study sponsored by the Minerals Management Service. The final base case initial and boundary conditions are consistent with those used by the TCEQ for modeling in 1-hour nonattainment areas. Details on the development of the base case may be found in Appendix H.

In accordance with EPA's 1999 draft 8-hour ozone modeling guidance, the September 1999 photochemical simulation was subjected to a variety of 1-hour and 8-hour ozone performance analyses. This evaluation measures the differences between model predictions and actual observations. Details are found in Appendix H.

Performance tests for both 1-hour and 8-hour predicted ozone concentrations used the seven monitors in the San Antonio, Austin, San Marcos, and Fayette County networks. Because the monitoring network in Central Texas is not dense, analysts evaluated performance based on data from all stations rather than on monitors grouped by cities.

Statistical evaluation of the 1-hour ozone model performance used the following statistical metrics:

unpaired peak accuracy, average paired peak accuracy, bias in peak timing, normalized bias and normalized error. EPA has performance criteria for the unpaired peak accuracy, normalized bias and normalized error statistics. The 1-hour ozone modeling for the seven Central Texas monitors meets all of these criteria. Figure 3.5-6 illustrates the comparison between observed and modeled concentrations at the Audubon monitor.

The evaluation of model performance for 8-hour average ozone attainment demonstrations was being evaluated for the first time in many areas and could be subject to future modifications. Many of the tests conducted, including scatter plots, Q-Q plots, and ozone metrics, measured the differences between predictions and their paired observations. In recognition of this, and the ambiguities in the EPA draft guidance, analysts used the following three different methodologies in selecting predicted ozone concentrations to compare to observed value:

- The predicted daily maximum ozone concentration within grid cells ‘near' a monitor, as defined by U.S. EPA guidance (1999);
- The predicted daily maximum ozone concentration within grid cells ‘near' a monitor that is closest in magnitude to the observed daily maximum at the monitor; and
- A bilinear interpolation of predicted daily maximum ozone concentration around the monitor location.

EPA's draft guidance provides default recommendations for delineating the area "near a monitor." The defaults are based on the size of the grid cells used in the photochemical model. Since the 1999 episode was modeled using a 4-km grid, "near a monitor" was determined to be the 7 x 7 array of cells surrounding each monitor. The 7 x 7 arrays surrounding the Central Texas monitors are represented by dashed red lines in Figure 3.5-2. The Central Texas monitors include four continuous air monitoring system (CAMS) sites located in the 10-county CAPCO region and four monitors located in the 12-county AACOG region.

The 1999 base case was also evaluated using a second type of performance analysis: sensitivity tests. These tests were used to determine how accurately the model responds to changes in emissions. Diagnostic, or sensitivity, tests were conducted throughout the model development process. The type of sensitivity test applied to the model depended on the stage of model development. During the performance evaluation stage, sensitivity analysis efforts focused on testing the impacts of precursor species on ozone concentrations. These tests and test results are provided in Section 3.5.4.

3.5.2 Ozone Metrics

EPA recommends calculating ozone metrics to produce statistical comparisons between observed (measured) ozone concentrations and the model’s predicted concentrations. The recommended metrics include calculations of bias, error, and correlation coefficients.

In addition to conducting the metrics calculations for individual monitors, the EPA recommends "pooling" data by monitor location, i.e., developing average statistics for downwind, city center, and upwind groups of monitors. Both the San Antonio and Austin areas have relatively sparse monitoring networks. Bias, error, and other metrics were calculated for monitoring groups when possible. Based on recommendations from the TCEQ and EPA Region 6, performance evaluation was conducted using the averaged statistics for all stations in Central Texas. The ozone metrics calculated for the eight Central Texas monitors are provided in this section. Metrics for individual monitors and monitor groups are provided in Appendix H.

EPA's 1999 draft modeling guidance recommends specific goals for each of the ozone metrics tests. Table 3.5-2 details these goals.

Statistical metrics averaged for the eight Central Texas monitors, using each of the three methodologies described in Section 3.5.1, are presented in Tables 3.5-4 through 3.5-6. Likewise, scatter plots with correlation coefficients and Q-Q results, using each of the three methodologies, are provided in Figures 3.5-4 through 3.5-6. These statistical and graphical metrics were performed on the final photochemical model run, CAMx Run 18, which incorporated the refined meteorological model (Met Run 5g), refined emissions inventories, modified dry deposition algorithms to account for vegetation moisture stress, and the modified boundary/initial conditions described in Appendix H.

Table 3.5-2 EPA Recommended 8-hour Ozone Performance Evaluation Metrics

Test	**Goal**
Bias between predicted/observed mean 8-hour (and 1-hour) daily maxima near each monitor	20% most monitors (8-hour comparisons only)
Fractional bias between predicted/ Observed mean 8-hour (and 1-hour) daily maxima near each monitor	20% most monitors (8-hour comparisons only)
Correlation coefficients, all data, temporally paired means, spatially paired means	Moderate to large positive correlation
Average Bias (8-hour daily maxima and 1-hour observed/predicted), all monitors	5 – 15%
Normalized Gross error (8-hour daily maxima and 1-hour observed/predicted), all monitors	30 – 35%

Calculating performance statistics is not required for the two-day model initialization, or "ramp-up" period, but these metrics are included in Tables 3.5-3 through 3.5-5 for comparison purposes. Metrics for the two initialization days are highlighted.

As demonstrated, all bias and error metrics averaged for the eight Central Texas monitors fall within the established EPA goals. Furthermore, the goals are met on primary episode days (September 15 – 20, 1999) as well as on the initialization days.

Table 3.5-3 Statistical Metrics (%), Based on the Predicted Daily Maximum Ozone Concentration within a 7x7 Array of Grid Cells Near Each Monitor, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-Hour Ozone Concentration (ppb)	Maximum Predicted 8-Hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	52.87	- 4.54	- 5.01	8.63	8.94
9/14/99	60.03	59.56	- 0.13	- 0.70	7.51	7.39
9/15/99	75.41	74.09	- 1.28	- 1.67	6.80	6.92
9/16/99	76.19	75.04	- 0.80	- 1.13	7.46	7.50
9/17/99	82.12	80.75	- 0.79	- 1.16	7.66	7.74
9/18/99	85.53	83.59	- 2.13	- 2.40	5.96	6.15
9/19/99	88.76	89.58	1.16	0.82	7.07	7.01
9/20/99	82.24	86.20	4.68	4.43	6.40	6.21

Table 3.5-4 Statistical Metrics (%), Based on the Predicted Daily Maximum Ozone Concentration within a 7x7 Array of Grid Cells Near Each Monitor that is Closest in Magnitude to the Observed Daily Maximum, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-hour Ozone Concentration (ppb)	Maximum Predicted 8-hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	51.92	- 6.45	- 6.84	6.74	7.13
9/14/99	60.03	57.59	- 3.84	- 4.07	3.84	4.07
9/15/99	75.41	72.15	- 4.09	- 4.34	4.11	4.36
9/1699	76.19	72.77	- 4.13	- 4.32	4.13	4.32
9/17/99	82.12	78.25	- 4.24	- 4.47	4.32	4.55
9/18/99	85.53	81.83	- 4.20	- 4.43	4.26	4.49
9/19/99	88.76	86.02	- 2.88	- 3.02	3.15	3.30
9/20/99	82.24	81.61	- 0.85	- 0.88	1.01	1.04

Table 3.5-5 Statistical Metrics (%), Based on a Bilinear Interpolation of Predicted Daily Maximum Ozone Concentration, used to Assess 8-hour Performance of the September 13-20, 1999 Photochemical Model in Central Texas

Date	Maximum Observed 8-hour Ozone Concentration (ppb)	Maximum Predicted 8-hour Ozone Concentration (ppb)	Average Normalized Bias (±15%)	Average Fractional Bias (±15%)	Average Normalized Error (35%)	Average Fractional Error (35%)
9/13/99	55.74	50.49	- 8.82	- 9.61	9.87	10.65
9/14/99	60.03	55.17	- 7.55	- 8.17	9.23	9.81
9/15/99	75.41	68.04	- 9.37	- 10.07	9.73	10.43
9/16/99	76.19	70.04	- 7.43	- 8.07	9.37	9.96
9/17/99	82.12	73.97	- 9.22	- 9.92	10.22	10.90
9/18/99	85.53	76.44	- 10.52	- 11.34	10.52	11.34
9/19/99	88.76	82.97	- 6.30	- 6.82	8.41	8.85
9/20/99	82.24	78.36	- 4.69	- 5.20	6.68	7.16

Observed and predicted 8-hour ozone maxima were compared graphically using scatter plots and Q-Q plots. Q-Q plots are used to determine whether two data sets, observed and predicted values in this case, come from populations with a common mean. EPA Quantile plots rank the observed and predicted values separately, and then plot the 1^{st}, 6^{th}, 11^{th}, 16^{th} ..... data pairs. The closer the Q-Q points follow the 1:1 reference line, the greater the evidence that the two data sets come from populations with similar distributions. Figures 3.5-3 through 3.5-5 provide combined scatter/Q-Q data pairs determined for the pooled Central Texas monitors using the three methodologies described previously. Only the third (and most stringent) methodology (Figure 3.5-5) yields observed/predicted data pairs (indicated by "+" signs) outside the ±20 indicator lines. Q-Q points, designated by circles, follow the 1:1 reference line closely in each graph, particularly for methods 1 and 2. Furthermore, each methodology yields moderate to high correlation coefficients. Therefore the graphics tests indicate a high degree of correlation between peak 8-hour ozone concentrations measured during the September 1999 episode and the predicted 8-hour maximums predicted by the model for the same period.

In addition, time series analysis, as seen in Figure 3.5-6, shows that the modeling for 1999 closely mirrors the actual observed data. This increases confidence that selected control strategies will be effective in reducing ozone.

Regardless of the methodology used to determine the predicted maximum concentration within Central Texas, the results of applying metrics tests to Run 18 for each day of the September 13 – 20, 1999 episode fell well within EPA guidelines. In addition, the 1-hour and 8-hour ozone metrics conducted on individual monitors and groups of monitors also yielded excellent results. These tests and test results are described in Appendix H.

3.6 FUTURE BASE CASE EMISSIONS INVENTORY AND MODELING

Future Case modeling used projected 2007 emission inventories with the same biogenic emissions, meteorological data, and CAMx configuration developed for the successful base case. Inputs followed EPA's Draft Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-Hour Ozone NAAQS (1999) and their Protocol for Early Action Compacts (2003). Development of the future base case EI required adjusting the 1999 base case modeling EI to the projection year using both control and growth factors. Growth factors accounted for anticipated increases or decreases in emission-generating activities as the result of change growth / decline in employment rates, population, and transportation. Control factors were applied to emission projections to account for state and federal control regulations that are already mandated and expected to be in place by the attainment year. Such control factors are expected to impact local emissions through changes in technology, fuel formulations, fuel use, energy efficiency, and other emission reduction programs.

Emission projection procedures are specific to the source category – onroad mobile, area/nonroad, and point – and are discussed in detail in Appendix E. In brief, Austin and San Antonio each developed its own base case and growth emissions files for its own local area, and shared those files with other areas. The TCEQ provided 4-km, 12-km and 36-km emissions files for base case and future growth for areas outside of the EAC areas. The emissions files outside of the EAC areas were the same as the emissions files being used for the HGB MCR at the time the EACs were developed. Growth and control assumptions for areas outside of Texas and Louisiana were taken from the EPA sponsored Heavy Duty Diesel Modeling for 2007. Data was downloaded from the EPA website and reformatted for modeling. The TCEQ made diurnal adjustments to the point files, but the emissions totals were unchanged. In accordance with EPA recommendations, the biogenic inventory for 2007 was identical to that used in the 1999 base case.

3.7 ATTAINMENT DEMONSTRATION PROCESS

As recommended by the EPA, attainment demonstrations for the 8-hour ozone NAAQS are based on the results of modeled attainment tests, screening tests, and, when appropriate, weight-of-evidence determinations. Key components of these tests are the predicted and observed ozone design values.

In general, an attainment demonstration compares predicted ozone concentrations with the thresholds established by the NAAQS. The 8-hour NAAQS are met if the fourth highest 8-hour daily maximum ozone concentration averaged over three consecutive years is less than or equal to 0.08 parts per million (ppm). Therefore, the modeled attainment test is passed when the predicted future design values near all monitoring sites are less than 85 ppb. The EPA methodology for estimating the future design value calls for multiplying "current" year design values by relative reduction factors (RRF) derived from a photochemical model. The calculation is carried out for each monitor site that measured ozone during the current year. In addition, a screening calculation identifies grid cells with consistently high ozone and estimates scaled design values for these screening cells. The screening procedure accounts for any areas where modeled ozone is consistently high, but not captured by the monitoring network. The attainment test is passed if all the future year scaled design values are less than 85 ppb (the results are truncated to the nearest integer). Additional information on the RRF is included in Appendix I.

3.7.1 Design Values and Relative Reduction Factors

The "current" year is determined by comparing two design values; one for the years that straddle the year for which the latest emission inventory was developed (1999) and the other for the year for which attainment of the standard was determined (2002). The current year is the year that has the higher of the two design values. A current year is determined for each monitor site. Based on this procedure, the area-wide "current" design value for the AER is 89 ppb as shown in Table 3.7-6

Table 3.7-6 Determination of "Current Year" for AER

Monitor Site	Design Value for 1999 (a)	Design Value for 2002 (b)	Current year	Design value for current year
Audubon (CAMS 38)	89 ppb	80 ppb	1999	89 ppb
Murchison (CAMS 3)	87 ppb	84 ppb	1999	87 ppb

a. Design value for 1998, 1999 and 2000
b. Design value for 2001,2002 and 2003

<u>3.7.2 Modeled Attainment Test</u>
The modeled attainment test predicts whether or not all observed future design values will be less than or equal to the 8-hour ozone NAAQS under the same meteorological conditions as those simulated for the base case (EPA, May 1999). The future design value is calculated by multiplying the "current" design value by a "Relative Reduction Factor," which is the relative change in modeled values between the base and future case. The test was performed for each monitoring site within the AER and San Antonio region.

Future Design Value = Relative Reduction Factor x Current Design Value

The RRF is calculated for each site by comparing the episode average of the future 8-hour daily maximum concentration predicted near a monitor (within the 7 X 7 grid) to the episode average for the base case 8-hour daily maximum concentration predicted near a monitor. Details of the RRF calculation can be found in Appendix I, Section 3.1. The modeled attainment test is passed if all resulting predicted future design values are < 85 ppb. Table 3.7-7 provides the results of the modeled attainment test at each AER monitor. As indicated, the test was passed at all the monitors used to determine attainment.

Table 3.7-7 Model results for base 2007 modeling with the September 1999 Episode

Monitor site	1999 design value	Relative reduction factor	Estimated design value for 2007 *	Attainment of the 8-hour standard?
Audubon (CAMS 38)	89 ppb	0.948	84.37	Yes
Murchison (CAMS 3)	87 ppb	0.948	82.48	Yes

* Truncate this number to the nearest integer to compare to the standard of 85 ppb. Any design value less than 85 ppb indicates attainment of the 8-hour ozone standard.

All the model runs to date have shown future design values below the standard of 85 ppb. Therefore, additional control strategies will help to assure attainment of the standard. Chapter 5 describes additional local controls that were evaluated and are being proposed as a means of further reducing ozone concentrations in the AER by the attainment year.

3.8 SUPPLEMENTAL CONTROL STRATEGY MODELING
The modeling was used to test various combinations of emission reduction measures or strategies. Each strategy package was individually applied to the base 2007 EI and the resulting EI was modeled. Then the RRF for each control strategy package at each monitor site was determined, and then multiplied by the appropriate current year design value to estimate the corresponding design value for 2007. The list of modeled emission reduction measures is in Table 3.8-8 (see Chapter 5 for a discussion of each measure). Details of the supplemental control strategy modeling runs may be found in Appendix J.

Table 3.8-8 List of Modeled Emission Reduction Measures in AER

Emission Reduction Measure	NO_X Reductions tpd	VOC Reductions tpd
I/M	3.22	3.83
Heavy Duty Vehicle Idling Restrictions	0.67	0
Low Emission Gas Cans	0	0.89
Stage I Vapor Recovery	0	4.88
Degreasing Controls	0	5.55
Cut Back Asphalt	0	1.03
TERP	2.0	0
Transportation Emission Reduction Measures (TERMS)	0.72	0.83

Table 3.8-9 defines each of the control strategies that were run. The table shows more detailed information on the location of the reductions and various combinations considered.

Table 3.8-9 List of Emission Reduction Measures Modeled for Each Strategy

Strategy Model Run	Emission Reduction Measure
1	Vehicle I/M (three counties) only
2	All locally requested State-Assisted Measures (with TERMS) but without Vehicle I/M in Hays County, without low Reid Vapor Pressure gasoline and without commute reductions.
3	TERP only (modeled at 2 tpd reduction)
4	All measures with VOC reductions and no NO_X reductions Portable Fuel Containers Low Emission Gas Cans Stage I Vapor Recovery Degreasing Controls Autobody Refinishing Cut Back Asphalt Low Reid Vapor Pressure Gasoline
5	Point Sources Only
6	Vehicle I/M in Travis & Williamson Counties Heavy Duty Diesel Idling Restrictions Portable Fuel Containers Statewide Stage 1 Vapor Recovery Degreasing Controls Cutback Asphalt TERP participation TERMS Point Source Reductions

Strategy Model Run	Emission Reduction Measure
7	Final Run including: Vehicle I/M in Travis & Williamson Counties Heavy Duty Diesel Idling Restrictions Portable Fuel Containers Statewide Stage 1 Vapor Recovery Degreasing Controls Cutback Asphalt TERP participation TERMS

Table 3.8-10 shows the calculated results for 8-hour ozone for each of the AER monitors. The control strategy run listed in Table 3.8-9 outlines the various control strategies being considered in each.

Table 3.8-10 Model Results for Emission Reduction Measures Applied to Base 2007 EI with the September 1999 Episode

Control Strategy Run	Monitor Site	1999 Design Value	Relative Reduction Factor	Estimated Design Value for 2007 *	Attainment of The 8-Hour Standard?
1	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.944	83.13	Yes
2	Audubon	89 ppb	0.937	83.39	Yes
	Murchison	87 ppb	0.934	81.26	Yes
3	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.947	82.39	Yes
4	Audubon	89 ppb	0.946	84.19	Yes
	Murchison	87 ppb	0.945	82.22	Yes
5	Audubon	89 ppb	0.944	84.02	Yes
	Murchison	87 ppb	0.943	82.04	Yes
6	Audubon	89ppb	0.936	83.30	Yes
	Murchison	87 ppb	0.934	81.26	Yes
7	Audubon	89ppb	0.940	83.66	Yes
	Murchison	87 ppb	0.939	81.69	Yes

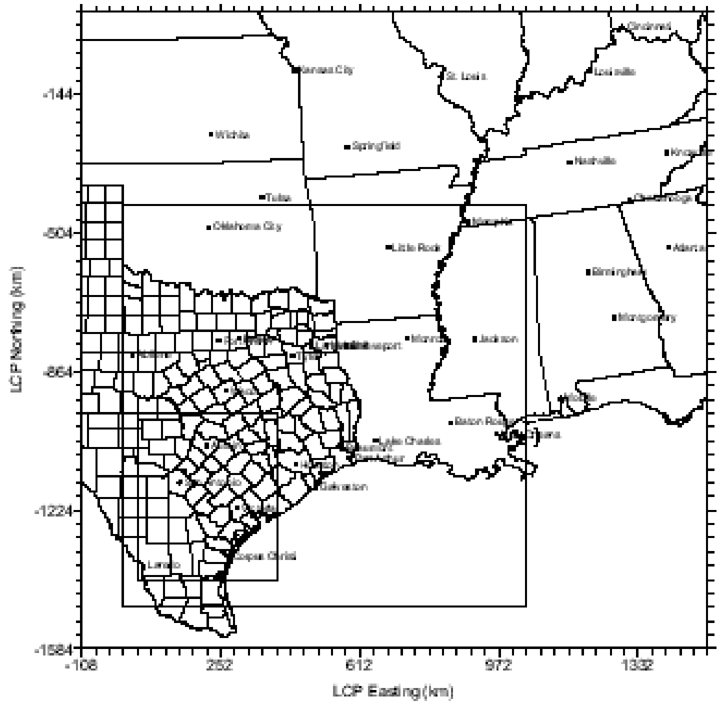
* Truncate this number to the nearest integer to compare to the standard of 85 ppb. Any design value less than 85 ppb indicates attainment of the 8-hour ozone standard.

Comments on the proposed revisions to the SIP for the EAC areas were received from EPA on August 30, 2004. Based on EPA comments and more recent estimates on certain emission reductions made by TCEQ, the AER modeling contractor modified the emissions reductions for I/M, heavy duty vehicle idling restrictions, spill proof gas cans, and degreasing controls to the values summarized in Table 3.8-8. The net impact of these modifications resulted in a maximum VOC increase of approximately 2 percent relative to the Run 2 Austin MSA emissions, while NOx emissions decreased by up to approximately 2 percent relative to the Run 2 values. The results of the updated final control strategy run (Run 7) are shown in Table 3.8-10.

The conclusion of this modeling is that without any additional control strategies, the area will be in attainment in 2007. The additional modeled control strategies further support the conclusion that the area will be in attainment in 2007.

A final control strategy run, Run 7, which includes all the adopted control measures and their final emissions reduction estimates was run. Without any additional control strategies, the CAMx future base case modeling results indicate that the area will be in attainment in 2007. Adding supplemental control strategies also indicates that the area will be in attainment in 2007.

Figure 3.2-1 Modeling Domain used to Simulate the September 13 - 20, 1999 High Ozone Episode



CAMx Grid Dimensions

LCP Grid with reference origin at (40N, 100 W)

36 km Grid: 45 x 46 cells from (-108, -1584) to (1512, 72)
12 km Grid: 87 x 87 cells from (0, -1476) to (1044, -432)
4 km Grid: 90 x 108 cells from (36, -1404) to (396, -972)
(nested grid dimensions do not include buffer cells)

Figure 3.5-2 Locations of Central Texas Air Quality Monitors in the Model's 4-km Grid System. Dashed red lines represent the 7 x 7 array of cells surrounding each monitor

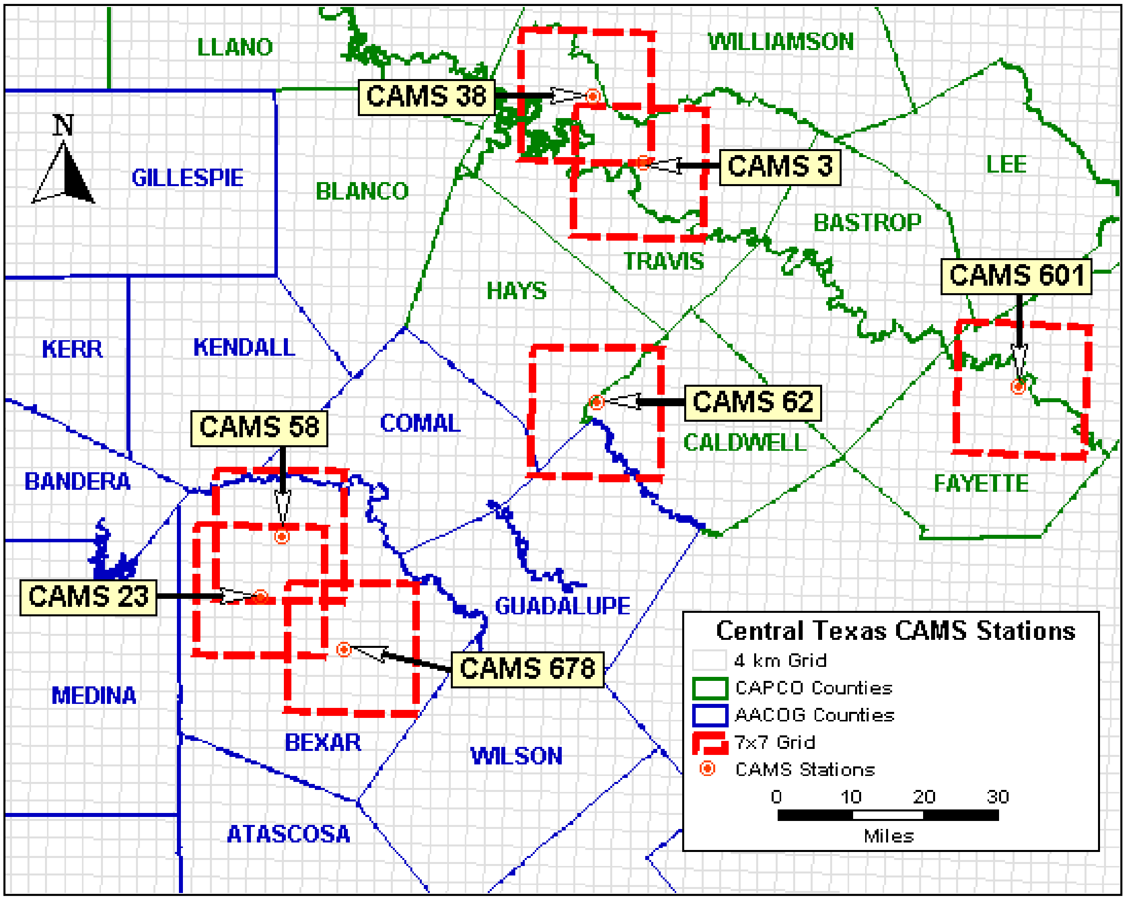


Figure 3.5-3 Observed and Predicted (within 7x7 array of grid cells near each monitor) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors

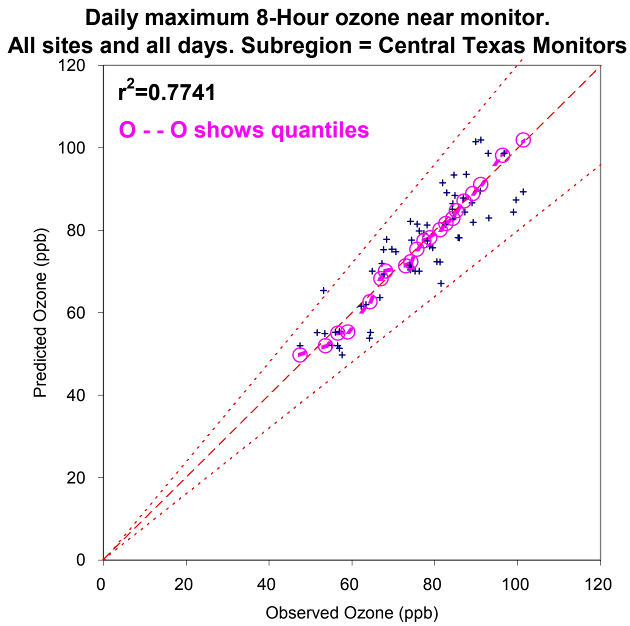


Figure 3.5-4 Observed and Predicted (within 7x7 array of grid cells near each monitor that is closest in magnitude to the observed daily maximum) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors

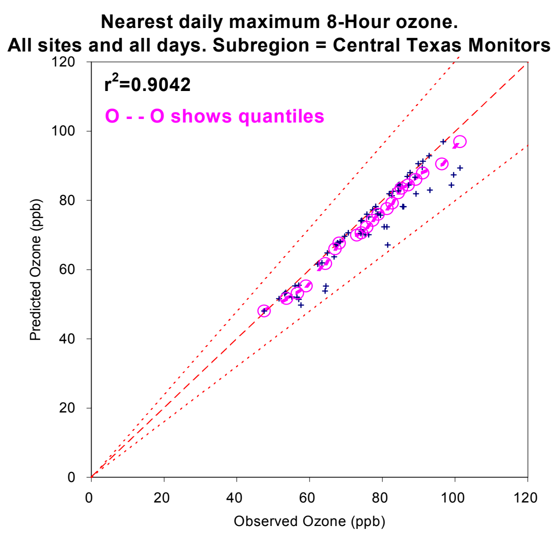


Figure 3.5-5 Observed and Predicted (based on a bilinear interpolation of daily maximum ozone concentrations around each monitor) Daily Maximum 8-hour Ozone Concentrations at Central Texas Monitors

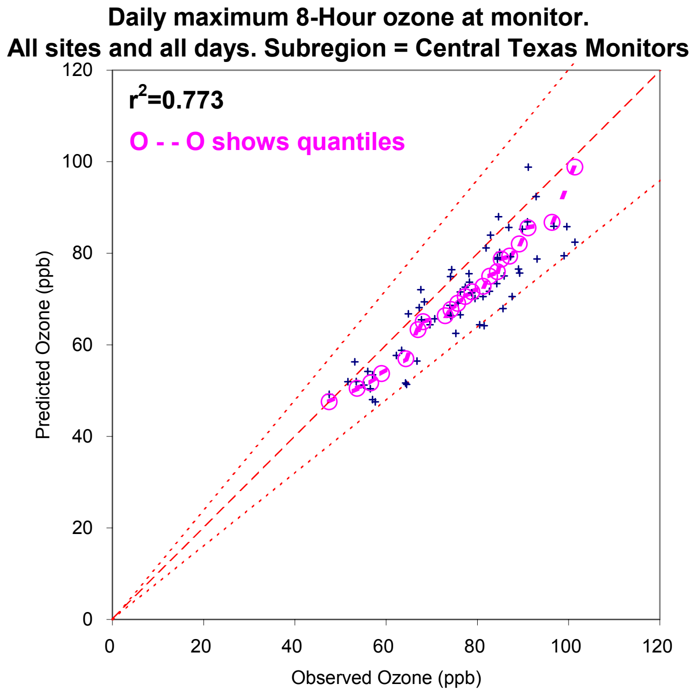
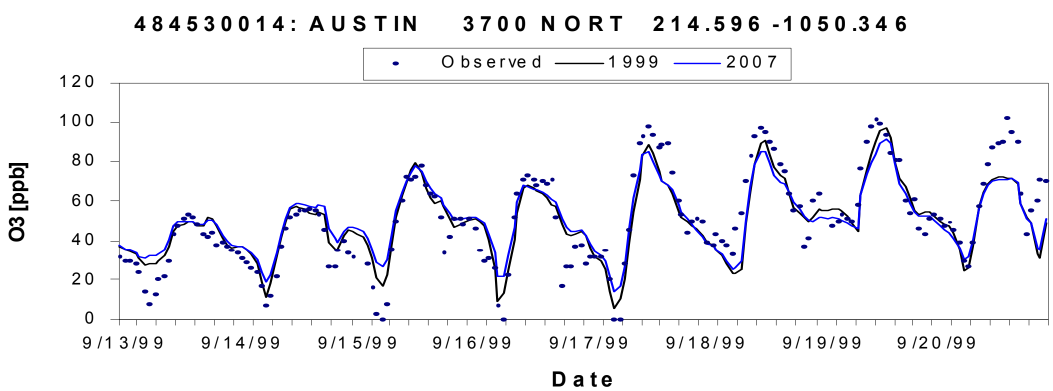


Figure 3.5-6 Time series of observed concentrations compared to modeled concentrations for the September 13-20, 1999 episode



CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

Data analysis entails examining ambient air quality data and other information to develop an understanding of ozone formation, transport, and deposition. The results of these analyses supplement the photochemical and meteorological processes and enhance the decision-making process for clean air strategy selection. The following sections summarize the results and conclusions of several analyses that support photochemical modeling efforts. Detailed information on these topics is provided in the appendices.

4.2 MONITORING TRENDS

Ozone concentrations at two sites in Austin have been monitored since 1983. The monitor at Murchison (CAMS 3) has not moved, but the other monitor (CAMS 38) was moved in 1997 to the current Audubon site. To be consistent, these analyses will be limited to the time period beginning in 1997 when ozone concentrations were measured at both the Murchison and Audubon sites. See Figure 3.5-2 for the location of these monitors.

Since the EAC addresses 8-hour ozone concentrations, these analyses will be performed for 8-hour time periods. EPA has chosen to use the 3-year average of the fourth highest concentrations to determine the design value. The area-wide design value is the highest of the design values for all of the monitors in the area. The average for the design value is truncated and if that value is greater than or equal to 85 ppb, the standard is exceeded.

Figure 4.2-1 shows the fourth highest 8-hour ozone concentrations and the design values at the Audubon monitoring site from 1997 to 2003. Figure 4.2-2 shows those same values for the Murchison monitoring site. Figure 4.2-3 shows the design value trends for Audubon and Murchison and the area-wide design values from 1997 to 2002.

The design values for the years that straddle 1999 (1998-1999-2000) were used as the "current" year to estimate the future year design value (2007) (see Table 3.7-6). These design values were the highest measured in the AER at both monitors. More recent monitoring provides lower design values and the latest design values for the years straddling 2002 do not exceed the standard.

An analysis of historical monitoring trends in the AER indicates that the "current" year design value of 89 ppb is the highest ever measured. Analyses of the various metrics related to the meteorological conditions indicate that the conditions favorable to formation of high ozone occurred more often than normal during 1999 and less often than normal in 2001. The selection of the "current" year is based on the date of the most recent EI. If an EI were prepared for 2002, then the current year would be 2002, which has a maximum design value of 84 ppb.

4.3 METEOROLOGICAL ANALYSIS

A conceptual model describes the local meteorological conditions and associated large-scale weather patterns that are associated with periods of high ozone. The AER conceptual model establishes that, prior to a typical high ozone episode, weak to moderate south/southeasterly flow from the Gulf of Mexico prevails. An upper-level ridge of high pressure enhances subsidence, suppressing vertical motion. The jet stream flows parallel to the Canada/U.S. border. Isolated afternoon convection and showers often occur along the coast in association with the sea breeze front or daytime convective heating. Peak ozone concentrations in Austin typically range from 40 ppb to 60 ppb. Skies are generally clear or partly cloudy and daily maximum temperatures reach the mid to upper 90s.

An upper-level trough develops in the jet stream over the eastern U.S. This allows drier air to move southward from the Central U.S. and Midwest as weak fronts or surface troughs move ahead of a strengthening surface ridge of high pressure. These frontal troughs propagate beneath the upper-level high pressure ridge and into Central and Southeast Texas. Afternoon convection and showers often develop due to weak surface convergence along these troughs. The surface high pressure system continues to advance southward, and is typically centered over the Central Plains or Ohio River Valley regions. The clockwise circulation around this feature generates northeasterly to easterly flow that transports continental air and haze into Central Texas. Peak ozone concentrations increase to the mid-70s. Significant convection and shower activity often occurs in nearby areas even on days characterized by very high ozone. This convection is associated with surface convergence along the dissipating frontal trough, which often extends eastward into Southeast Texas. This feature may enhance the strength of the sea breeze front as well.

The synoptic-scale surface high pressure ridge is associated with weak pressure gradients in Texas, generating only very light surface winds. Extremely high ozone concentrations are often measured throughout eastern Texas. Morning winds in Austin often exhibit a northerly or westerly component, likely associated with drainage along the Balcones Escarpment in a shallow surface layer that becomes decoupled from the prevailing synoptic-scale circulation. By mid-morning, mechanical mixing due to convective thermals deepens the mixed layer. Higher momentum air dominated by the larger-scale flow is mixed to the surface and afternoon winds typically blow with an easterly component. Temperatures increase to the upper 90s in the slightly drier continental airmass. Surface winds remain very light and the depth of the convective boundary layer is limited by upper and mid-level subsidence. Peak ozone concentrations remain above 75 ppb for up to three consecutive days or more, sometimes reaching levels as high as 100 ppb. Substantial levels of background ozone are potentially transported into the AER during these periods. The Fayette County and San Marcos monitoring stations, which are often located upwind of Austin, typically measure peak ozone concentrations that are 80-85% percent of the observed AER maximum. As the surface high pressure center weakens and/or moves eastward, the synoptic-scale flow becomes more southeasterly and southerly. Easterly or southeasterly flow is sometimes enhanced by the cyclonic circulation associated with tropical systems located in the central or western Gulf of Mexico.

With continued southerly winds, relatively clean air from the Gulf of Mexico improves horizontal dilution of ozone concentrations across the AER. Ozone levels decrease dramatically throughout the state. High ozone episodes sometimes end when a second frontal system enters Texas, bringing cooler temperatures and generating convection and shower activity. Occasionally, tropical circulations enter Texas from the Gulf of Mexico as well, and are associated with a return to maritime flow and rain showers.

Once the meteorological conditions that are frequently associated with high ozone days are identified using the conceptual model, representative periods can be selected and modeled with a photochemical model. A synoptic cycle is a set of consecutive days for which the meteorological conditions fit into a repeating pattern. A set of days that are typical of high ozone and that cover a synoptic cycle is called an episode. A typical photochemical modeling episode has two or more days when the measured ozone is high and close in magnitude to the design value for the area. In order to minimize the impacts of the initial conditions for the model, a photochemical modeling episode will include two or three initialization days prior to the first day when high ozone was measured. The conceptual model for the AER indicates that the period from September 13 to 20, 1999, is a representative episode to use for photochemical modeling and includes a complete synoptic ozone cycle. This episode is representative of approximately

80 percent of the days when 8-hour ozone concentrations exceed the standard.

EPA provides guidance on approaches that can be used to evaluate the meteorological conditions that occurred in 2001, 2002 and 2003 compared to those that occurred in the past. The guidance recommends the following metrics that relate to 8-hour ozone measurements:

- annual number of exceedances of the standard,
- highest daily concentration for each year,
- second highest daily concentration for each year,
- fourth highest daily concentration for each year, and
- design value for each three year period.

The values for each of these metrics from 1997 to 2003 are shown in Table 4.3-1

Table 4.3-1 Values for Meteorological Monitoring Metrics in the AER

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**Average 2001,2002, 2003**
Number of Days ≥85 ppb*	6	6	19	11	1	5	6	**4**
High Ozone* (ppb)	96	95	103	93	85	100	92	**92.3**
2^{nd} High Ozone* (ppb)	91	92	101	89	82	96	87	**88.3**
4^{th} High Ozone** (ppb)	87	88	99	88	80	91	84	**85.0**
Design Value ** (ppb)		89	89	88	85	84		

*All monitors
** Murchison and Audubon only

4.4 TRANSPORT

A useful tool for evaluating the impact of regional transport from one urban area to another is zero-out modeling. A zero-out modeling simulation is one in which emissions from a region of interest are eliminated (or "zeroed-out") in order to evaluate change resulting from eliminating those emissions. Using the 2007 EI, a zero-out modeling run was performed for each of the eight ozone nonattainment and NNA areas in eastern Texas. The nonattainment areas include Houston/Galveston/Brazoria, Beaumont/Port Arthur, and Dallas/Fort Worth. The NNA areas include Austin, Victoria, San Antonio, Corpus Christi, and Northeast Texas (Tyler/Longview/Marshall). In each zero-out run, anthropogenic emissions of VOC, NO_X, and CO were eliminated from one of the eight urban sub-regions, referred to as the source area, and then the impacts were evaluated within the sub-region itself, as well as within the remaining seven analysis areas. Two additional zero-out modeling runs were performed to evaluate the impact of transport from selected point sources within the state of Texas, as well as from all sources located outside of the state of Texas. In the first of these runs, all anthropogenic point source emissions occurring outside of the eight source areas, but within the state of Texas, were zeroed-out. In the second, all anthropogenic emissions within the state of Texas were eliminated.

Peak ozone concentrations for the AER from the base case with the interim 2007 projected emission inventory ranged from 88 ppb to 98 ppb for the 8-hour ozone average. Peak zero-out concentrations ranged from 58 ppb to 72 ppb for the 8-hour ozone average.

Similar zero-out modeling was performed with the September 13-20, 1999 episode with the 2007 EI used for the EAC. The peak 8-hour ozone values ranged from 77 ppb to 92 ppb. Peak zero-out concentrations ranged from 70 ppb to 85 ppb for the 8-hour ozone average. Additional similar zero-out modeling was performed using additional episodes. The additional episodes modeled were September 5-11, 1993, June 18-22, 1995, and June 30-July 4, 1996.

Table 4.4-2 shows the number of days each area made a significant impact (difference of 2 ppb or more) on the AER for each of these episodes. These results indicate that ozone levels in the AER are influenced by the transport of ozone and/or ozone precursors from other urban areas.

Table 4.4-2 Summary of Number of Days that Emissions from Other Areas are Transported into the AER

Source Area	**Number of days significant impact on Austin**		
	September 13-20, 1999	July 9-12, 1995	1993, 1995 and 1996
Number of days modeled	*6*	*4*	*11*
Houston/Galveston/Brazoria	5	3	10
Beaumont/Port Arthur	5	1	5
Dallas/Fort Worth	0	0	3
Tyler/Longview/Marshal	3	0	4
Victoria	2	4	5
San Antonio	3	4	6
Corpus Christi	2	2	0

Another analysis that can be performed with the zero-out modeling is to determine the maximum concentration before the zero-out, and the maximum concentration after the zero-out, of local emissions. This quantifies the difference in maximums that the local emissions make and also provides insight into the magnitude of the ozone in the area that is due to transport. Table 4.4-3shows a summary of these data for the September 13-20, 1999 episode.

Table 4.4-3 Impact of zero-out of Austin anthropogenic emissions on the AER

Episode day	Maximum Concentration before zero of Austin Emissions (ppb)	Maximum Concentration after zero of Austin Emissions (ppb)	Difference (ppb)
9/15/99	77	70	7
9/16/99	75	70	5
9/17/99	82	79	3
9/18/99	80	72	8
9/19/99	83	78	5
9/20/99	88	70	18

These results show that for the episode modeled on one day there is difference of 18 ppb when the AER emissions are zeroed out. On other days there is only a 3-8 ppb difference. An effective control strategy should include reductions in the background levels of ozone and as well as local measures.

Figure 4.2-1 Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Audubon monitoring station for the 1997 through 2003 period

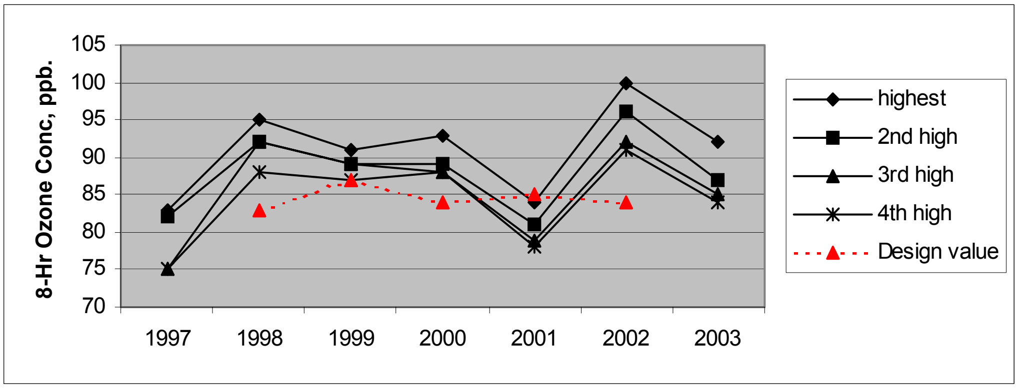


Figure 4.2-2 Four Highest 8-hour Ozone Concentrations and Design Values (ppb) at the Murchison monitoring station for the 1997 through 2003 period

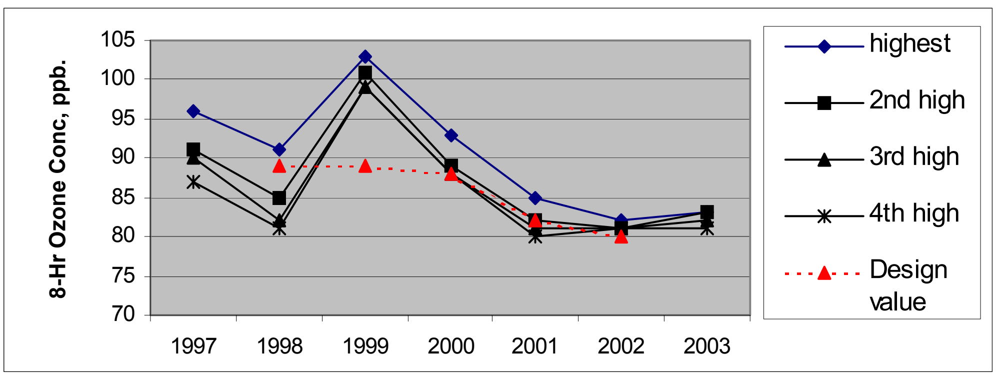
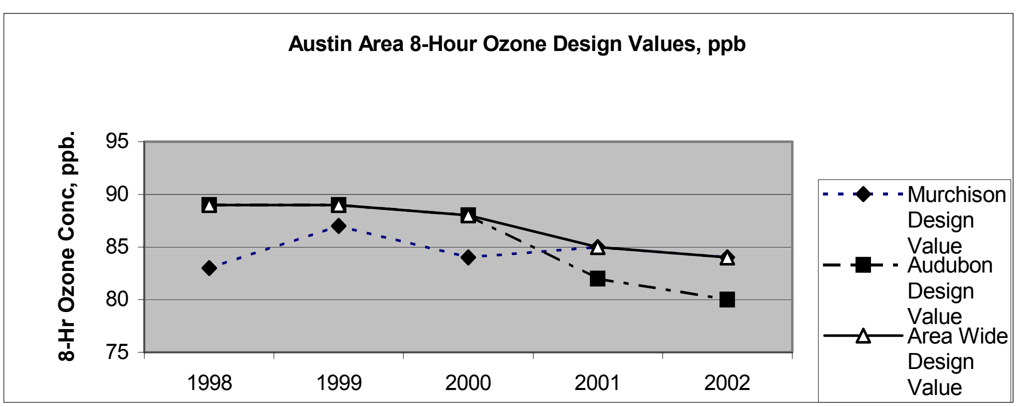


Figure 4.2-3 Design Value Trends for AER



CHAPTER 5: CONTROL STRATEGIES

5.1 INTRODUCTION

Various emission reduction techniques can effectively reduce ozone precursors. Emission reduction methods employed nationally, statewide and regionally benefit the AER, but more reductions are needed to ensure clean air for the AER. The EAC provides the mechanism for implementation of local emission reduction techniques.

5.2 FEDERAL AND STATE MEASURES

5.2.1 Federal Measures

The ACAAP projects emission reductions from the following federal initiatives:

Federal Area Source Measures:

- Reformulated Architectural and Industrial Maintenance Coatings
  - 40 CFR Part 59 Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings
- Auto Body Refinishing
  - 40 CFR Part 59 Subpart B *National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings*

Federal On-Road Measures:

- Tier 2 Vehicle Emission Standard
  - 40 CFR Parts 80, 85, and 86 *Air Pollution; Tier 2 Motor Vehicle Emission Standards and Gasoline Sulphur Control Requirements; Diesel Fuel Quality Controls*
- Heavy-duty Diesel Engine Rule
  - 40 CFR Parts 85 and 86 *Emissions Control, Air Pollution from 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles; Light-Duty On-Board Diagnostics Requirements*
- National Low Emission Vehicle Standards
  - 40 CFR Parts 9, 85, and 86 *Control of Air Pollution form New Motor Vehicles and New Motor Vehicle Engines: State Commitments to National Low Emission Vehicle Program*

Federal Non-Road Measures:

- Small Spark-Ignition Handheld Engines
  - 40 CFR Parts 90 and 91 *Phase 2 Emission Standards for New Non-road Spark-Ignition Handheld Engines at or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines.* (FR 24268, Vol.65, No.80, April 25, 2000)
- Tier 3 Heavy-Duty diesel equipment
  - 40 CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines* (FR 56968, Vol.63, No.205, October 23, 1998)
- Locomotives
  - 40 CFR Parts 85, 89, and 92 *Emission Standards for Locomotives and Locomotive Engines* (FR 18978, Vol.63, No.73, April 16, 1998)
- Compression ignition standards
  - 40 CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines*
- Emissions from Non-Road Large Spark-Ignition Engines and Recreational Engines
  - CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines (Marine and Land-Based); Final Rule* (FR 68242, Vol.57, No.217, November 8,

2002)

- Recreational Marine Standard
  - CFR Part 89 *Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines*

Federal Point Source Measures:
Alcoa Inc. Consent Decree

5.2.2 State and Regional Measures
The ACAAP projects emission reductions from the following statewide initiatives:
State Area Source Measures:

- Non-Road Large Spark-Ignition Engines
  - 30 TAC 114, Subchapter I, Division 3 *Non-Road Large Spark-Ignition Engines*
- HB2914 - Grandfathered Pipeline Facilities
  - 30 TAC 116, Chapter H, Division 2 *Small Business Stationary Source Permits, Pipeline Facilities Permits, And Existing Facility Permits*Gas-fired Water Heaters, Small Boilers and Process Heaters30 TAC 117, Chapter D, Division 1 Water Heaters, Small Boilers, And Process Heaters
- Stage 1 Vapor Recovery
  - 30 TAC 115, Subchapter C, Division 2 *Filling Of Gasoline Storage Vessels (Stage I) For Motor Vehicle Fuel Dispensing Facilities*

State On-Road Source Measures:

- Clean Gasoline
  - 30 TAC 114, Subchapter H, Division 1 *Gasoline Volatility*

State Non-Road Source Measures:

- Texas Low Emission Diesel (TxLED)
  - 30 TAC 114, Subchapter H, Division 2 *Low Emission Diesel*

State Point Source Measures:

- Cement Kiln NO_X limits
  - 30 TAC 117, Subchapter B, Division 4 Cement Kiln
- SB5 – TERP
  - 30 TAC 114 Subchapter K, Division 3 *Diesel Emissions Reduction Incentive program for On-Road and Non-Road Vehicles*
- SB7 - Electric Utility Deregulation
  - 30 TAC 116 Subchapter I, Division *Electric Generating Facility Permits*
- SB766 - VERP & MPP for Grand fathered Facilities
  - 30 TAC 116 Subchapter H, Division 4 *Voluntary Emission Reduction Permits*
- HB2912 - Grandfathered Permitting Requirements
  - 30 TAC 116 *Control Of Air Pollution By Permits For New Construction Or Modification*
- Electric Generating Facilities NO_X Emission Rules for boilers & gas turbines (EAST NO_X)
  - 30 TAC 117, Subchapter B, Division 2 *Utility Electric Generation In East And Central Texas*

5.3 LOCAL STRATEGIES

5.3.1 Introduction

Measures included in this attainment demonstration may be divided into two groups. The state-assisted measures would apply to all or most jurisdictions in the AER. The locally-implemented measures were self-selected by the EAC signatories, with each encouraged to implement at least three in addition to continuing O3 Flex commitments. Jurisdictions could choose to enhance an existing O3 Flex measure.

5.3.2 Locally-Implemented Measures

Locally-implemented EAC measures build on those in the O3 Flex Agreement. More detailed descriptions and commitments from participating agencies appear in Appendix K, which also lists each signatory's commitments. Signatories implement these measures according to their needs and abilities. With the exception of the Transportation Emission Reduction Measures (TERMS), the ACAAP neither quantifies these reductions nor includes them in its modeling.

Transportation Emission Reduction Measures (TERMS)

TERMS are transportation projects designed to reduce vehicle use, improve traffic flow, or reduce congested conditions. A transportation project that adds single-occupancy vehicle (SOV) roadway capacity is not considered a TERM. General categories of TERMS include intersection improvements, traffic signal synchronization improvements, bicycle and pedestrian facilities, high-occupancy vehicle lanes, major traffic flow improvements, park and ride lots, intelligent transportation system (ITS), and transit projects.

TERMS are similar to transportation control measures (TCMs), except that TCMs apply to nonattainment areas. TCMs are included in the SIP and subject to transportation conformity requirements. The AER O3 Flex and AEAD TERMS are not subject to nonattainment SIP or transportation conformity requirements.

Various jurisdictions and implementing agencies committed to numerous TERMS in the AER's O3 Flex Agreement. Additional TERM commitments have been made for the AEAD. A total of 467 TERM projects have been, or will be, implemented. The listed O3 Flex and AEAD TERMS have various implementation dates. All TERMS will reduce emissions in 2007, while some will contribute to continued attainment past 2007. A project-specific list of O3 Flex, AEAD and continued attainment TERMS is found in Appendix L. The list provides locations, project limits, implementation dates, and emission reductions for all TERMS. A summary table of the O3 Flex and AEAD TERMS, and the expected emission reductions, is below.

Table 5.3-1 Transportation Emission Reduction Measures VOC and NO_X reduction estimates

TERMS by Project Type	2007 VOC Reductions (lbs/day)	2007 NO_X Reductions (lbs/day)
Intersection Improvements	448.82	374.95
Signal Improvements	797.30	705.14
Bicycle/Pedestrian Facilities	69.88	62.54
Grade Separations	5.94	5.28
Park and Ride Lots	98.26	87.99
Traffic Flow Improvements	159.43	145.98
ITS	41.32	41.32
Transit	35.10	14.51
Total (lbs/day)	**1656.05**	**1437.71**
Total (tpd)	**0.83**	**0.72**

The TERMS are in various locations in the AER. See Appendix L for specific locations. Participants in the TERMS program are local jurisdictions and implementing agencies in the AER and CAMPO. The expected 2007 emission reductions are 0.83 tpd VOC and 0.72 tpd NO_X.

Clean Air Partners (CAP)
The CAP Program, overseen by the CAF, assists companies in reducing emissions with a variety of options. The CAF also works in partnership with the Greater Austin Chamber of Commerce to market and coordinate the program. Strategies include commute alternatives such as carpooling/vanpooling, transit, remote work such as teleworking/telecommuting, flex-time and bicycling. Additional strategies include on-site emission reductions from the use of Green Choice energy, low-emission construction activities, cleaner, water-conserving landscaping practices, and a host of other activities that can lead to cleaner air. Companies report their achievements twice a year.

The CAF, working with environmental and business organizations, developed the program in January of 2001, after learning that the majority of pollutants that form ozone are emitted from commuting vehicles. The CAF recruited six major employers to pilot the program and develop innovative strategies for reducing emissions. There are now over 60 Partners in the five county AER.

Energy Efficiency
The TCEQ has revised SIPs to include a protocol for implementing and calculating emission reductions from energy saving resulting from Senate Bill SB 5 and SB 7 measures. The revisions relied on assumptions about the level of commitment by political subdivisions to implement the 5 percent per year reduction within their facilities. SB 5 only requires that a target of 5 percent reduction in energy usage per year be set, it remains the responsibility of each individual political subdivision to adopt ordinances, resolutions, procedures or plans to demonstrate its commitment. Since passing the bills, efforts have been underway to implement the energy reductions goals of the state and to quantify the associated ozone precursor reductions. The Energy Systems Laboratory (ESL) of Texas A&M University plans to work with the AER to quantify the emission reductions due to energy efficiency projects in the area.

<u>5.3.3 State-Assisted Measures</u>
State-assisted measures have been implemented through state regulations, with appropriate enforcement. A list summarizing these measures appears below. The rules will be implemented no later than December 31, 2005, unless otherwise indicated. The semi-annual review will track and document all state-assisted measures. In accordance with the EAC agreement, these emission reduction measures are specific,

quantified, permanent, and enforceable. All emission reduction estimates provided below are specific to the 2007 evaluation year.

Based on requests from the local EAC participants, the commission requested a waiver from the U.S. EPA that would allow the adoption of rules lowering Reid Vapor Pressure in gasoline to 7.2 pounds per square inch during the ozone season. In a letter dated October 14, 2004, the U.S. EPA denied the commission's request.

State-assisted emission reduction measures include:

- Two Speed Idle (TSI) & Onboard Diagnostic (OBD) based Vehicle I/&M program in Travis and Williamson Counties
- Idling Restrictions on Heavy-Duty Diesels Vehicles (14,000 lbs or more)
- Portable Fuel Containers statewide requirements
- Participation in the Texas Emission Reduction Plan (TERP)
- Stage 1 Vapor Recovery Exemption Change
- Degreasing Restrictions
- Cutback Asphalt Restrictions
- Power Plant Reductions

5..3.3.A1 Vehicle Inspection and Maintenance (I/M) Program
Senate Bill 1159, enacted by the78th Legislature, authorized counties in EAC agreements to voluntarily implement vehicle I/M programs through resolutions from the individual county and its largest municipality. Counties and municipalities requested TCEQ's implementation of the vehicle I/M program in Travis and Williamson Counties. The vehicle I/M program is similar to I/M program requirements established for other testing areas.

Applicability
All gasoline powered vehicles 2 to 24 years old, registered and primarily operated in the I/M program area (Travis and Williamson Counties), will be required to undergo an annual emissions inspection test in conjunction with the annual safety inspection. Emissions inspection tests are conducted at public safety inspection stations. The program does not apply to vehicles registered as antique or parade vehicles, motorcycles, or slow moving vehicles, as defined by Section 547.001, Transportation Code.

Vehicle Emissions Inspection Requirements
The On-board Diagnostics (OBD) will test 1996 model year and newer vehicles. The OBD system monitors emissions performance components to ensure that the vehicle runs as cleanly as possible. If a problem is detected, the OBD system illuminates a "Check Engine" or "Service Engine Soon" warning light on the vehicle's instrument panel. The system will store information about the detected malfunction so that a repair technician can accurately diagnose and fix the problem.

Model year 1996 and newer vehicles are required to meet EPA specifications for collection and transfer of emissions control data during each driving cycle. The Diagnostic Link Connector (DLC) cable on the emissions test analyzer is hooked up to the DLC located in the vehicle. When the vehicle's OBD system has checked the emissions control systems and detected a problem with the vehicle, this information is stored in the vehicle's on-board computer. The OBD test transmits this data to the analyzer and the vehicle will fail the inspection. The Vehicle Inspection Report will indicate which emissions control systems were checked and display the description of the fault codes retrieved from the vehicle's computer.

The Two-Speed Idle (TSI) testing program will be used to test 1995 model year and older vehicles. The TSI test uses a tailpipe probe exhaust gas analyzer to measure hydrocarbons (HC) and carbon monoxide (CO) while the vehicle is idling at a low and a high rate.

Control Requirements
Affected vehicles are required to comply with the air pollution emission control requirements included in the annual vehicle safety inspection administered by DPS, the vehicle emissions inspection and maintenance requirements, and the onroad emissions test requirements. Federal government agencies shall require vehicles driven by federal employees on property under the jurisdiction of the agency and located in Travis and Williamson counties to comply with the vehicle emissions requirements. If a vehicle fails the emissions inspection test, the failure will be indicated on the Vehicle Inspection Report. The vehicle can be returned to the same inspection station within 15 days for a free re-test. A passing emissions inspection test (or test waiver) is required in order to receive a safety inspection sticker. Test on resale is required for all vehicles from non-vehicle I/M program counties that are sold or registered in the vehicle I/M program counties. The I/M program includes a high emitter program to identify vehicles that may be significantly exceeding federal vehicle emission standards. Onroad remote sensing equipment will be used to identify high-emitting vehicles in the two I/M program counties or those commuting from adjacent counties. The onroad testing equipment is strategically placed to capture auto emissions from single-lane traffic in an acceleration mode. Vehicles identified as high emitters must be tested using the age-appropriate OBD II or TSI test within 30 days of notification and be repaired, if necessary. Failure to comply may result in vehicle re-registration denial. State, governmental, and quasi-governmental agencies which fall outside the normal registration or inspection process must comply with all vehicle emissions I/M program testing requirements in Travis and Williamson counties.

Waivers and Extensions
The following waivers and extensions as specified in 37 TAC §23.93, relating to Vehicle Emissions Inspection Requirements, will be available to all qualifying vehicle owners/operators through the Texas Department of Public Safety (DPS):

- Individual Vehicle Waiver– In order to address unusual cases where a vehicle cannot meet emissions standards, an Individual Vehicle Waiver may be issued to a vehicle owner whose vehicle has failed its initial emissions inspection and re-inspection, and in which at least $600 in emissions related repairs have been performed.
- Low Mileage Waiver – A Low Mileage Waiver may be issued to a vehicle owner whose vehicle has failed both its initial emissions inspection and the re-inspection, and in which at least $100 in emissions related repairs have been performed. The vehicle should have been driven less than 5,000 miles in the previous inspection cycle and anticipate being driven fewer than 5,000 miles before the next required safety inspection.
- Parts Availability Time Extension – A Parts Availability Extension may be issued for 30, 60, or 90 days to a vehicle owner whose vehicle fails the initial emission inspection and needs time to locate necessary vehicle emissions control parts.
- Low Income Time Extension- A Low Income Time Extension may be issued to a vehicle owner whose vehicle has failed its initial inspection and re-inspection, and the applicant's adjusted gross income is at or below the federal poverty level.

Prohibitions
The adopted rule prohibits misuse of vehicle emissions testing documents or certifications.

Equipment Evaluation Procedures for Vehicle Gas Analyzers
Guidelines have been established for approval of exhaust gas analyzers or analyzer system for use in the I/M program.

Low Income Repair Assistance Program (LIRAP) for Participating EAC Counties
Counties that implement a vehicle emissions inspection program may elect to implement the Low Income Repair Assistance, Retrofit, and Accelerated Vehicle Retirement Program (LIRAP). Vehicle owners/operators whose vehicles fail the emissions inspection and who meet eligibility requirements may receive assistance through this program. The assistance can pay for emissions related repairs or be used toward a replacement vehicle. The assistance program is funded through a portion of the emissions inspection fee. The program is administered through a grant contract between the TCEQ and each participating county. By statute, no more than 5 percent of the funds provided to each county may be used for the administrative costs of the program. Assistance is limited to no more than $600 for repairs or $1,000 toward replacement of the vehicle.

In order to be eligible for LIRAP, the vehicle owner's total family income must be less than or equal to twice the amount of the Federal Poverty Guidelines for designated family units. (As of September 2004, $24,980 for a family of two and $37,700 for a family of four). A vehicle is eligible for repair assistance if the emissions inspection has been failed within 30 days prior to application, is currently registered, and has been registered in the program area for the two years preceding application, and it passes the safety inspection portion of the test. Repairs must be performed at a DPS-recognized repair facility. Vehicle retirement eligibility requirements are the same as for vehicle repairs, except the vehicle must have passed a safety inspection within 15 months of the application.

Emissions Fee
The emissions portion of the test fee set by the TCEQ will not exceed $16.00 in Travis and Williamson Counties. The safety inspection fee is $12.50, so the combined inspection cost will not exceed $28.50. Testing equipment costs estimated at $15,000 per station, are recouped through emission test fees. The equipment includes the TSI, the OBD analyzer testing system, gas cap tester, secured computer hard-drive, printer, and 2-D Bar Code scanner.

Expected Emissions Reduction
MOBILE 6.2 was used to estimate NO_X and VOC emission rates for vehicles operating in each of the two counties for a typical ozone season weekday in 2007. Emission rates were then combined with VMT values to estimate emissions in tons per day, for the uncontrolled base case and the EAC I/M program.

Link level activity data for Travis and Williamson Counties was obtained from TTI. These link files included hourly speed and VMT estimates by vehicle type, for each link in the area, for the September 2007 modeling episode. MOBILE6 input file data were obtained from CAMPO. The CAMPO data included county level registration distributions and diesel sales fractions (from 2002 TxDOT data), and ambient temperatures and humidity levels obtained from the TCEQ. The MOBILE 6.2 hourly emission factor outputs were combined by roadway and vehicle type with the link-level activity data to estimate total 24-hour mass emissions for the AER. Emission reductions for the I/M program were estimated by taking the differences between MOBILE 6.2 emissions calculated with and without I/M input parameters. The MOBILE 6.2 input files and VMT link files are available from the TCEQ.

The I/M program is expected to reduce NO_X emissions by 3.22 tpd and VOC emissions by 3.83 tpd. The I/M program will also reduce toxic emissions, some of which are known carcinogens. Proper vehicle maintenance is a key component of the I/M program and repair may result in fuel savings for some vehicle owners.

Table 5.3-2 - Emission Reductions from I/M Program in Travis and Williamson Counties

Control Strategy	Area Affected	Emissions Categories Affected	Precursor	2007 Uncontrolled Emissions (tpd)	2007 Controlled Emissions (tpd)	Net Emission Reduction (tpd)	Percent Reduction
Vehicle Inspection and Maintenance	Travis and Williamson Counties	On-road Mobile: LDGV, HDGV	NO_X	31.12	27.90	3.22	10.3%
			VOC	30.33	26.50	3.83	12.6%

5.3.3.A2 Idling Restrictions on Heavy-Duty Vehicle Engines
At the request of local governments, the TCEQ has establish a new Chapter 114, Subchapter J: Operational Controls for Motor Vehicles, Division 2: Locally Enforced Motor Vehicle Idling Limitations. This new rule will limit heavy-duty motor vehicle idling to five consecutive minutes during the time period April 1 through October 31 within the political jurisdiction of any local government in the state that has signed a memorandum of agreement with the commission to delegate enforcement to a local enforcement agency. Local enforcement is crucial to the effective implementation of this rule to reduce the extended idling of heavy-duty vehicles and to help ensure emission reductions.

Exemptions are allowed for vehicles with a gross vehicle weight rating of 14,000 pounds or less; that are forced to remain motionless because of traffic conditions over which the operator has no control; are being used as an emergency or law enforcement vehicle; when the engine operation is providing power for a mechanical operation other than propulsion; when engine operation is providing power for multiple passenger heating or air conditioning; when the engine is being operated for maintenance or diagnostic purposes; or when the engine is being operated solely to defrost a windshield.

Alternative methods of preventing idling by a vehicle are currently available. Truck stop electrification allows the vehicle operator access to electricity as a power source. Small generators, which emit less and are commercially available, can be used as auxiliary power sources.

Contingent on enforcement agreements with local jurisdictions, this measure may apply throughout the AER. Owners and operators of heavy duty vehicles, AER county and municipality law enforcement agencies or designees will be the affected parties.

Expected Emissions Reduction
In January 2004, EPA released Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity, which states that "extended idling" emissions account for 3.4 percent of the total emissions calculated with MOBILE 6.2 for the HDDV8a and HDDV8b vehicle classes. These two vehicle types are more commonly referred to as the diesel-powered "18-wheeler" trucks and are collectively responsible for the majority of both the heavy-duty on-road NO_X and, in particular, the diesel-powered portion of the on-road NO_X. In addition, 18-wheelers are the most common source of "extended idling" events. Consequently, the majority of any idling restriction benefit will come from the HDDV8a and HDDV8b classes.

Under the scenario where the proposed idling restriction rule applied to the HDDV8a (33,001-60,000 pounds GVWR) and HDDV8b (60,001-and-above pounds GVWR) classes only, the maximum possible benefit would be 0.67 NO_X tpd for the 5-county AER. This estimate was developed by taking 3.4 percent of the HDDV8a/HDDV8b emissions for the 5-county AER, as developed by TTI, and processing those emissions through EPS2x by applying both a temperature/humidity NO_X correction and the LED benefit mentioned above. According to the EPA guidance, the 3.4 percent figure represents a maximum amount of SIP credit which can be claimed for idling reduction measures whether mandatory, voluntary, or a combination of the two.

The commission has committed enough funding from TERP to the Austin EAC area to obtain 2.5 tons per day of NO_X reductions. However, the commission claimed only 2 tons per day NO_X reductions from TERP in the final control strategy modeling run (see Section 3.8), making available 0.5 tons of NO_X reductions per day. In the event that one or more counties choose not to implement idling restrictions, up to 0.5 tons per day NOx reductions from the TERP program (see section 5.3.3.A7 Texas Emission Reduction Plan (TERP)) may be used to make up any shortfall in this control strategy.

5.3.3.A3 Portable Fuel Containers Rule

At the request of local governments and in response to a rule making petition, the TCEQ has established a statewide rule to lower the emission of VOCs from portable fuel containers that spill, leak, and/or allow permeation.

The portable fuel container rule establishes new requirements relating to the design criteria for portable fuel containers and portable fuel container spouts. The new rules will establish design criteria for "no-spill" portable fuel containers based in large part on the CARB standards. Effective December 31, 2005, these new rules will limit the type of portable fuel containers and spouts sold, offered for sale, manufactured, and/or distributed in the State of Texas. Fuel released into the environment can lead to the contamination of both the state's air and water. These rules will ensure that portable fuel containers will release fewer amounts of fuel as the result of spillage and evaporation.

Expected Emissions Reduction

This strategy will reduce NOx emissions by approximately 0.89 tpd of VOC in the AER, as well as additional reductions statewide that can lead to reduced background levels of ozone.

5.3.3.A4 Stage I Vapor Recovery Requirement Change

At the request of local governments, the TCEQ has revised changes to Chapter 115, Subchapter C, Volatile Organic Compound Transfer Operations, Division 2, Filling of Gasoline Storage Vessels (Stage I) for Motor Vehicle Fuel Dispensing Facilities that would lower the exemption level for facilities subject to Stage I Vapor Recovery controls from 125,000 gallons to 25,000 gallons of gasoline in any calendar month in the five counties in the Austin EAC Area. According to the TCEQ Petroleum Storage Tank database, over 60 percent of existing tanks in the area are Stage I equipped. Program participants are gasoline stations and fuel dispensing facilities in the AER.

The Stage I Vapor Recovery control has a potential to reduce VOC emissions by 4.88 tpd in the five county area. A Stage I control efficiency of 95 percent (EPA 453/R-94-002a / Stage I NESHAP), rule penetration of 64.4 percent, and rule effectiveness of 80 percent was assumed. The AER gasoline sales shown in Table 5.3-3 were used to derive rule penetration as presented in Table 5.3-4. The expected cumulative (by monthly throughput category) emission reductions from Stage I Vapor Recovery control are presented for each county by percentage in Table 5.3-5. For example, in Travis County the difference in reduction between 10,000 gallons cut-off and 25,000 gallons throughput cut-off is only 2 percent.

Table 5.3-6 shows the cumulative reductions in tpd.

Table 5.3-3 Gasoline Station Throughput based on sales in AER

Throughput (gallons)	Bastrop (gallons)	Caldwell (gallons)	Hays (gallons)	Travis (gallons)	Williamson (gallons)	Total (gallons)
< 10,000	77,639	0	96,309	902,618	295,673	1,372,239
10,000 to 25,000	1,118,909	490,221	1,784,558	13,472,908	4,666,992	21,533,588
25,000 to 50,000	4,452,799	2,451,106	7,648,105	58,736,569	20,001,394	93,289,973
50,000 to 125,000	17,582,848	9,804,424	30,734,052	228,807,145	78,121,386	365,049,855
> 125,000	10,960,737	5,602,528	20,394,947	149,330,261	50,438,298	236,726,771
County Totals	34,192,932	18,348,279	60,657,971	451,249,501	153,523,743	717,972,426

*Allocated Gasoline Gallons – 2002 (assume throughput per station remains constant through 2007

Table 5.3-4 Stage I Rule Penetration for Gas Stations in AER

County	<10,000	10,000 to 25,000	25,000 to 50,000	50,000 to 125,000	> 125,000	Total
Bastrop	0.2%	3.3%	13.0%	51.4%	32.1%	100.0%
Caldwell	0.0%	2.7%	13.4%	53.4%	30.5%	100.0%
Hays	0.2%	2.9%	12.6%	50.7%	33.6%	100.0%
Travis	0.2%	3.0%	13.0%	50.7%	33.1%	100.0%
Williamson	0.2%	3.0%	13.0%	50.9%	32.9%	100.0%

Table 5.3-5 Expected Cumulative Percent of Emission Reductions from Stage 1 in AER

County	<10,000	10,000 to 25,000	25,000 to 50,000	50,000 to 125,000	> 125,000
Bastrop	52%	51%	49%	39%	24%
Caldwell	53%	53%	51%	41%	23%
Hays	50%	50%	48%	39%	26%
Travis	51%	51%	48%	39%	25%
Williamson	51%	51%	49%	39%	25%

Table 5.3-6 Expected Cumulative Reductions from Stage I* Controls in AER

County	2007 Base Emissions (tpd)	All stations	10,000 and above	25,000 and above	50,000 and above	125,000 and above
Bastrop	0.33	0.17	0.17	0.16	0.13	0.08
Caldwell	0.37	0.20	0.20	0.19	0.15	0.09
Hays	1.31	0.66	0.66	0.63	0.51	0.34
Travis	5.84	2.97	2.96	2.83	2.25	1.47
Williamson	2.21	1.13	1.13	1.07	0.86	0.55
Total (tpd)	10.06	5.13	5.12	4.88	3.90	2.53

*Stage I (SCC: 2501060053) VOC Emissions (tpd)

5.3.3.A5 Degreasing Controls

At the request of local governments, the TCEQ has revised changes to Chapter 115, Subchapter E, Solvent-Using Processes, Division 1, Degreasing Processes, to extend the control requirements to the five counties in the Austin EAC Area.

A degreaser is any equipment designed to hold a solvent used for cleaning operations in batch-loaded cold cleaners, open-top vapor degreasers, conveyorized (in-line) degreasers, and air-tight and airless cleaning systems. Solvent cleaning machines are used to dry materials and remove impurities, such as grease, wax, and oil from metal parts, circuit boards, sheet metal, assemblies, and other materials. Emissions of VOC primarily result from evaporation loss. Program participants are facility owners and operators that conduct degreasing operations in the AER.

Degreasing controls are expected to reduce VOC emissions by 5.55 tpd. The total VOC emissions for this category are estimated to be 16.25 tpd. It is estimated that 50 percent of the market is in compliance with the current rules at 85 percent efficiency; therefore the adjusted base is 9.38 tpd. This was based on the fact that one large degreasing supplier is estimated to have 50 percent of the market in the AER and is in compliance with the current rules. An estimated control efficiency of 85 percent and rule efficiency of 80 percent was used in this calculation. A rule penetration of 87 percent was estimated based on the fact that 50 percent of uncontrolled emissions (8.125 tpd) are 87 percent of 9.38 tpd. Table 5.3-7 presents the degreasing emissions in 2007.

Table 5.3-7- VOC Emission Reduction Estimates from Cold Cleaning Degreasing in AER

Emissions Category	Control Strategy	Area Affected by This Rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net VOC Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Degreasing (Cold Cleaning) SCCs: 2415300000, 2415360000, 2415355000, 2415330000, 2415320000, 2415305000, 2415325000, 2415340000, 2415345000, 2415365000, 2415310000, 2415335000	Degreasing Reduction Measures	Austin-Round Rock MSA (5 Counties)	9.38	3.83	5.55	59.2%

5.3.3.A6 Cut Back Asphalt

At the request of local governments, the TCEQ has revised Chapter 115, Subchapter F, Miscellaneous Industrial Sources, Division 1, Cutback Asphalt to extend the control requirements to the five counties in the Austin EAC Area. Users and suppliers of cut-back asphalt in the AER are program participants.

The rule language requires VOC solvents used in conventional cutback asphalt for the paving of roadways, driveways, or parking lots to be restricted to no more than 7.0 percent of the total annual volume averaged over a two-year period. This applies to asphalt used by or specified by any state, municipal, or county agency who uses or specifies the type of asphalt application.

When asphalt emulsion is used or produced, the maximum VOC content shall not exceed 12 percent by weight or the following limitations, whichever is more stringent:

- 0.5 percent by weight for seal coats;
- 3.0 percent by weight for chip seals when dusty or dirty aggregate is used;
- 8.0 percent by weight for mixing with open graded aggregate with less than 1.0 percent by weight of dust or clay-like materials adhering to the coarse aggregate fraction (1/4 inch in diameter or greater); and
- 12 percent by weight for mixing with dense graded aggregate when used to produce a mix designed to have 10 percent or less voids when fully compacted.

Exemptions are provided for:

- asphalt concrete made with cutback asphalt, used for patching, which is stored in a long-life stockpile (longer than one-month storage); and
- cutback asphalt used solely as a penetrating prime coat.

The expected emission reductions from this measure are 1.03 tpd VOC. A conservative rule efficiency of 80 percent and rule penetration of 80 percent were used in this calculation. Together with an efficiency of 60 percent, this brings the total reduction to 38.4 percent. A conservative estimate of 60 percent efficiency is estimated from a study on the evaporation rate of cut-back asphalt over six months time. Therefore, the expected emission reductions from this measure are 1.03 tpd VOC.

Table 5.3-8 Emission Reductions for Cutback Asphalt Restrictions in AER

Emissions Category	Control Strategy	Area Affected by This Rule	2007 Uncontrolled VOC Emissions (tpd)	2007 Controlled VOC Emissions (tpd)	Net VOC Reduction (tpd)	Percent Reduction (%)
AREA SOURCES: Asphalt Applications SCC: 2461020000	Cutback Asphalt Restrictions	Austin-Round Rock MSA (5 Counties)	2.68	1.65	1.03	38.4%

5.3.3.A7 Texas Emission Reduction Plan (TERP)

The 77th Texas Legislature established TERP in 2001, through enactment of SB 5. The program was not fully funded, however, until the 78th Legislature enacted House Bill (HB) 1365 in 2003. TCEQ expects to have about $115-120 million in revenue in FY 2004, of which approximately $104 million will be available for the TERP Program (see below). Those figures are expected to increase in each of the subsequent fiscal years through FY 2008, averaging a total of $150 million each year. The program is scheduled to end after FY 2008.

The primary purpose of the TERP is to replace, through voluntary incentive programs, the reductions in emissions of NO_X that would have been achieved through mandatory measures that the Legislature directed the TCEQ to remove from the SIP for the DFW and HGB ozone nonattainment areas. TERP funding is also expected to be available to help achieve reductions in counties located in the state's other nonattainment areas and in designated NNA areas, where air quality is approaching nonattainment levels. Forty-five counties have been identified for TERP funding to reduce on- and off-road equipment emissions.

HB 1365 designated all five counties in the AER as "affected counties" and therefore eligible for participation. This voluntary program is available to all public and private fleet operators that operate qualifying equipment in any of the five counties. The TERP web page at http://www.terpgrants.org provides additional information on the TERP program.

Expected Emissions Reduction

Because TERP was initially designed to address deficiencies in the HGB and DFW ozone nonattainment areas, a majority of TERP funding will be necessary to address those continuing concerns. The program is expected to reduce approximately 38 tpd in HGB and 22.2 tpd in DFW. The signatories to the AER EAC intend to pursue TERP grants and to work with other public and private sector entities operating in the AER and have committed to pursue grants that will result in total NO_X reductions of up to 2 tpd. The commission allocated funding for up 2.5 tpd of NO_X reductions in the Austin area by 2007. This should provide for the area’s commitment to pursue at least 2 tpd NOx reductions by 2007, as included in the final modeling run.

5.3.3.A8 Power Plant Reductions

Local power plants have voluntarily committed to reduce annual NO_X emissions at their facilities in and near the AER below current state and federal mandates. Austin Energy (AE) and the Lower Colorado River Authority (LCRA) have committed to annual NO_X emission reductions at their facilities. These agreements will be detailed and formalized in an enforceable regulatory mechanism, such as an agreed order or permit alteration, to be effective by December 31, 2005. Additional enforceable annual emissions reductions from the University of Texas and Fayette Power Project will be in place by December 31, 2006.

The base case emissions for this measure are based on the TCEQ permit cap and/or the worst case scenario predicted by the individual facility. The estimated controlled emissions for 2007 were calculated as the difference between the base case and the power company facility or system commitment level. The total result was 1,866 Tons/year of NO_X reduced as shown in Table 5.3-9.

Table 5.3-9 - Emission Reductions from Point Source Agreements by County in AER

Power Plant	County	2007 NOx Base Case Tons/year	2007 NOx Controlled Case Tons/year	2007 NOx Reduction Tons/year	Percent Reduction %
LCRA (Sim Gideon)	Bastrop	1,344	1,044	300	22.3%
LCRA (Fayette Power Project)	Fayette	10,494	9,522	972	9.3%
Austin Energy (Holly Street and Decker Lake)	Travis	1,741	1,500	241	13.8%
UT Hal C Weaver	Travis	1,088	735	353	32.4%
Total		**14,667**	**12,801**	**1,866**	**12.7%**

The power plant reductions will be implemented by the specified entities through agreed orders and/or permit revisions and implemented by:

- AE – No later than April 1, 2005
- LCRA – Sim Gideon - No later than Dec.31, 2005
- FFP - No later than December 31, 2006
- UT - No later than December 31, 2006

While enforceable emission limits are being committed to only for annual emissions of NOx, daily emissions are also expected to decrease for the AE and LCRA facilities due to the phase out of the AE Holly Plant, improved control on the AE Decker Plant and fine-tuning of control systems at the LCRA plants. Projections for these daily emission reductions are approximately 7 Tons/day at the power plants in the AER; however, these reductions were not included in the modeled attainment demonstration.

5.4 ADDITIONAL EVIDENCE

Additional programs not included in the modeling that area organizations have initiated, used periodically or are considering, include:

Residential electric lawnmower exchange program – The program offers incentives to the trade-in of gas-powered lawnmowers for electric lawnmower models at participating retail stores. The program was operated in 1997, 2002, and 2003 with quantifiable reductions of VOC and CO emissions.

Adopt-a- School-Bus – Implemented under the auspices of the CAF. In 2003, the CAF brought the Adopt-A-School Bus Program to the Central Texas region. This program is an EPA initiative to partner with communities, businesses, educational leaders, and heath care professionals to reduce children's exposure to diesel exhaust and to improve air quality in communities. The program operates as a private/public nonprofit grant program, making funds available to local school districts to replace and retrofit their aging, diesel bus fleets with new cleaner technology buses and fuels. This program will also support anti-idling guidelines in school districts. The Adopt-A-School Bus Program grant opportunity is open to all school districts in the five county AER. A projected replacement of 200 school buses over the course of three years could realize a reduction of approximately 80 tpy of NO_X. Another component of the Adopt-A-School Bus Program is a supplemental environmental project (SEP) in which funds will be used to retrofit or replace aging school buses in Milam, Lee and Bastrop Counties. With these two programs combined, both PM and NO_X emissions from older school buses will be reduced in the AER.

Tree Planting Guide – This initiative involves specifying low VOC emitting trees in local lists of regionally appropriate plantings.

State Agency Voluntary Commute Reduction Projects - The agency supports and has taken the lead in efforts by state government agencies to voluntarily reduce emissions through reductions in employee commuting.

CHAPTER 6: MAINTENANCE FOR GROWTH

6.1 MAINTENANCE FOR GROWTH (MFG) DEMONSTRATION

The anticipated future growth of the AER as been evaluated to ensure that the area will remain in attainment of the 8-hour standard for the time period 2007 through 2012 and 2015. This evaluation included analysis of population growth and its effect on onroad mobile emissions and area sources, and new and planned new point sources. This chapter is a summary of the analysis.

6.1.1 Area Sources

The emissions associated with area sources are directly related to population and economic activity. These two data sources are typically used to estimate area source emissions.

The population of the AER has been growing for the past 60 years and is expected to continue to grow through 2012.

Table 6.1-1 Population Growth in AER Through 2012 (CAPCO Regional Forecast 2000 to 2030, REMI, 2003)

	Population (thousands)				
County	**1999**	**2002**	**2005**	**2007**	**2012**
Bastrop	55.68	62.78	74.41	76.77	96.49
Caldwell	31.49	34.71	37.31	40.09	46.52
Hays	93.62	109.48	128.14	144.51	184.50
Travis	788.50	851.59	931.17	985.47	1095.30
Williamson	236.61	289.85	328.62	358.66	428.30
Total	1205.90	1348.41	1499.66	1605.50	1851.11

As the population increases, so will the economic activity in the AER. Though the economy of the AER has slowed in recent years, the overall trend from 1999 through 2012 continues to show an increase.

Table 6.1-2 Total Manufacturing Employment Forecast in AER Through 2012 (CAPCO Regional Forecast, REMI, 2003)

	Employment as Manufacturing Total (thousands)				
County	**1999**	**2002**	**2005**	**2007**	**2012**
Bastrop	0.93	0.96	1.02	1.06	1.12
Caldwell	0.43	0.41	0.43	0.44	0.46
Hays	3.86	3.61	3.89	4.11	4.61
Travis	68.90	65.13	64.39	66.08	68.53
Williamson	9.10	9.09	9.36	9.68	10.11
Total	83.23	79.21	79.10	81.36	84.83

With this increase in population and economic growth in the AER, emissions from area sources are expected to increase 14.2 percent from 1999 to 2012.

Table 6.1-3 Area Source Emission Trends Break Down (tpd), CAPCO

Area Sources Emission Trend			
	1999	**2007**	**2012**
BASTROP			
NO_X	0.60	0.76	0.82
VOC	4.52	5.53	6.16
CALDWELL			
NO_X	0.54	0.67	0.68
VOC	15.29	15.75	17.17
HAYS			
NO_X	0.58	0.79	0.85
VOC	5.47	7.67	8.21
TRAVIS			
NO_X	3.21	4.05	4.28
VOC	50.60	57.04	57.58
WILLIAMSON			
NO_X	3.00	3.84	3.86
VOC	14.68	20.44	21.25
AER			
NO_X	7.93	10.12	10.50
VOC	90.56	106.42	110.37

For more details, please see the report, Emissions Inventory Comparison and Trend Analysis for the Austin-Round Rock MSA: 1999, 2002, 2005, 2007, & 2012 in Appendix M.

6.1.2 Onroad Mobile Sources

The EAC Protocol calls for an evaluation of the current long-range transportation plan. By definition, the long-range plan covers the geographical area of the MPO, which for the Austin Metropolitan area includes only Hays, Travis and Williamson Counties. The AER also includes Bastrop and Caldwell Counties. Therefore, the analysis of the AER's onroad emissions will be of VMT from three different sources, CAMPO, TxDOT, and TTI. Please refer to Appendix N for details.

VMT Screen: Because onroad mobile emissions account for a significant amount of the AER's ozone forming emissions, the AER has focused much of its attention on onroad growth. It was, therefore, reasonable to perform a test to determine if the future planned transportation system will contribute increasing or decreasing amounts of NO_X and VOC. One test that uses readily available data is a review of the relative change in VMT, also referred to as a VMT "screen." The VMT screen EPA originally developed for its proposed transitional ozone classification was used.

The VMT screen tests if any expected increase in VMT in a future year will be offset by technology and control measures. That is, that the expected associated emissions in a future year will not exceed the associated emissions of the base year.

The current CAMPO long-range transportation plan is based on VMT for the years 1997, 2007, 2015 and 2025. TxDOT supplied the 1999 VMT. The "VMT Screen" for years 2007 and 2015 of the plan, Mobility 2025 (Appendix N), gave the following results.

Table 6.1-4 Emission Reductions In VMT For Campo From 1999 To 2015, With And Without I/M

Three-County CAMPO LRP VMT Emissions Equivalents (thousands of VMT)				
	NO_X		VOC	
Year	Without I/M	With I/M	Without I/M	With I/M
1999	29,002	----	29,002	----
2007	19,816	18,802	20,414	17,869
2015	9,163	7,317	15,037	11,943

VMT in the three-county region is expected to increase 40 percent from 1999 to 2007 and 90 percent from 2007 to 2015. Even though VMT will increase significantly during this period, the more stringent federal emissions standards will reduce the emissions in the newer fleet, therefore reducing the VMT "emission equivalents" in the VMT screen. The associated NO_X emissions will decrease by so much it results in an equivalent of a 31.7 percent decrease in VMT from 1999 to 2007 and a 68.4 percent decrease from 1999 to 2015. Additional, though less substantial, decreases will be realized from the region's implementation of a vehicle I/M program in Travis and Williamson Counties in 2005 (35.2 percent and 74.8 percent). Also, VOC emissions will be reduced by 29.6 percent from 1999 until 2007 and 48.2 percent from 1999 to 2015. Reductions of VOC will also be greater with the I/M program (38.4 percent and 58.8 percent). The expected increases in population and the planned expansion of the roadway system will contribute to an increase in VMT, but will not cause onroad emissions to exceed 1999 levels.

Because Bastrop and Caldwell Counties are outside the CAMPO boundaries, and because they will not participate in the I/M program, a separate VMT screen was conducted for the aggregate 5-county AER. The results are similar to those realized for the CAMPO area.

Table 6.1-5 Emission Reductions in VMT for Bastrop and Caldwell Counties from 1999 to 2015

Five County Area TTI VMT Emission Equivalents with No Control Measures (thousands of VMT)		
Year	NO_X	VOC
1999	32,506	32,506
2007	27,678	22,322
2015	9,796	15,908

VMT is expected to increase in the five-county AER by 36 percent from 1999 to 2007 and 79.3 percent from 1999 to 2015. Without I/M in the five-county AER, NO_X from VMT is expected to decline by 33.3 percent from 1999 to 2007 and 69.9 percent from 1999 to 2015. The VOC will also decline 31.3 percent and 51.1 percent in 1999 and 2015, respectively. Again, the expected increases in population and the planned roadway system that will contribute to an increase in VMT will not contribute to emissions exceeding the amount of 1999 onroad emissions.

One conclusion from this analysis is that the currently planned roadway system will not exacerbate the production of ozone in the AER through 2015. The details of all calculations are included in Appendix N.

Another way to evaluate VMT and associated emissions is to compare the estimated emissions for future years to the base year emissions. Multiplying the emission factor by the VMT results in an estimate of the daily emissions associated with onroad travel. This evaluation shows a decrease in both NO_X and VOC emissions, despite an increase in VMT.

Emission factors for each year were calculated by CAMPO using MOBILE 6 and included appropriate local data where available. Emissions factors are typically expressed in grams/mile. Multiplying the emissions factor times the VMT results in the grams of emissions, either NO_X or VOC. Because the EI is expressed in tpd, the resultant grams of onroad emissions were converted to tons by dividing the number of grams by 454 grams/lbs and then by 2000 lbs/ton. Please refer to Appendix N for more details.

Table 6.1-6 Emission Reductions from 1999 to 2015

TTI, Five-County, No I/M Controls								
NO_X					**VOC**			
Year	**VMT (thousands of VMT)**	**EF (g/mi)**	**VMT X EF (tons)**		**Year**	**VMT (thousands of VMT)**	**EF (g/mi)**	**VMT X EF (tons)**
1999	32,506	2.433	87		1999	32,506	1.425	51
2007	44,508	1.185	58		2007	44,508	0.715	35
2015	58,274	0.409	26		2015	58,274	0.389	25

Both evaluation techniques, the VMT screen and comparison of emissions, show large enough decreases in onroad emissions to more than offset the anticipated growth in VMT through 2015. These decreases in emissions will be even greater once the vehicle I/M program is implemented.

6.1.3 Non-road Mobile Sources

Projected AER non-road mobile emissions for 2002, 2005, 2007 and 2012 were developed using the EPA's Non-road model and accounted for several federal programs including: Standards for Compression-ignition Vehicles and Equipment, Standards for Spark-ignition nonroad Vehicles and Equipment, Tier III Heavy-duty Diesel Equipment, Locomotive Standards, Recreational Marine Standards, and Lawn and Garden Equipment. The non-road mobile emissions totals were calculated by using the following equation:

$$\frac{\text{Base Case Year Non-road Model Emissions}}{\text{Projection Year Non-road Model Emissions}} = \frac{\text{Base Case Emission Inventory}}{\text{Projection Year Emission Inventory}}$$

Table 6.1-7 Nonroad Mobile Source VOC Emissions (tpd), AER

County	1999	2002	2005	2007	2012
Bastrop	0.92	0.54	0.54	0.99	0.57
Caldwell	0.61	0.40	0.44	0.68	0.89
Hays	1.53	1.28	1.23	1.77	1.30
Travis	15.59	16.53	14.15	12.70	13.93
Williamson	3.84	3.93	3.28	3.73	3.39
Total	22.49	22.68	19.64	19.87	20.08

Table 6.1-8 Nonroad Mobile Source NO_X Emissions (tpd), AER

County	1999	2002	2005	2007	2012
Bastrop	1.72	1.39	1.68	1.66	1.81
Caldwell	1.42	1.17	1.43	1.39	2.41
Hays	1.88	1.68	1.89	1.84	1.94
Travis	16.69	16.24	17.98	16.21	16.38
Williamson	6.73	6.45	6.90	6.36	7.11
Total	28.44	26.93	29.88	27.46	29.65

The following figures graphically depict the non-road mobile emission trend.

Emissions were grown using the NONROAD model (version 2002a). Population, and the distribution of population in urban and rural areas, has considerable effect in this category. However, the population growth that is expected is offset by new technology and upcoming emission regulation on non-road mobile engines due to state and federal regulations. This accounts for the near straight line effect seen in the NO_X trend in Figure 6.1-1, with only a slight increase by 2012. However, for VOC emissions increases are shown from 2007 to 2012 (Figure 6.1-2).

6.1.4 Point Sources

The TCEQ provided emission data for point sources in the CAPCO region for the 1999 EI. In the 1999 EI, the point source category was subdivided into major point source and minor point source categories. CAPCO developed the following point source information for 1999 and 2007.

Table 6.1-9 Point Source Emissions from EGUs, AER and Surrounding Area

EGUs Point Source Emissions (tpd) AER and Surrounding Area					
County	**Facility Name**	**1999**		**2007**	
		NO_x	**VOC**	**NO_x**	**VOC**
Bastrop	Sim Gideon Electric Power Plant	7.10	0.33	3.94	0.11
Bastrop	Lost Pines 1 Power Plant	n/a	n/a	1.50	0.23
Bastrop	Bastrop Clean Energy Center	n/a	n/a	2.21	0.12
Fayette	Fayette Power Project	60.82	0.55	28.12	0.78
Hays	Hays Energy Facility	n/a	n/a	3.70	0.96
Milam	Sandow Steam Electric	24.20	0.33	13.19	0.32
Travis	Decker Lake Power Plant	8.15	0.44	3.80	0.12
Travis	Holly Street Power Plant	2.88	0.12	2.98	0.01
Travis	Sand Hills	n/a	n/a	1.03	0.20
Travis	Hal C Weaver Power Plant	1.99	0.03	1.86	0.05
Total AER		20.12	0.92	21.01	1.81
Grand Total		105.14	1.80	62.32	2.91

A uniform change for 2002 and 2005 was assumed and 2012 is not expected to change.

Table 6.1-10 Point Source Emissions from NEGUs, AER and Surrounding Area

NEGUs Point Source Emissions (tpd) AER and Surrounding Area					
County	Facility Name	1999		2007	
		NO_X	VOC	NO_X	VOC
Caldwell	Durol Western Manufacturing, Inc.	0.00	0.01	0.00	0.00
Caldwell	Luling Gas Plant	0.89	0.26	0.29	0.04
Caldwell	Maxwell Facility	0.00	0.15	0.00	0.06
Caldwell	Prairie Lea Compressor Station	2.66	0.04	2.23	0.03
Caldwell	Teppco Crude Oil LLC, Luling Station	0.00	0.01	n/a	n/a
Comal	APG Lime Corp	1.15	0.00	1.15	0.00
Comal	Sunbelt Cement of Texas LP	7.61	0.12	3.79	0.13
Comal	TXI Operations LP	3.34	0.14	3.43	0.15
Hays	Parkview Metal Products, Inc.	0.00	0.10	0.00	0.03
Hays	Southern Post Co. Commercial Metal	0.00	0.06	0.00	0.01
Hays	Southwest Solvents and Chemicals	0.00	0.00	0.00	0.00
Hays	Texas LeHigh Cement	7.20	0.18	5.24	0.55
Milam	Aluminum Company of America	54.26	4.25	26.66	0.38
Travis	RIN3M Austin Center	0.15	0.03	0.15	0.03
Travis	Advanced Micro Devices, Inc.	0.00	0.00	0.23	0.17
Travis	Austin White Lime Co.	0.89	0.00	0.94	0.02
Travis	IBM Corporation	0.09	0.04	0.01	0.04
Travis	Lithoprint Co., Inc.	0.00	0.05	n/a	n/a
Travis	Motorola-Ed Bluestein	0.46	0.17	0.01	0.04
Travis	Motorola Integrated Circuit Division	0.09	0.08	0.02	0.02
Travis	Multilayer TEK, L.P.	0.00	0.18	0.01	0.21
Travis	Raytheon Systems, Co.	0.02	0.02	0.01	0.00
Travis	Twomey Welch Aerocorp, Inc.	0.00	0.00	0.00	0.00
Williamson	Aquatic Industries, Inc.	0.00	0.11	0.00	0.04
Total AER		**12.46**	**1.50**	**9.13**	**1.28**
Grand Total		**78.82**	**6.02**	**44.26**	**1.95**

Documentation for Tables 6.1-9 and 6.1-10 may be found in Appendix O.

6.2 CONTINUED PLANNING PROCESS

The TCEQ is committed to continue to work with local stakeholders to find additional measures that can be implemented to further reduce ozone forming emissions, including the possibility of initiating a point sources emissions balancing program.

CAPCO and CAMPO will analyze air quality and related data and perform necessary modeling updates annually. In addition to the data sources used for the above analyses, maybe added information from the Central Texas Sustainability Indicators Project (CTSIP). The CTSIP is a nonprofit organization that tracks 40 key indicators (e.g., water pollution, air quality, density of new development) that show the economic, environmental, and social health of the AER. The results of all these analyses will be reported in the June semi-annual reports beginning in June 2005.

The following will also be evaluated:

- future transportation patterns;
- all relevant actual new point sources; and
- impacts from potential new source growth.

As part of the Mobility 2030 plan development process CAMPO will perform the VMT screen for years 2007 and 2017. The screen will test to be sure that any expected increase in VMT over the planning horizons will be offset by technology and control measures, that is, that the expected associated emissions will not exceed the associated emissions of the base year (1999).

As part of this analysis, the emission factors will be reviewed and updated as necessary. Review of the emission factors includes checking and updating the fleet mix. This test will also be performed prior to adoption of any CAMPO long-range transportation plan update or amendment that significantly increases VMT.

New Point Sources and Potential New Point Sources: In addition to the VMT screen and review of area sources, staff will include a list and impact analysis of the relevant new and potential new point sources. Staff will obtain data on these relevant new and potential new point sources from TCEQ.

The annual analysis will determine the adequacy of the selected control measures. After review by the appropriate elected officials, these measures will be adjusted if necessary.

6.3 TRACKING AND REPORTING

All signatories and implementing agencies will review EAC activities twice yearly. The semi-annual review will track and document, at a minimum, control strategy implementation and results, monitoring data and future plans. CAPCO, or its designee, will continue to file reports with the TCEQ and EPA by June 30 and December 31 of each reporting year through the duration of the EAC, or until December 31, 2007. Reporting periods will be May 1 to October 31, and November 1 to April 30, to allow for adequate public notice and comment. CAPCO has primary responsibility for report generation, and will provide appropriately detailed technical analysis for all semi-annual review reporting.

Figure 6.1-1 Nonroad Mobile NO_X Emissions, AER

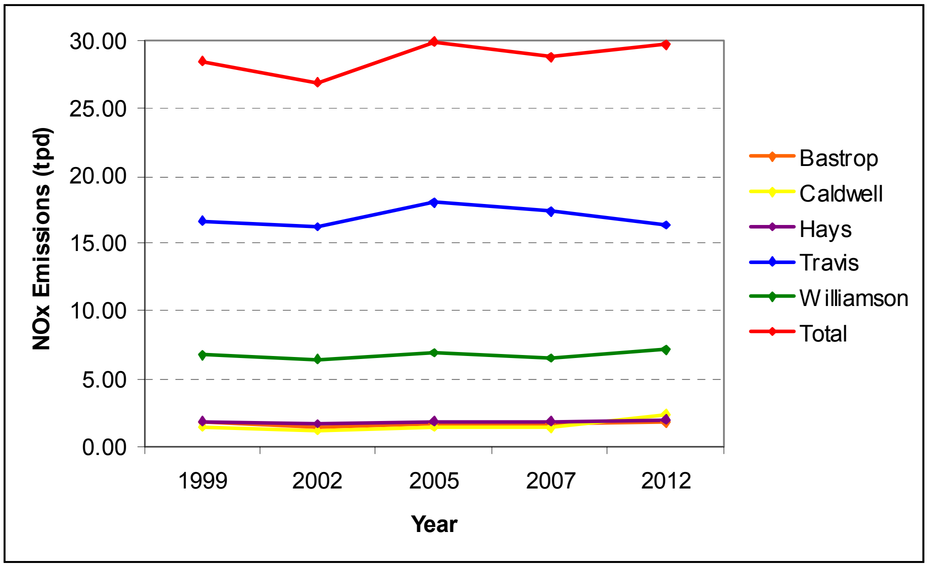


Figure 6.1-2 Non-road Mobile VOC Emissions, AER