2008 REVISION TO THE CARBON MONOXIDE LIMITED MAINTENANCE PLAN

FOR THE TUCSON AIR PLANNING AREA (FOR 2010)

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This plan has been prepared by Pima Association of Governments (PAG) in cooperation with the Pima County Department of Environmental Quality, the Arizona Department of Environmental Quality, the Arizona Department of Transportation and the U. S. Environmental Protection Agency.

Table of Contents

1.	Executive Summary	1
2.	Background	2
3.	Limited Maintenance Plan Option	4
4.	Attainment Emissions Inventory and Mobile Source Control Measures	5
5.	Maintenance Demonstration	7
6.	Monitoring Network / Verification of Continued Attainment	9
7.	Contingency Plan	9
8.	Conformity Determinations under Limited Maintenance Plans	14
9.	Public Record and Opportunity for Public Comment	14
10.	References	15

List of Figures

Figure 1	Map of Carbon Monoxide Maintenance Area	3
Figure 2	Carbon Monoxide Trends (1972-2006)	11

List of Tables

Table 1	2008 Typical Winter Day Carbon Monoxide Emissions for the Tucson Region (tons/day)	6
Table 2	On-Road Mobile Source Emissions of Carbon Monoxide – Winter Season (tons/day)	6
Table 3	Carbon Monoxide Monitoring Data Summary for the Tucson Air Planning Area	8

Appendices

A. 2008 Pima County Emissions Inventory

B. Arizona Revised Statutes Section 49-406 State Implementation Plan

C. Memorandum of Agreement, August 2000

D. Letter from Arizona Department of Environmental Quality re: Vehicle Emissions Inspection Program

E. PAG's Air Quality Report 2007 National, State and Tucson Region Trends

F. Arizona Revised Statutes Section authorizing contingency measures for CO Limited Maintenance Plan

G. Resolutions from the PAG jurisdictions concerning priorities for Transportation Improvement Programs

H. Public Participation, Hearing and Process Documentation

EXECUTIVE SUMMARY

Significant progress continues to be made in reducing carbon monoxide (CO) levels across the United States, including in the Tucson Air Planning Area (TAPA). Dramatic reductions in CO levels from cleaner cars, equipment and fuels have cut CO emissions despite growth. No violations of the CO National Ambient Air Quality Standard (NAAQS) have been recorded in the TAPA since 1984 and ambient CO concentrations continue to trend lower. The highest CO level during the last two years was less than one third of the NAAQS.

Pima Association of Governments (PAG) adopted a State Implementation Plan (SIP) revision under the limited maintenance plan option. The TAPA was designated CO attainment status with an effective date of July 10, 2000. This plan met the requirements of the "Limited Maintenance Plan Option for Nonclassifiable [not classified] CO Nonattainment areas" announced by the U.S. Environmental Protection Agency (EPA) on Oct. 6, 1995.

PAG is submitting a SIP revision to the EPA to revise the Carbon Monoxide Limited Maintenance Plan (CO LMP) in accordance with §107 (d) of the Clean Air Act (CAA) to ensure maintenance of the NAAQS in the TAPA for a second 10-year period through year 2020. This 10-year plan essentially maintains existing controls and contingency provisions, and succeeds the previous plan approved by EPA in 2000. CO levels are expected to remain well below the NAAQS for the 10-year period ending in 2020.

BACKGROUND

The Tucson Air Planning Area (TAPA) was designated as a CO nonattainment area "not classified" by operation of law as published in accordance with CAA §107(d)(1)(C)(i). The extent of the TAPA is described in 40 CFR part 81.303 as the Tucson Area, Pima County (part) by Township and Range, and a map of the TAPA is presented in Figure 1.

Pima Association of Governments (PAG), as the designated air quality planning agency for Pima County, addresses regional air quality issues in keeping with federal, state and local requirements. Failure to meet the requirements of the CAA can result in economic sanctions and/or civil lawsuits. Such a civil lawsuit was filed in 1985 by the Arizona Center for Law in the Public Interest (ACLIPI). It forced EPA and others to respond to a number of CAA deadlines that had not been met, including nonattainment area plans to be submitted and approved for Maricopa and Pima counties.

One of the results of this litigation was the EPA approval of the 1987 Carbon Monoxide State Implementation Plan Revision for the Tucson Air Planning Area. The EPA approval was later vacated by an Order of the Ninth Circuit Court of Appeals on March 1, 1990, in response to an appeal filed by ACLIPI. In response to the court order, EPA promulgated the Arizona Federal Implementation Plan (FIP) on Jan. 28, 1991. At the same time EPA carried forward all control measure commitments contained in the 1987 SIP Revision and those that were later added to the SIP through legislation.

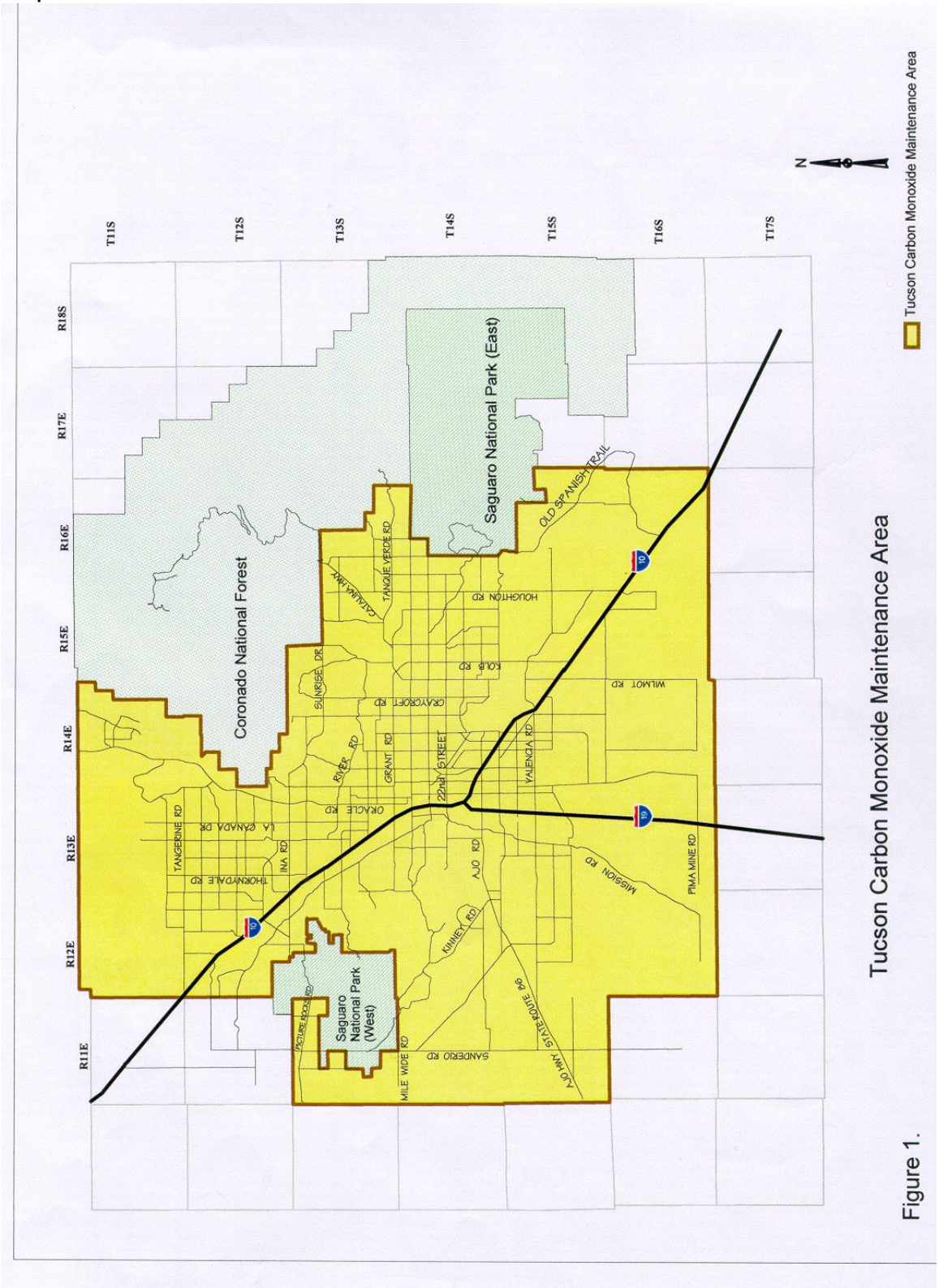
The FIP contained no new control measures because, ". . . the 1987 Pima plan accurately predicted that attainment would occur in or before early 1990." Therefore, EPA concluded, "sufficient emission reductions have already been achieved in Pima County to assure that current CO emission levels are below those needed to attain the CO NAAQS and that no additional federal measures are needed to ensure attainment." The EPA hot-spot modeling for the FIP showed that with the existing control strategies ambient CO concentrations for the next 10 years would be well below the CO NAAQS, even under worst case meteorological conditions.

The 1996 CO Limited Maintenance Plan for the TAPA (as updated August 1997) showed how the region would continue to attain the standard through 2010. The CO LMP SIP Revision was adopted by PAG and the TAPA was designated CO attainment status by EPA with an effective date of July 10, 2000.

The continuous downward trend in CO monitor readings in the TAPA has demonstrated that these improvements can be attributed to permanent, enforceable reductions in CO emissions despite growth in population and vehicle travel. These reductions are largely achieved through more stringent federal controls on vehicles and fuels and state and local measures in the CO LMP.

The CAA requires that a second SIP revision be submitted within eight years of redesignation to demonstrate that the area will maintain the standard for another 10 years.

Figure 1
Map of Carbon Monoxide Maintenance Area



This update must comply with the Act's requirements in section 175(A) for maintenance plans, by including:

- Air quality data that demonstrate that the area continues to be in attainment
- On-road mobile source emissions forecasts[1]
- Contingency emission reduction measures that decrease CO emissions, as necessary after a trigger event
- Continued air monitoring to verify the attainment status of the region

LIMITED MAINTENANCE PLAN OPTION

The "Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment Areas" EPA guidance document from Joseph Paisie (Oct. 6, 1995) lists the core requirements for this plan as follows:

a. Attainment Inventory

The State should develop an attainment emissions inventory to identify a level of emissions in the area which is sufficient to attain the CO NAAQS. This inventory should be consistent with EPA's most recent guidance on emissions inventories for nonattainment areas available at the time and should represent emissions during the time period associated with the monitoring data showing attainment. The inventory should be based on actual "typical winter day" emissions of CO.

b. Maintenance Demonstration

The maintenance demonstration requirement is considered to be satisfied if the monitoring data show that the area is meeting the air quality criteria for limited maintenance areas (7.65 ppm or 85 percent of the CO NAAQS). There is no requirement to project emissions over the maintenance period. The EPA believes if the area begins the maintenance period at or below 85 percent of exceedance levels, the air quality along with the continued applicability of PSD requirements, any control measures already in the SIP (or FIP), and federal measures, should provide adequate assurance of maintenance over the initial 10-year maintenance period.

When the EPA approves a limited maintenance plan, the EPA is concluding that an emissions budget may be treated as essentially not constraining for the length of the maintenance period because it is unreasonable to expect that such an area will experience so much growth in that period that a violation of the CO NAAQS would result.

c. Monitoring Network/Verification of Continued Attainment

To verify the attainment status of the area over the maintenance period, the maintenance plan should contain provisions for continued operation of an appropriate, EPA-approved air quality monitoring network, in accordance with 40 CFR part 58. This is particularly important for areas using a limited maintenance plan because there is no cap on emissions.

[1] under a Limited Maintenance Plan, there is no constraining emissions budget

d. Contingency Plan

Section 175(A) of the CAA requires that a maintenance plan include contingency provisions, as necessary, to promptly correct any violation of the NAAQS that occurs after redesignation of the area. These contingency measures do not have to be fully adopted at the time of redesignation. However, the contingency plan is considered to be an enforceable part of the SIP and should ensure that the contingency measures are adopted expeditiously once they are triggered by a specified event. The contingency plan should identify the measures to be promptly adopted and provide a schedule and procedure for adoption and implementation of the measures. The state also should identify specific indicators, or triggers, which will be used to determine when the contingency measures need to be implemented. While a violation of the NAAQS is an acceptable trigger, states may wish to choose a pre-violation action level as a trigger, such as an exceedance of the NAAQS. By taking early action, a state may be able to prevent any actual violation of the NAAQS and, therefore, eliminate any need on the part of EPA to redesignate an area back to nonattainment.

e. Conformity Determinations under Limited Maintenance Plans

The transportation conformity rule and the general conformity rule apply to nonattainment areas and maintenance areas operating under maintenance plans. Under either rule, one means of demonstrating conformity of federal actions is to indicate that expected emissions from planned actions are consistent with the emissions budget for the area. Emissions budgets in limited maintenance plan areas may be treated as essentially not constraining for the length of the initial maintenance period because it is unreasonable to expect that such an area will experience so much growth in that period that a violation of the CO NAAQS would result. In other words, EPA would be concluding that emissions need not be capped for the maintenance period. Therefore, in areas with approved limited maintenance plans, federal actions requiring conformity determinations under the transportation conformity rule could be considered to satisfy the "budget test" required in the conformity rule.

ATTAINMENT EMISSIONS INVENTORY AND MOBILE SOURCE CONTROL MEASURES

The dominant source of CO emissions is from on-road motor vehicles. Other contributing sources include nonroad emissions, which include lawn and garden equipment and construction equipment, as well as area and point sources such as woodburning and cement production. Table 1 illustrates the CO emissions for a typical winter day in 2008. Additional details can be found in Appendix A.

Table 1:
2008 Typical Winter Day Carbon Monoxide Emissions for the Tucson Region (tons/day)

Sources	CO (tons/day)	Percent of Total CO Emissions
Point	9.04	1.66
Area	9.57	1.75
Nonroad Mobile	182.62	33.46
On-road Mobile	344.56	63.13
Total	**545.79**	

Monitored levels of CO have continued to decrease over the last decade. The modeled emissions of CO from on-road mobile sources mirror this downward trend. The availability of cleaner cars through the Federal Motor Vehicle Control Program (FMVCP) together with the addition of other local controls such as the Vehicle Emissions Inspection Program (VEIP) have resulted in decreased emissions and hence lower CO concentrations.

Total 2008 CO emissions from all sources for an average winter day in 2008 are estimated to be 546 tons, with the on-road mobile contribution estimated to contribute 63 percent. Additional details on the estimated emissions inventory for all sources of CO for the base year of 2008 are included in Appendix A.

Table 2 below shows the 2008 on-road emissions of CO. The emissions calculations used the most recent data available and planning assumptions for transportation network vehicle miles traveled and speed. The EPA-approved MOBILE6.2 model was used to calculate emission factors for on-road mobile sources. The estimated CO emissions projected for 2030 in the Regional Transportation Plan 2030 reflect the tapering of the CO emissions benefits of the FMVCP and VEIP and the continuing regional growth and subsequent increase in VMT. As shown, emissions from on-road sources for the end of the 10-year maintenance period are expected to be well below the 2008 base year. Under the Limited Maintenance Plan option, there is no constrained emissions budget.

Table 2:
On-Road Mobile Source Emissions of Carbon Monoxide - Winter Season (tons/day)

Year	CO Emissions (tons per day)
2008	345
2030	291

The following mobile source emissions control measures for the Tucson Air Planning Area are currently in effect:

- Federal Motor Vehicle Control Program;
- State Vehicle Emissions Inspection Program;
- State Oxyfuels Program (1.8 percent oxygen, that can be increased according to the provisions of A.R.S. § 41-2125);
- PAG Travel Reduction Program (TRP) including RideShare Program; and
- Pima County Department of Environmental Quality (PDEQ) Voluntary No-Drive Days Program.

These programs represent the permanent and enforceable commitments (as required under § 107(d)(3)(E)(iii) of the Clean Air Act) that have contributed to bringing the Tucson area into attainment and/or will help keep the area in attainment of the CO NAAQS. All of these control measures are assured of funding as long as current statutes are not changed and current agreements continue. Appendix B (A.R.S. § 49-406) describes the requirements for a Memorandum of Agreement (Appendix C) and the statutory requirements for implementation and enforcement of a "nonattainment area plan." We believe that this statute applies to maintenance area plans as well as nonattainment area plans. The State Vehicle Emissions Inspection Program, initiated by the state Legislature in 1976, has a maximum extension time set at 10 years, and is authorized through Jan. 1, 2017. Appendix D addresses the anticipated continued support of this program that is also a part of the Phoenix area SIPs.

Emissions benefits from the control measures listed above are estimated and reported each year in the annual CO Progress Report and the annual transportation improvement program (TIP). Quantitative estimates of CO emissions benefits from these control measures for 2005 are presented in the Air Quality Report 2007 in Appendix E. The possible additional benefits from travel demand management measures such as the PAG TRP, RideShare Program and Volunteer No-Drive Days Program have not been claimed as credits against any emissions budgets in the past because CO "not classified" areas are not required to have an emissions budget.

The emissions benefit attributable to travel demand management strategies, such as TRP, RideShare and No-Drive Days are generally 1 percent or less individually. The travel demand programs provide additional education and understanding to a large segment of the working public about the need for and benefit of other air quality control measures. This broad understanding may help governments to implement more stringent transportation control measures or contingency measures when necessary for the protection of air quality and public health.

MAINTENANCE DEMONSTRATION

The Pima County Department of Environmental Quality (PDEQ) monitors ambient CO concentrations in eastern Pima County. The 1-hour NAAQS for CO has not been

violated in the Tucson region. The 8-hour NAAQS is currently set at 9 ppm, not to be exceeded more than once per year at each site. Observation of the second highest 8-hour concentration is an indicator of the region's proximity to violating the standard. These data are presented in Table 3 and include the highest and second highest one-hour and non-overlapping 8-hour averages for the CO monitor stations from 2004 through 2006 in the Tucson Air Planning Area (TAPA). The highest 8-hour average CO concentration measured during this three-year period was 3.7 ppm at the Downtown site. The 8-hour standard was last violated in 1984. No 8-hour average CO concentration above 85 percent of the NAAQS or 7.65 ppm has been recorded at any CO monitoring station since 1990 (PDEQ, 2007).

Table 3:
Carbon Monoxide Monitoring Data Summary for the Tucson Air Planning Area

SITE	YEAR	HIGHEST ONE-HOUR (ppm)	SECOND-HIGHEST ONE-HOUR (ppm)	HIGHEST EIGHT-HOUR (ppm)	SECOND HIGHEST EIGHT-HOUR (ppm)
DOWNTOWN					
	2004	5.5	4.7	3.7	2.5
	2005	3.0	2.8	1.9	1.7
	2006	2.9	2.6	1.4	1.2
22ND/CRAYCROFT					
	2004	3.6	3.4	1.6	1.6
	2005	3.5	3.3	1.7	1.5
	2006	3.2	2.9	1.6	1.4
22ND/ALVERNON					
	2004	4.0	4.0	2.1	2.0
	2005	4.1	3.6	2.2	2.1
	2006	3.4	3.4	2.0	1.8
CHILDREN'S PARK					
	2004	2.2	2.2	1.4	1.4
	2005	2.0	1.8	1.1	1.1
	2006	1.7	1.7	1.1	1.0
CHERRY/GLENN					
	2004	4.0	3.9	2.7	2.2
	2005	3.8	3.4	2.5	2.4
	2006	3.4	3.3	2.3	2.0
GOLF LINKS/KOLB					
	2004	3.6	3.5	2.1	2.1
	2005	3.3	3.2	2.2	2.1
	2006	3.8	2.9	1.8	1.6

MONITORING NETWORK/VERIFICATION OF CONTINUED ATTAINMENT

PDEQ operates and maintains a CO monitoring network through an EPA grant program (Section 105). The network is EPA-approved, in accordance with 40 CFR part 58. The monitoring network is consistent with the ambient air monitoring network assessment and plan developed by PDEQ that is submitted annually to EPA and follows a public notification and review process.

Ambient CO concentrations continue to be low, currently at a quarter of the NAAQS. With the emphasis on monitoring CO levels to indicate trigger events, the network provides data representative of the ambient air and tracks maximum expected concentrations.

CONTINGENCY PLAN

This contingency plan provides a procedure to prevent future violations and promptly correct any violation of the CO NAAQS that occurs after the renewal of the CO LMP for another 10 years. The contingency plan is considered to be a federally enforceable part of the SIP. The assurance that contingency procedures will be followed and commitments will be implemented and enforced is found in state law at A.R.S. § 49-406 (Appendix B). By adopting this limited maintenance plan renewal, the PAG Regional Council and member jurisdictions are obligated to adhere to the procedures outlined herein. The resolutions previously adopted by PAG jurisdictions in 1996 confirming their ongoing commitment to implement certain contingency control measures, are reproduced in Appendix G. Following the regional adoption of the CO LMP by the PAG Regional Council in 1996, the Town of Sahuarita became a member of the PAG Regional Council. As the Town of Sahuarita is almost completely outside the CO maintenance area and the CO maintenance area does not include the urban area of the town, a memorandum to implement traffic flow improvements at intersections was not deemed necessary.

This contingency plan ensures that appropriate measures are adopted and implemented expeditiously once they are triggered by a specified event. An event triggering the contingency plan is specified in the plan at a level well below the violation level to ensure that additional control measures are implemented before a violation of the standard occurs or is imminent. This contingency plan identifies measures that can be promptly adopted and implemented by following the procedures specified below:

a. Action Levels

The following process is used to define the trigger event and to evaluate the need for contingency measures to avoid any CO NAAQS violations. First, a verified ambient CO level over 7.65 ppm for an 8-hour period must be recorded at least twice at one monitor station during the CO season (October through March). Next, the most recent microscale modeling at known hot-spot locations will be reviewed. Additional data collection and analyses of potential hot-spot intersections will then be considered.

If a trigger event occurs, field studies using a portable CO monitor will be conducted at one or more of the hot-spot locations most likely to have high CO concentrations. The monitor will run for at least 30 days during the CO season (October through March). The objective is to record episodes that are typical of weather and traffic conditions that produce high ambient concentrations. Finally, using all the data available, PAG staff will make a determination and recommendation to implement additional control measures, if needed, to assure that the CO NAAQS will not be violated.

b. Procedure

PDEQ must notify PAG within seven days every time verified monitoring data indicate that a CO concentration greater than 7.65 ppm CO for an 8-hour average has been recorded at one of the monitor sites. An 8-hour average of 7.65 ppm (85 percent of the CO NAAQS) is the maximum level designated by the EPA for Nonclassifiable CO Nonattainment areas to qualify for the limited maintenance plan option. Two verified 8-hour average concentrations in excess of 85 percent of the CO NAAQS at any one monitor site in any CO season has been selected by PAG as the pre-violation action level. When this criterion is first reached, there should be ample time available to complete all necessary field studies, technical evaluations, recommendations and provide for implementation of mitigation measures, if needed, to prevent any violations of the CO NAAQS. If the field studies can not be completed during the CO season of the occurrence, they must be completed within 12 months of reaching the pre-violation action level.

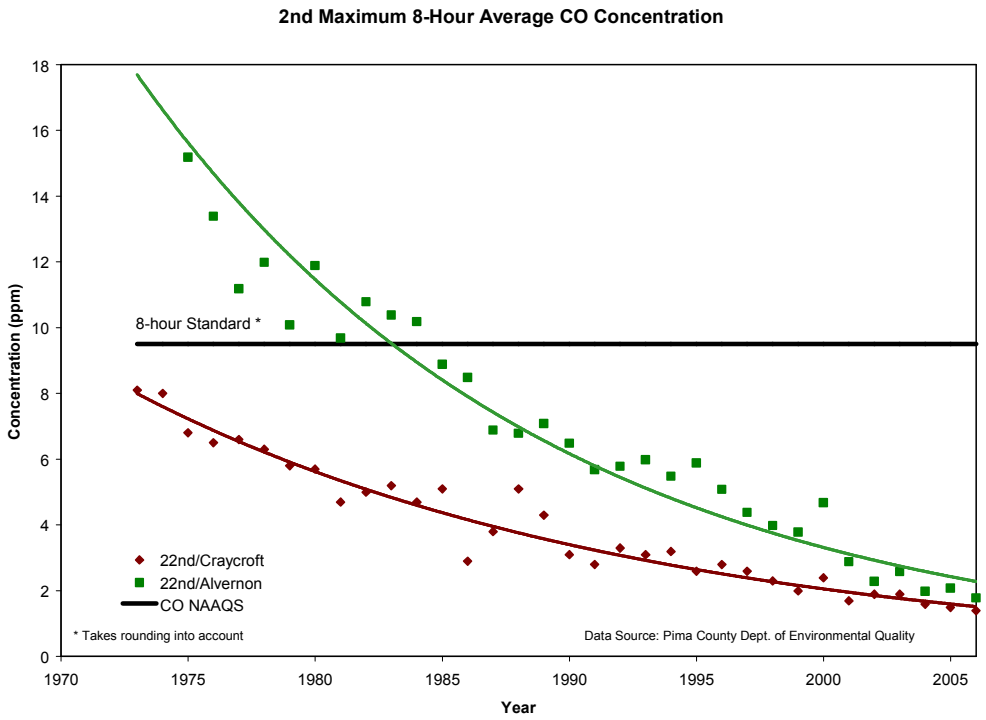
It should be noted that since 1988, Tucson has recorded no exceedances at any monitor. While the Tucson region has not yet experienced any areawide high CO concentrations close to the health standard, the cause of monitored concentrations above the action level must be determined so that the most appropriate control measures can be implemented. If the event is the result of monitored emissions from an identified hot-spot, local mitigation measures will be assessed first. If local transportation system improvements at that hot-spot location can be implemented promptly, and will fully mitigate the congestion and emissions problem, that action will be recommended to the appropriate jurisdiction by the PAG Regional Council. If it is determined that the cause of the problem is common to a number of hot-spots or is areawide, a general control measure such as increasing the oxygen content in the oxyfuels program will be requested from the appropriate authority as pre-authorized by state statute as a more effective remedy. If it is determined that no violation is threatened, the data acquired will be filed as part of the database to evaluate future trigger events.

PAG periodically models current ambient CO concentrations for selected hot-spot intersections. PAG typically evaluates the three highest total average daily traffic (ADT) and the three worst level of service (LOS) intersections using the most current microscale model, CAL3QHC. The results are evaluated to determine CO levels at hot-spot intersections.

Recent trends in monitored ambient air quality are displayed in Figure 2. It shows the

downward trend of 2nd high 8-hour average concentrations of CO at the SLAMS microscale monitor at 22nd Street and Alvernon and neighborhood scale monitor near 22nd Street and Craycroft.

Figure 2:
Carbon Monoxide Trends (1972-2006)



Field Study Requirement

If the PAG analyses indicate a reasonable probability of violating the CO NAAQS at any of these modeled hot-spot locations within the five-year period, and no trigger event has occurred, a field study will be initiated, deploying a portable monitoring station no later than the beginning of the next CO season. This monitoring station will be deployed at the intersection with the highest modeled CO values that is also able to accommodate the monitoring equipment. The portable station will measure ambient CO levels and meteorological data for at least 30 days during the primary CO season (December through February) unless suitable meteorological conditions occur sooner. Traffic data will be obtained from the department of transportation of the jurisdiction where the monitor is located to provide up-to-date traffic data. The data collected at the intersection site will be compared with the data inputs and outputs of the microscale modeling for that intersection.

Data Analysis and Enforcement

An analysis of the entire data package will then be prepared by PAG and PDEQ air quality staff within three months of completion of the field study monitoring program. The analysis will focus on the probability of exceeding the CO NAAQS; when that might occur; and what control measures, if any, should be implemented to ensure that no violations of the CO NAAQS occur. The analysis will be prepared with full agency consultation and public participation. The analysis report will be presented to the PAG Regional Council after consultation, review and recommendation from the appropriate PAG committees and other interested parties.

If the PAG air quality analysis anticipates that a violation of the CO NAAQS is probable within five years, the analysis report will contain a recommendation that PAG's Regional Council implement, or specifically request the appropriate agency to implement, the control measures recommended in the analysis that will fully mitigate the projected violation. Implementation must be initiated by the start of the next CO season (Oct. 1). Failure of the PAG Regional Council and/or the PAG jurisdictions (within their legal authority) to implement the recommendations may be considered a failure to fulfill the obligations of this plan. Likewise, a failure of the state of Arizona and its agencies to implement control measures (within their legal authority) requested by PAG may be considered a failure to fulfill the obligations of this plan.

A monitored exceedance of the CO NAAQS (one verified ambient CO level over 9.5 ppm for an 8-hour period) at any monitor is an event that will trigger the same evaluation and implementation process described above.

In the event of a violation of the CO NAAQS, the Director of ADEQ is authorized to reduce the maximum volatility of gasoline sold in Area B (the Tucson vehicle emissions control area) according to the provisions of A.R.S. § 41-2122 (D) and allow additional increments of oxygen content in motor vehicle fuels up to 3.5 percent for ethanol for implementation as needed to prevent future CO NAAQS violations according to the provisions A.R.S. § 41-2125 (see Appendix F).

c. Prioritization of Contingency Measures

The Air Quality Subcommittee (see Appendix C) of the PAG Environmental Planning Advisory Committee (EPAC) serves as the initial public review body for evaluation of the control measures considered for inclusion on the contingency measure list. During the development of the CO LMP, which was approved by EPA with an effective date of July 2000, the committee reviewed the cost effectiveness of the reasonably available measures. It also has evaluated the public acceptability of these measures[2]. This resulted in a listing of contingency measures for consideration when a triggering event

[2] The principal sources of information used by PAG staff and the Subcommittee were:
Woodard and Horn, "Arizona Carbon Monoxide Emissions Reduction Study" prepared for ADEQ, May 1990.
Sierra Research, et. al., "Feasibility and Cost-Effectiveness Study of New Air Pollution Control Measures Pertaining to Mobile Sources" prepared for MAG, June 1993.
Sierra Research, et. al., "Feasibility and Cost Effectiveness of New Air Pollution Control Measures" Final Report, prepared for MAG, September 1993

occurs. The ranking process for inclusion in the list will likely change over time as better information becomes available concerning the effectiveness of various control measures. Also, the most suitable control measure to correct a particular problem may not be the highest ranked one.

The criteria used by the Air Quality Subcommittee to rank the candidate control measures included:

- Cost effectiveness based on cost estimates per ton of carbon monoxide reduction;
- Amount of emissions reduction needed and/or available;
- Feasibility of governmental actions required for implementation;
- Equity for all affected publics;
- Public perception and acceptance of measure; and
- Reliability of available cost and effectiveness data.

d. Current List of Contingency Measures

The following list will be considered first when evaluating the appropriate measure to implement for a defined problem. Implementation of one or more of these measures would be possible choices should emission reduction measures be needed to prevent or correct a violation of the CO NAAQS. The final decision on which measure/s to implement will be made by the PAG Regional Council based on recommendations from PAG staff, after review by the EPAC Air Quality Subcommittee and the required public participation and agency consultation. Changes to the list may be made by SIP revision following the required public participation and agency consultation. Current enforceable contingency measures, if needed, are:

- Transportation system management improvements such as additional signal light coordination and turn lanes (Appendix G)

- Incremental increase in the oxygen content during the oxyfuel season (October through March) up to the practical limit (3.5 percent for 100 percent ethanol oxygenate) in no less than 0.3 percent increments (Appendix F)

- Setting a maximum winter Reid Vapor Pressure (RVP) at 9 pounds per square inch (psi) with an ethanol waiver of 1 psi (Appendix F)

- Setting a maximum winter RVP at 9 psi without an ethanol waiver of 1 psi to be implemented in the event of a violation of the CO NAAQS (Appendix F)

e. Other Candidate Contingency Measures

The following contingency control measures also are considered feasible and effective, but were not ranked, and no effort has been made to obtain enabling legislation:

- Mandatory no-burn (fireplace) days for defined, high-risk weather conditions.
- Elimination of, or restrictions on, VEIP waivers (Appendix F).
- Remote sensing in conjunction with VEIP program.
- Emissions based vehicle use fee.
- VMT based vehicle use fee.
- One of the congestion pricing methodologies such as high parking fees in areas of congestion.
- VEIP (I/M 147) consistent with current Maricopa County use.
- Mandatory no-drive days for defined, high-risk weather conditions (cold, calm).

CONFORMITY DETERMINATIONS UNDER LIMITED MAINTENANCE PLANS

Under a limited maintenance plan, continued timely implementation of transportation control measures (TCMs), consultation and maintenance of CO emissions below the NAAQS is required. With an approved limited maintenance plan, it is presumed that the TAPA has demonstrated that it would be unreasonable to expect a violation of the CO NAAQS from growth in vehicle emissions for that period.

The region continues to model CO emissions levels from on-road sources annually to give an indication of future trends in ambient CO concentrations that may not be apparent in the trends of monitored data. Even though the CO emissions budget is treated as essentially not constraining for the length of the maintenance period, the conformity analyses will produce useful information for continued air quality planning. These air quality analyses will be an important factor in evaluating possible control measures for implementation under the contingency plan procedures.

Modeling emission levels for the end of the maintenance plan will not be feasible until the new Regional Transportation Plan is completed and analysis year transportation networks have been established. Transportation Plan conformity analysis years will be modeled for emissions levels, but the finding of conformity will not depend on the modeling results. Under the limited maintenance plan option, the modeled emissions for the last year of the maintenance plan automatically meet the budget, as the CO budget is essentially unconstrained.

PUBLIC RECORD AND OPPORTUNITY FOR PUBLIC COMMENT

PAG conducted a public review process that included a 30-day comment period and public hearing on the draft plan renewal in accordance with federal requirements. This CO LMP renewal was reviewed by PAG's Air Quality Subcommittee and subsequently

approved by PAG's Environmental Planning Advisory Committee composed of representatives from state, county and local governments, private industry, environmental groups and the general public on May 2, 2008. The PAG Management Committee, comprised of managers from each of the PAG member jurisdictions and tribes and the Arizona Department of Transportation, recommended approval of the plan to the PAG Regional Council on June 11, 2008. The Regional Council is PAG's decision-making body which is composed of elected officials from the PAG member jurisdictions. The CO LMP revision was approved and adopted by the Regional Council on June 26, 2008, and has been submitted to the Arizona Department of Environmental Quality for official adoption and submission to the EPA.

REFERENCES

"Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment Areas" EPA Guidance Document from Joseph Paisi, October 6, 1995

"PDEQ 2006 Air Quality Summary Report Appendix", 2007

Appendix A

2008 Pima County Emissions Inventory

Average Winter Day CO Emissions Inventory for 2008

Methodology

Point and Stationary Area Sources

For this document, carbon monoxide (CO) point and area source emissions were based on a study, *Emissions Inventories for the Tucson Air Planning Area,* for the Pima Association of Governments (PAG) in 2001, conducted by Envair. Base year emission estimates were provided for 2000, and projections were developed for 2005 and 2010. This is the most current emissions inventory available for these sources.

Point sources covered in this study included stationary, commercial, government and industrial facilities permitted by the Pima Department of Environmental Quality (PDEQ) or the Arizona Department of Environmental Quality (ADEQ). The 2000 annual estimates were based on activity data from five sources: survey of each facility throughput, PDEQ 1999 emissions reports, ADEQ's 1999 permit database, facility actual emissions and EPA National Emission Inventory Tier 2 data.

Area sources in this inventory are those facilities or activities that are not required to be permitted by PDEQ or ADEQ or are too numerous to be handled as individual point sources. The area sources were grouped into sixteen categories[1] based on those used in a PAG-sponsored study (PAG, 1999) and an EPA guidance document (EPA, 1999). Four general methods were employed to gather 2000 area emissions data: source surveys, per capita emission factors, per employee emission factors and projection of existing inventories.

In 2003, PAG staff revised the residential wood burning emissions portion of the area sources for 2000, 2005 and 2010 (PAG, 2003; PAG, 2002) since the base year data on residential wood burning totals were exaggerated. The modified area totals resulting from this revision were included in all subsequent calculations.

To estimate CO point and area source emissions for 2008, estimates were interpolated from Envair's projected point and area source emissions for 2005 and 2010, converted to metric tons and divided by 365 to represent tons of emissions per typical day.

Nonroad Mobile Sources

Nonroad mobile sources consist of all mobile sources that are not constrained to roadway operation. Envair's 2001 emissions inventory included estimates for nonroad mobile emissions and served as a template for revising the nonroad emission data. PAG staff recently updated the 2005 and 2010 nonroad mobile emission estimates from seven sources[2] embedded in the latest EPA NONROAD2005 model. Local data were used for model inputs such as Tucson's NOAA 30-year average temperatures and 2005 county fuel specifications and population data.

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[1] Architectural surface coating, asphalt paving, automobile refinishing, commercial bakeries, consumer solvent usage, dry cleaning, forest fires and other burnings, gasoline distribution, graphic arts, industrial surface coating, miscellaneous residual/commercial fuel combustion, pesticide application, residential wood combustion, solvent cleaning, structural and vehicle fires and traffic markings.

[2] Agricultural, commercial, construction and mining, industrial, recreational equipment and commercial and residential lawn and garden equipment.

Data for 2005 and 2010 carbon monoxide emissions from aircraft, locomotives and airport ground support equipment were taken from the Envair 2001 report since the nonroad model does not evaluate these sources. In forecasting CO emissions from these three sources, Envair extrapolated from the 2000 base year to project 2005 and 2010 emissions.

Emissions for 2008 were interpolated using the 2005 and 2010 projected emissions data from the three Envair nonroad sources and the seven 2005 and 2010 NONROAD2005 modeled sources. Data were converted to metric tons and divided by 365 to represent tons of emissions per typical day.

On-road Mobile Sources
On-road mobile source emissions include those produced from highway motor vehicles. Using EPA's MOBILE6.2 model, PAG staff estimated on-road mobile CO emissions for 2008. Model inputs incorporated 2007 winter meteorological and Reid Vapor Pressure data, current oxyfuel and vehicle inspection and maintenance programs and 2007 ADOT vehicle registration data. MOBILE6.2 emissions modeling results reflect the averaging of the high and low altitude scenarios. Local VMT and speed determinations by road type for 2008 were provided by PAG's Technical Services staff using the TransCAD transportation model. Using these data and the MOBILE6.2 outputs, CO emissions for a typical winter day in 2008 were estimated.

Results

2008 Typical Winter Day CO Emissions for the Tucson Region (tons)

Sources	CO (tons/day)	Percent of Total CO Emissions
Point	9.04	1.66
Area	9.57	1.75
Nonroad Mobile	182.62	33.46
On-road Mobile	344.56	63.13
Total	**545.79**	

Data Sources

Envair. 2001. Final Report: Emissions Inventories for the Tucson Air Planning Area. Vol.1: Study Description and Results.

Pima Association of Governments. 2003. Letter from Natalie Shepp, PAG, to Ursula Kramer, PDEQ, describing changes to Envair's 2001 area source emissions (changes to the residential wood burning data are highlighted)(May 6, 2003).

Pima Association of Governments. 2002. Residential Wood Burning in the Tucson Region.

Pima Association of Governments. 1999. SMOGMAP, System for Management, Observation, and GIS Modeling of Air Pollution: Final Report Phase II.

U.S. Environmental Protection Agency. 1999. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter - National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations.

Pima Association of Governments. 2008. Letter from Susanne Cotty, PAG, to Ursula Kramer, PDEQ, detailing the updates to the Tucson Area Nonroad Emissions Inventory for 2000, 2005, and 2010.

Appendix B

Arizona Revised Statutes Section 49-406 State Implementation Plan

49-406. Nonattainment area plan

A. For any ozone, carbon monoxide or particulate nonattainment or maintenance area the governor shall certify the metropolitan planning organization designated to conduct the continuing, cooperative and comprehensive transportation planning process for that area under 23 United States Code section 134 as the agency responsible for the development of a nonattainment or maintenance area plan for that area.

B. For any ozone, carbon monoxide or particulate nonattainment or maintenance area for which no metropolitan planning organization exists, the department shall be certified as the agency responsible for development of a nonattainment or maintenance area plan for that area.

C. For any ozone, carbon monoxide or particulate nonattainment or maintenance area, the department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall, by November 15, 1992, and from time to time as necessary, jointly review and update planning procedures or develop new procedures.

D. In preparing the procedures described in subsection C of this section, the department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall determine which elements of each revised implementation plan will be developed, adopted, and implemented, through means including enforcement, by the state and which by local governments or regional agencies, or any combination of local governments, regional agencies or the state.

E. The department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall enter into a memorandum of agreement for the purpose of coordinating the implementation of the procedures described in subsection C and D of this section.

F. At a minimum, the memorandum of agreement shall contain:

1. The relevant responsibilities and authorities of each of the coordinating agencies.
2. As appropriate, procedures, schedules and responsibilities for development of nonattainment or maintenance area plans or plan revisions and for determining reasonable further progress.
3. Assurances for adequate plan implementation.
4. Procedures and responsibilities for tracking plan implementation.
5. Responsibilities for preparing demographic projections including land use, housing, and employment.
6. Coordination with transportation programs.
7. Procedures and responsibilities for adoption of control measures and emissions limitations.
8. Responsibilities for collecting air quality, transportation and emissions data.
9. Responsibility for conducting air quality modeling.
10. Responsibility for administering and enforcing stationary source controls.
11. Provisions for the timely and periodic sharing of all data and information among the signatories relating to:

(a) Demographics.
(b) Transportation.
(c) Emissions inventories.
(d) Assumptions used in developing the model.
(e) Results of modeling done in support of the plan.
(f) Monitoring data.

G. Each agency that commits to implement any emission limitation or other control measure, means or technique contained in the implementation plan shall describe that commitment in a resolution adopted by

the appropriate governing body of the agency. The resolution shall specify the following:

1. Its authority for implementing the limitation or measure as provided in statute, ordinance or rule.
2. A program for the enforcement of the limitation or measure.
3. The level of personnel and funding allocated to the implementation of the measure.

H. The state, in accordance with the rules adopted pursuant to section 49-404, and the governing body of the metropolitan planning organization shall adopt each nonattainment or maintenance area plan developed by a certified metropolitan planning organization. The adopted nonattainment or maintenance area plan shall be transmitted to the department for inclusion in the state implementation plan provided for under section 49-404.

I. After adoption of a nonattainment or maintenance area plan, if on the basis of the reasonable further progress determination described in subsection F of this section or other information, the control officer determines that any person has failed to implement an emission limitation or other control measure, means or technique as described in the resolution adopted pursuant to subsection G of this section, the control officer shall issue a written finding to the person, and shall provide an opportunity to confer. If the control officer subsequently determines that the failure has not been corrected, the county attorney, at the request of the control officer, shall file an action in superior court for a preliminary injunction, a permanent injunction, or any other relief provided by law.

J. After adoption of a nonattainment or maintenance area plan, if, on the basis of the reasonable further progress determination described in subsection F of this section or other information, the director determines that any person has failed to implement an emission limitation or other control measure, means or technique as described in the resolution adopted pursuant to subsection G of this section, and that the control officer has failed to act pursuant to subsection I of this section, the director shall issue a written finding to the person and shall provide an opportunity to confer. If the director subsequently determines that the failure has not been corrected, the attorney general, at the request of the director, shall file an action in superior court for a preliminary injunction, a permanent injunction, or any other relief provided by law.

K. Notwithstanding subsections A and B of this section, in any metropolitan area with a metropolitan statistical area population of less than two hundred fifty thousand persons, the governor shall designate an agency that meets the criteria of section 174 of the clean air act and that is recommended by the city that causes the metropolitan area to exist and the affected county. That agency shall prepare and adopt the nonattainment or maintenance area plan. If the governor does not designate an agency, the department shall be certified as the agency responsible for the development of a nonattainment or maintenance area plan for that area.

Appendix C

Memorandum of Agreement, August 2000

CONTRACT
NO. 01-00-A-127793-0700
AMENDMENT NO. _____
This number must appear on all invoices, correspondence and documents pertaining to this contract.

ADEQ

MEMORANDUM OF AGREEMENT
AMONG
THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
AND
THE ARIZONA DEPARTMENT OF TRANSPORTATION
AND
PIMA COUNTY, BY AND THROUGH THE PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY
AND
THE PIMA ASSOCIATION OF GOVERNMENTS

AUG 2000
RECEIVED BY PIMA ASSOC. OF GOVS.

PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to provide the framework and guidelines to promote coordinated decision making in planning, development, implementation and enforcement of those actions necessary to attain and maintain the National Ambient Air Quality Standards (NAAQS) in Pima County. This MOA is required pursuant to Arizona Revised Statutes (A.R.S.) § 49-406 D. and E. This MOA also provides the framework and guidelines for preparing plans designed to address other air pollution problems of regional concern, and to fulfill the requirements contained in A.R.S. § 49-408, air quality conformity.

SCOPE

This MOA is designed to address the identification and control of air pollutants of regional concern: specifically carbon monoxide, particulate matter and ozone (as referenced in A.R.S. § 49-404 and 49-406), as well as regional haze and visibility.

The geographical area of concern is Pima County or the area specifically designated by the Administrator of the U.S. Environmental Protection Agency (EPA), or the Governor of the State of Arizona (A.R.S. § 49-405 A), as not having attained the NAAQS for one or more of the pollutants named above.

RESPONSIBILITIES AND AUTHORITIES

The Arizona Department of Environmental Quality (ADEQ) has the primary authority in the State of Arizona for air pollution control and abatement. ADEQ is charged with:

1) maintaining a State Implementation Plan that provides for implementation, maintenance, and enforcement of NAAQS and protection of visibility as required by the Clean Air Act (CAA) (A.R.S. § 49-404);
2) adopting rules, procedures, and criteria for describing and changing the designation of areas of the State with respect to compliance with and attainment of the NAAQS (A.R.S. § 49-405); and

3) assuring that nonattainment or maintenance area plans, and other regional air quality plans (for example, Natural Events Action Plans) are implemented (A.R.S. § 49-406 J.).

ADEQ has original jurisdiction and control over portable, mobile and specific types of stationary air pollution sources (see A.R.S. § 49-402 A.). In addition, ADEQ is responsible for development of stationary source permitting procedures and standards (A.R.S. § 49-424 and 49-426.). ADEQ is also responsible for:

4) providing technical assistance to political subdivisions of the State for implementing air pollution control programs (A.R.S. § 49-424 (9);
5) conducting research on the amounts of hazardous air pollutants in ambient air and their impacts on human health (A.R.S. § 49-426.06);
6) management and implementation of programs under the Air Quality Fee Fund (A.R.S. § 49-551) including funding the regional Travel Reduction Program and the Voluntary No Drive Days program;
7) implementation of the Vehicle Emissions Inspection Programs (A.R.S. §§ 49-541 through 550); and
8) conducting research on vehicular emissions and clean burning fuels (A.R.S. § 49-553).

ADEQ may delegate authority to a county for implementing air pollution control statutes (A.R.S. § 49-107.).

The Arizona Department of Transportation (ADOT) has exclusive control over state highways and all other state owned transportation systems (A.R.S. § 28-332). This includes the responsibility of multi-modal state transportation planning, cooperation with local governments, coordination of transportation planning with local governments, investigation of new transportation systems, and advising local governments concerning the development and operation of public transit systems (A.R.S. § 28-332).

The ADOT Director enters into agreements on behalf of the state with political subdivisions for the improvement and cooperative maintenance and construction of public transit systems, and provides rules for the application for and expenditure of all public transit funds (A.R.S. § 28-367).

In addition, ADOT may conduct demonstration projects to evaluate the effectiveness of new, extended, improved or integrated public transportation services and carpooling or vanpooling activities in meeting regional transportation needs or in improving air quality (A.R.S. § 28-8133).

The Pima County Department of Environmental Quality (PDEQ) is the local air pollution control agency for Pima County. PDEQ has jurisdiction over air pollution sources not explicitly reserved for state jurisdiction (A.R.S. § 49-402). PDEQ is delegated authority from the State of Arizona to regulate certain stationary and portable air pollution sources initially reserved for state jurisdiction (A.R.S. § 49-424). ADEQ has delegated authority to PDEQ for those duties that

ADEQ believes can be competently, efficiently and properly performed by PDEQ and for which PDEQ has accepted the delegation. PDEQ operates the Voluntary No Drive Days Program (A.R.S. § 49-506). PDEQ is also responsible for monitoring the ambient air quality of the region (A.R.S. § 49-473) through collecting and analyzing air quality data.

Within PDEQ, the Director is designated as the Air Pollution Control Officer. The Air Pollution Control Officer has the responsibility and authority to enforce the provisions of Article 3, Chapter 3, Title 49, "County Air Pollution Control," Arizona Revised Statutes. The Air Pollution Control Officer also has the responsibility for assuring adequate nonattainment and maintenance area plan implementation as prescribed by A.R.S. § 49-404 and 49-406 I.

The Pima Association of Governments (PAG) is a nonprofit Arizona corporation with a governing board composed of elected officials from six jurisdictions - five cities and towns, and Pima County. In addition, a member of the Arizona State Transportation Board votes on transportation issues. PAG has been designated by the Governor of Arizona as the lead air planning organization for Pima County that, together with the State, is responsible for determining which elements of the State Implementation Plan revisions will be planned, implemented, and enforced by State and local governments in Arizona (Governor Wesley Bolin, February 7, 1978; Clean Air Act § 174(a); and A.R.S. § 49-406). PAG is responsible for the development of nonattainment and maintenance area plans for areas under its jurisdiction, and for implementing the PAG Travel Reduction Program as described in an Intergovernmental Agreement between all PAG jurisdictions originally signed April 18, 1988 and amended April 9, 1991 and July 24, 1996. PAG is the official (U.S. Department of Transportation) designated Metropolitan Planning Organization for transportation (Governor Jack Williams, December 14, 1973) as required by law (23 USC 134 (b)), and the designated agency for preparing population estimates and projections for the Pima County area (Executive Order 77-5, Governor Raul Castro, August 3, 1977; superseded by Executive Order 88-10, Governor Rose Mofford, July 1, 1988; superseded by Executive Order 95-2, Governor Fife Symington, February 10, 1995). PAG is also responsible for making transportation / air quality conformity determinations as required by Arizona Administrative Code (R18-2-1401 et seq.) and the State Implementation Plan, and subject to the consultation procedures as provided by law (Clean Air Act § 176).

UNDERSTANDING / AGREEMENTS

To facilitate the accomplishment of the foregoing, IT IS HEREBY AGREED that:

1. The Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Transportation (ADOT), the Pima County Department of Environmental Quality (PDEQ), and the Pima Association of Governments (PAG), will work through a coordinated effort to prepare the PAG regional

air quality plans (nonattainment and maintenance area plans) and plan revisions as outlined in Attachment one. The parties to this agreement will share all data and information in a timely manner, including demographics, transportation, emissions inventories, assumptions used in model development, results of modeling, and monitoring data. Attachment one contains a description of the generalized roles and areas of expertise of the major agencies involved in air quality and transportation in the PAG Region.

2. The Pima Association of Governments will maintain the PAG Regional Air Quality Planning Process for decision making as described in Attachment two. This Attachment contains the current roles of the PAG Regional Council, PAG Management Committee, PAG Environmental Planning Advisory Committee (EPAC), PAG Transportation Planning Committee (TPC), and subcommittees. PAG will coordinate the preparation of the nonattainment and maintenance area plans. Representatives from PAG, ADOT, ADEQ, PDEQ, and the Tucson Airport Authority are included as members of the Transportation Improvement Program (TIP) Subcommittee of the TPC, in addition to the six PAG jurisdictions.

3. The Arizona Department of Environmental Quality, Arizona Department of Transportation, Pima County Department of Environmental Quality and Pima Association of Governments will pursue all necessary commitments to implement the measures required in the nonattainment and maintenance area plans. The same entities will work together to implement the measures identified as the result of action under the State Exceptional and Natural Events Policy. Attachment three lists the current authorities and responsibilities for implementation of PAG regional air quality plans.

EFFECTIVE DATE

This Agreement and all Amendments shall become effective on the date it has been signed by all parties to it.

TERM

This Agreement shall remain in effect from the effective date of the Agreement until such time it is terminated or superseded by a subsequent agreement. This Agreement may be terminated by any party to it, providing written notice of intent to terminate is provided to all other parties to the Agreement thirty days prior to the effective date of withdrawal of that party from the Agreement.

AMENDMENT

This Agreement may be amended at any time upon mutual written agreement of all parties. No agent, employee or other representative of any party to this Agreement is empowered to alter any of the terms of the Agreement, unless it is done in writing and signed by the Designated Officers of the respective parties, their Authorized representatives, or duly appointed successors.

ATTEST

All terms of this Memorandum of Agreement are hereby acknowledged and agreed to, as certified by the signatures of the Designated Officers affixed hereto:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

By _____
Jacqueline E. Schafer, Director, Arizona Department of Environmental Quality

Date August 10, 2000

ARIZONA DEPARTMENT OF TRANSPORTATION

By Mary E. Peters
Mary E. Peters, Director
Arizona Department of Transportation

Date August 18, 2000

PIMA COUNTY, BY AND THROUGH THE PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY

By Sharon Bronson
Sharon Bronson, Chair, Pima County Board of Supervisors

Date JUL 05 2000

PIMA ASSOCIATION OF GOVERNMENTS

By Ora Mae Harn
Ora Harn, Chair
PAG Regional Council

Date 7-26-2000

ATTEST:

Lori Godoshian
Clerk, Board of Supervisors
Pima County, Arizona

PAG REGIONAL AIR QUALITY PLANNING TECHNICAL ROLES

All PAG regional air quality plans are prepared through a coordinated effort among the Arizona Department of Environmental Quality (ADEQ); Arizona Department of Transportation (ADOT); Pima Association of Governments (PAG), Pima County Department of Environmental Quality (PDEQ); Pima County Department of Transportation (PCDOT); and City of Tucson Department of Transportation (TDOT).

Agency Roles

- ADEQ - technical air quality programs assistance, PM10 SIP development for certain major stationary sources, state-wide air quality monitoring, air quality modeling, regional haze planning and monitoring, air quality research studies, mobile source emissions research and inventory, state-wide emissions inventory, Vehicle Emission Inspection Maintenance Program, State Air Quality Fee Fund administration, adoption and submittal of State Implementation Plans to the Environmental Protection Agency, tracking plan implementation, assurances, determining adequacy and reasonable further progress, and data reporting and archival

- ADOT - State-wide planning, design and construction of federal and state highway network, State Transportation Improvement Program, traffic counts on federal and state highways, vehicle registration data, transportation management systems, and administration of demonstration project grants from the Air Quality Fee Fund for integrated public transportation services and/or improved air quality

- PAG – demographic projections including land use, housing and employment, transportation modeling, air quality modeling, Regional Transportation Plan and Transportation Improvement Program, Mobility Management Plan, coordination with other transportation plans, programs, and transportation management systems, development of air quality nonattainment and maintenance area plans or revisions, conformity determinations, collection and archival of transportation data, transportation and air quality impacts analysis, implementation of Travel Reduction Program, alternate mode promotion through the RideShare program, and facilitation of public participation in these plans and programs

- PDEQ – enforce stationary source emissions controls, permit-based annual emissions inventory, air quality monitoring, air quality modeling, clean air campaign promotions, develop and enforce county air quality rules and regulations, air quality and emissions data reporting and archival, implements air quality permit program, assurances, and tracking plan implementation, prepare revisions to county ordinance for adoption of control measures and emissions limitations

- PCDOT - transportation planning, design and construction in unincorporated Pima County, traffic counting and data archival, coordination of mass transit in unincorporated Pima County, and bicycle/alternate mode planning

- TDOT - transportation planning, design and construction within City of Tucson, traffic counting and data archival, development of Short Range Transit Plan, coordination of mass transit services in City of Tucson, Pima County, City of South Tucson and Oro Valley, development of bicycle and pedestrian networks within City of Tucson.

ATTACHMENT TWO (Information Only)

PAG REGIONAL AIR QUALITY POLICY DEVELOPMENT

REGIONAL COUNCIL

Composition: Elected officials of Pima County, City of Tucson, City of South Tucson, Town of Sahuarita, Town of Oro Valley and Town of Marana; In addition, a member of the Arizona State Transportation Board votes on transportation issues

Responsibilities: Reviews and adopts all air quality plans and programs

Reviews and adopts all regional transportation plans, programs and projects

Reviews and adopts all air quality planning policies for the region

MANAGEMENT COMMITTEE

Composition: Managers of Pima County, City of Tucson, City of South Tucson, Town of Sahuarita, Town of Oro Valley, Town of Marana

Responsibilities: Reviews all air quality plans and programs

Reviews all transportation plans, programs and projects

Recommends air quality policies for the region

ENVIRONMENTAL PLANNING ADVISORY COMMITTEE (EPAC)

Composition: Citizen representatives, public and economic interest groups, and local government agencies.

Responsibilities: Reviews all air quality data, plans and programs

Recommends air quality policy

TRANSPORTATION PLANNING COMMITTEE (TPC)

Composition: Local, state, and federal transportation and planning agencies

Responsibilities: Reviews all transportation plans, programs and projects

EPAC AIR QUALITY SUBCOMMITTEE

Composition: Drawn from EPAC membership and other citizens by appointment from the EPAC chair

Responsibilities: Reviews all air quality data, plans and programs

Suggests air quality policy to EPAC

TRANSPORTATION IMPROVEMENT PROGRAM (TIP) SUBCOMMITTEE

Composition: ADEQ, ADOT, PAG, PDEQ, TAA, PCDOT, TDOT, Marana, Oro Valley, Sahuarita, South Tucson representatives selected by TPC

Responsibilities: Reviews transportation plans, programs and projects

Recommends policy to TPC

ATTACHMENT THREE

AUTHORITIES AND RESPONSIBILITIES FOR IMPLEMENTATION OF PAG REGIONAL AIR QUALITY PLANS

PIMA ASSOCIATION OF GOVERNMENTS (INCLUDING TRANSPORTATION PLANNING DIVISION)

- Implement PAG Travel Reduction Program
- Implement regional RideShare program
- Develop regional air quality plans
- Track transportation control measure (TCM) effectiveness
- Coordinate public participation
- Determine conformity of transportation plans and programs to State and federal air quality implementation plans
- Develop regional transportation plans and programs
- Allocate federal program funds for transportation and air quality projects and programs
- Maintain TRANPLAN model of transportation network
- Prepare demographic projections including land use, housing and employment
- Maintain traffic volumes database
- Perform air quality modeling

PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY

- Monitor ambient air quality and meteorology
- Maintain permit-based source control database
- Issue and enforce stationary source controls and delegated portable source controls
- Enforce open burning controls
- Implement Clean Air campaign (no drive days program)
- Implement applicable air quality ordinances
- Lead agency for Travel Reduction Ordinance (TRO) plan review and approval in unincorporated Pima County
- Recommend enforcement action under TRO to County Attorney
- Evaluate air quality impacts of regional transportation plans and programs
- Perform air quality modeling
- Administer vehicle repair and retrofit program
- Implement local control measures under State Exceptional and Natural Events Policy

PIMA COUNTY ATTORNEY'S OFFICE

- Enforce Pima County Travel Reduction Ordinance
- Enforce air quality ordinances

PIMA COUNTY DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT

- Plan, develop and manage Pima County roadway system
- Implement mass transit planning and policy development in unincorporated Pima County

PIMA COUNTY DEPARTMENT OF PLANNING AND DEVELOPMENT SERVICES

- Implement planning and zoning in unincorporated Pima County

CITY OF TUCSON ATTORNEY'S OFFICE

- Enforce City of Tucson Travel Reduction Ordinance
- Enforce air quality ordinances

CITY OF TUCSON DEPARTMENT OF TRANSPORTATION

- Plan, develop and manage City of Tucson roadway system
- Implement mass transit planning and policy development
- Lead agency for Travel Reduction Ordinance(TRO) plan review and approval within the City of Tucson
- Recommend enforcement action under TRO to City Attorney

CITY OF TUCSON PLANNING DEPARTMENT

- Implement planning and zoning in the City of Tucson

CITY OF SOUTH TUCSON PLANNING AND ZONING DEPARTMENT

- Lead agency for Travel Reduction Ordinance plan review and approval within the City of South Tucson
- Recommends enforcement of TRO to Counsel for City of South Tucson

COUNSEL FOR SOUTH TUCSON

- Enforce City of South Tucson Travel Reduction Code

TOWN MANAGER OF SAHUARITA

- Lead agency for Travel Reduction Ordinance plan review and approval within the Town of Sahuarita

TOWN MANAGER OF ORO VALLEY

- Lead agency for Travel Reduction Ordinance plan review and approval within the Town of Oro Valley

- Recommends enforcement of TRO to Attorney for Town of Oro Valley

ATTORNEY FOR TOWN OF ORO VALLEY

- Enforce Town of Oro Valley Travel Reduction Code

TOWN MANAGER OF MARANA

- Lead agency for Travel Reduction Ordinance plan review and approval
- Recommend enforcement of TRO to Attorney for Town of Marana

ATTORNEY FOR TOWN OF MARANA

- Enforce Town of Marana Travel Reduction Code

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

- Regulate certain major stationary sources
- Issue and enforce certain stationary source controls and portable source controls
- Enforce State air quality statutes and rules
- Maintain State Implementation Plan
- Implement Statewide air quality programs
- Continue mobile source emissions research
- Implement State Air Quality Fund programs
- Perform air quality modeling
- Develop State Exceptional and Natural Events Policy and supporting technical documentation

ARIZONA DEPARTMENT OF TRANSPORTATION

- Plan, develop and manage State and Interstate transportation system
- Provide current vehicle registration data for air quality modeling

ARIZONA DEPARTMENT OF WEIGHTS AND MEASURES

- Implement oxygenated fuels program (October through March)
- Implement other fuel-related control measures as directed (RFG, RVP limit, etc.)

Appendix D

Letter from Arizona Department of Environmental Quality re: Vehicle Emissions Inspection Program

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Stephen A. Owens
Director

March 10, 2008

Ms. Deborah Jordan, Director
Air Division
U.S. Environmental Protection Agency, Region IX, Air-4
75 Hawthorne Street
San Francisco, California 94105

SUBJECT: Vehicle Emissions Inspection Program

Dear Ms. Jordan:

The purpose of this letter is to give a brief overview of the recent legislative changes to Arizona's Vehicle Emissions Inspection Program (VEIP) and explain why the State is prohibited from taking further action to extend the Program at this time.

The VEIP is an integral component of Arizona's State Implementation Plans for the Phoenix carbon monoxide (CO) maintenance area and PM10 nonattainment area and the Tucson CO maintenance area. Continuation of the Program is essential to achieve attainment status for Phoenix and continuation of attainment of the CO national ambient air quality standard for Phoenix and Tucson.

The VEIP precedes the formation of ADEQ, and has been in place since 1976. The VEIP has consistently received support for necessary program updates from the Legislature. In 2007, the Arizona Legislature approved SB 1531, which authorized the VEIP through January 1, 2017, and subjecting the Program to the state agency sunset provisions (see Enclosure 1, Arizona Revised States § 41-2951, et seq.), rather than a simple repeal.

Though a sunset date for VEIP does exist, the Arizona Department of Environmental Quality maintains that the Arizona Legislature's practice of approving VEIP legislation, when necessary to support the SIP, has established a sufficient precedent to enable EPA to move forward in approving the appropriate SIP revisions for the Phoenix and Tucson areas. If you have any questions, please call me at (602) 771-2308.

Sincerely,

Nancy C. Wrona, Director
Air Quality Division

cc: Lindy Bauer, MAG
Lee Comrie, PAG
Colleen McKaughan, EPA

Northern Regional Office
1801 W. Route 66 • Suite 117 • Flagstaff, AZ 86001
(928) 779-0313

Southern Regional Office
400 West Congress Street • Suite 433 • Tucson, AZ 85701
(520) 628-6733

Printed on recycled paper

Appendix E

PAG's Air Quality Report 2007 National, State and Tucson Region Trends

PIMA ASSOCIATION OF GOVERNMENTS

REGIONAL COUNCIL

Chair

Ed Honea
Mayor
Town of Marana

Vice Chair

Ramon Valadez
Supervisor
Pima County

Treasurer

Herminia Frias
Chair
Pascua Yaqui Tribe

Member

Lynne Skelton
Mayor
Town of Sahuarita

Member

Paul Loomis
Mayor
Town of Oro Valley

Member

Jennifer Eckstrom
Mayor
City of South Tucson

Member

Robert Walkup
Mayor
City of Tucson

Member

Ned Norris, Jr.
Chairman
Tohono O'odham Nation

Member

S. L. Schorr
Arizona State
Transportation Board
Representative

MANAGEMENT COMMITTEE

Dale Buskirk, Director, Arizona Department of Transportation
Enrique Serna, City Manager, City of South Tucson
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September 2007

TABLE OF CONTENTS

LIST OF FIGURES **2**

LIST OF TABLES **3**

ACKNOWLEDGEMENTS **4**

EXECUTIVE SUMMARY **5**

1. BACKGROUND **6**

2. STANDARDS AND REGIONAL MONITORING INFORMATION **7**

3. POPULATION PROJECTIONS AND POLLUTANT EMISSIONS **9**

National *9*
State and Tucson Region *9*

4. MAJOR POLLUTANTS IN EASTERN PIMA COUNTY **11**

CARBON MONOXIDE ***11***
National *11*
State *12*
Tucson Region *13*
PARTICULATE MATTER ***18***
PM COARSE (PM_{10}) *18*
National *18*
State *19*
Tucson Region *20*
PM FINE ($PM_{2.5}$) *22*
National *22*
State *23*
Tucson Region *23*
OZONE ***25***
National *25*
State *26*
Tucson Region *27*

5. REGIONAL HAZE **33**

National *33*
Western Region *34*
State and Tucson Region *34*

6. GREENHOUSE GASES **37**

National *38*
State *40*
Tucson Region *42*

7. MOBILE SOURCE EMISSIONS REDUCTIONS **44**

National *44*
State *45*
Tucson Region *46*

8. CONCLUSIONS **59**

9. LIST OF ACRONYMS **61**

10. CITATIONS **63**

APPENDIX A: EMISSION ANALYSIS **66**

APPENDIX B: CAL3QHC MODELING DETAILS **68**

LIST OF FIGURES

Figure 2.1 PDEQ Air Quality Monitors in the Tucson Air Planning Area 8

Figure 3.1 Actual & Estimated U.S. Population and Total Criteria Pollutant Emissions: 1990-2030 9

Figure 3.2 Actual & Estimated Pima County Population and Total Criteria Pollutant Emissions: 1990-2030 10

Figure 4.1 U.S. Emissions of Carbon Monoxide: 1970-2005 12

Figure 4.2 U.S. Carbon Monoxide Concentrations: 1980-2006 12

Figure 4.3 Sources of Carbon Monoxide Emissions in eastern Pima County, 2005 13

Figure 4.4 Eastern Pima County Carbon Monoxide Concentrations: 1973-2005 14

Figure 4.5 Average Vehicle Traffic and Average Carbon Monoxide Concentrations near 22nd and Alvernon Intersection, March 28, 2006 14

Figure 4.6 U.S. PM_{10} Emissions: 1970-2005 19

Figure 4.7 U.S. PM_{10} Concentration Trends: 1990-2006 19

Figure 4.8 Sources of PM_{10} Emissions in eastern Pima County, 2005 20

Figure 4.9 Eastern Pima County PM_{10} Concentrations: 1991-2005 21

Figure 4.10 U.S. $PM_{2.5}$ Emissions: 1990-2006 22

Figure 4.11 U.S. $PM_{2.5}$ Concentrations: 1999-2005 23

Figure 4.12 Eastern Pima County $PM_{2.5}$ Concentration: 1994-2005 24

Figure 4.13 U.S. Emissions of the Ozone Precursors: 1970-2005 25

Figure 4.14 U.S. Ozone Concentrations: 1980-2006 26

Figure 4.15 Sources of Ozone Precursors Emissions in eastern Pima County, 2005 27

Figure 4.16 Eastern Pima County Ozone Concentrations: 1982-2005 28

Figure 4.17 Map of Annual Anthropogenic NO_x Emissions for the Tucson Region 32

Figure 4.18 Map of Annual Anthropogenic VOC Emissions for the Tucson Region 32

Figure 5.1 Light Extinction Trends for Phoenix: 1996-2005 35

Figure 5.2 Light Extinction Trends for Tucson: 1996-2005 36

Figure 6.1 Composition of U.S. Greenhouse Gas Emissions, 2005 39

Figure 6.2 U.S. Greenhouse Gas Emissions: 1990 vs. 2005 39

Figure 6.3 Arizona Greenhouse Gas Emissions by Sector, 2000 40

Figure 6.4 Actual and Projected Greenhouse Gas Emissions - Arizona 2000 vs. 2020 41

Figure 6.5 Tucson Greenhouse Gas Emissions by Sector, 1995 42

Figure 7.1 Annual Total Pollutant Emission Map for eastern Pima County, 2000 47

Figure 7.2 Projected Total Pollutant Emission Map for eastern Pima County, 2030 48

Figure 7.3 Number of Clean Fuel Vehicles in eastern Pima County: 2002-2005 52

Figure 7.4 Annual Percentages of Alternate Mode Usage and One-Way Weekly Vehicle Miles Traveled 55

LIST OF TABLES

Table 2.1 EPA's National Ambient Air Quality Standards (NAAQS) 7

Table 4.1 8-Hour Carbon Monoxide Monitored Concentrations (ppm) for Hot- Spot Intersections 16

Table 4.2 Highest ADT and Worst LOS Intersections, 2006 17

Table 4.3 Modeled 8-Hour Carbon Monoxide Concentrations (ppm) for Hot-Spot Intersections, 2006 17

Table 4.4 Monthly Ozone Sensitivities using MAPPER 30

Table 5.1 Composition of Pollutants Impacting Visibility in the Eastern and Western U.S. 34

Table 7.1 Actual & Estimated VMT and Mobile Emissions: 2000 and 2030 in eastern Pima County 46

Table 7.2 Pollutant Annual Average Emission Factors (Combined CO, NO_x, VOC, PM_{10} 49

Table 7.3 Modeled CO, NO_x, VOC, and PM_{10} Savings per Day due to State Vehicle Emissions Inspection and Oxyfuel Programs 50

Table 7.4 Annual TRP Survey Results 54

Table 7.5 2005 TRP Savings from Alternate Mode Usage 55

ACKNOWLEDGEMENTS

The following individuals contributed to the production of this report and their efforts are greatly appreciated. We extend a special note of thanks to the Pima County Department of Environmental Quality for their contributions.

Pima Association of Governments:

Lee Comrie
Susanne Cotty
Dennis Dickerson
Philip Cyr
Paul Casertano
Tom Cooney
Rich Corbett
Colleen Crowninshield
Rita Hildebrand
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Manny Rosas
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Pima County Department of Environmental Quality

Wayne Byrd
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City of Tucson

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SunTran
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EXECUTIVE SUMMARY

The Air Quality Planning program of Pima Association of Governments (PAG) addresses regional air quality issues and provides information to its jurisdictions. PAG strives to understand the primary causes of air pollution. This report provides information on air quality trends in Pima County and compares those with national and state trends. This report represents an expansion of the annual Carbon Monoxide (CO) Progress Report, which is required by the CO Limited Maintenance Plan.

The U.S. Clean Air Act has resulted in major improvements in air quality across the nation. Over the past 35 years, there has been a steady decline in emissions of the six criteria pollutants at the national, state and county levels. These declines occurred despite the fact that population has increased and more miles are being driven each year. Most of these improvements can be attributed to the implementation of stationary source controls, regulation of motor vehicle tailpipe emissions and cleaner burning fuels.

In general, ambient air pollutant concentrations also have decreased nationwide and many Americans are able to breathe healthier air. In Arizona and Pima County, concentrations are generally below the U.S. Environmental Protection Agency (EPA) health standards; however, three criteria pollutants remain a concern in the Tucson region: carbon monoxide, ozone and particulate matter. While carbon monoxide levels no longer exceed the EPA health standard, the region remains under a Limited Maintenance Plan for this pollutant, with specific control measures in place. Ozone levels are currently near 90 percent of the health standard, and this standard is currently under review by EPA. With respect to particulate matter, the region experienced a violation of the health standard in 1999, and a Natural Events Action Plan is in place.

This report highlights three pollutants (carbon monoxide, ozone and particulate matter), detailing emissions, trends and pollutant levels. Additionally, the related air quality issues of regional haze and greenhouse gases are discussed. Mobile sources of air pollutants are the primary focus of this report since they are the major contributor to air pollution in the Tucson region. Stationary sources, such as power plants and mining operations, also contribute to total emissions and are regulated by federal, state and local agencies. The report concludes with a section on mobile source emissions reductions, an analysis of select control measures, and details on other local control strategies currently are in use.

1. BACKGROUND

Pima Association of Governments (PAG) is the designated air quality planning agency for eastern Pima County and addresses regional air quality issues in keeping with federal, state and local requirements. Part of the Air Quality Planning Program's role is to improve our understanding of pollutant emissions in the Tucson region. PAG partners with Pima Department of Environmental Quality (PDEQ) to address this regional role. Separately, PDEQ implements the air quality monitoring program and is the regulatory agency responsible for permitting pollutant sources in Pima County.

In the1970s and early 1980s, the Tucson area frequently violated the carbon monoxide health standard. This resulted in the Environmental Protection Agency (EPA) designating the area as nonattainment. Largely due to stricter tailpipe emission standards, carbon monoxide levels decreased significantly. In 2000, EPA redesignated the Tucson region as an attainment area for carbon monoxide and approved a Limited Maintenance Plan to control that pollutant. Continuation of attainment status relies on PDEQ air monitoring data and PAG air quality modeling analyses to determine if and when emissions control measures should be added or removed.

As part of the Limited Maintenance Plan, PAG is required to produce an annual progress report to document monitoring and analysis of control strategies being undertaken to reduce carbon monoxide levels. Historically, this report has focused only on carbon monoxide and its major source, vehicle tailpipe emissions. However, this year, the report is expanded to include information on ozone and particulate matter. In addition to these criteria pollutants, data are presented on regional haze and greenhouse gases at the national, state and local level. The Tucson area's rapid increase in population, accompanied by increased vehicular traffic, also contributes to greenhouse gas emissions and visibility impairment.

This report includes national and statewide air quality trends, but emphasizes Pima County and local data where possible. The inclusion of multiple pollutants in this report is intended to present a comprehensive overview of emerging trends in the Tucson region. As in previous progress reports, the emphasis continues to be on mobile sources, as they are responsible for the majority of air pollution in the Tucson region. The last chapter contains mobile source emission reduction strategies, an analysis of select measures for the Tucson region, and details on other local measures in place.

2. STANDARDS AND REGIONAL MONITORING INFORMATION

Pursuant to the federal Clean Air Act (CAA), the EPA has established standards for six common air pollutants: CO, lead (Pb), nitrogen dioxide (NO_2), ozone, sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$). National Ambient Air Quality Standards (NAAQS) establish limits to protect public health and welfare. Primary standards are established to protect public health, including sensitive populations (children, elderly, and asthmatics). Secondary standards provide protection for public welfare, including protection against visibility impairment, damage to animals, vegetation, and buildings. The CAA requires periodic review of the standards and the most recent modification occurred in 2006. Table 2.1 reflects the current regulatory levels for the various pollutants.

Table 2.1. EPA's National Ambient Air Quality Standards (NAAQS)

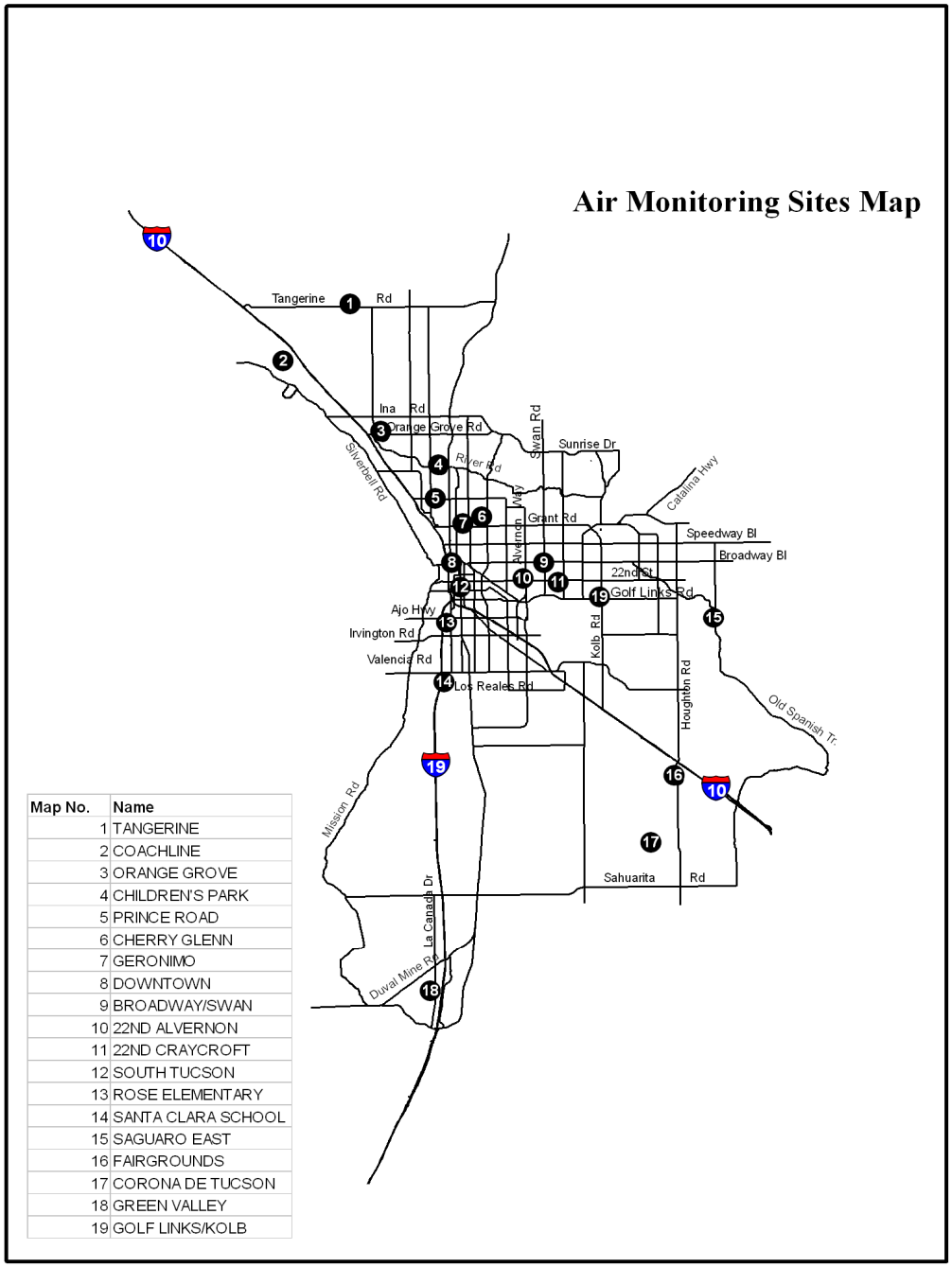
Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm	8-hour [1]	None
	35 ppm	1-hour[1]	None
Lead	105 µg/m^3	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	Revoked [2]	Annual [2] (Arith. Mean)	
	150 µg/m^3	24-hour[3]	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual [4] (Arith. Mean)	Same as Primary
	35 µg/m^3	24-hour [5]	
Ozone	0.08 ppm	8-hour [6]	Same as Primary
	0.12 ppm	1-hour [7] (Applies only in limited areas)	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-----
	0.14 ppm	24-hour [1]	-----
		3-hour [1]	0.5 ppm

Source: National Ambient Air Quality Standards (Dec. 2006)

[1] Not to be exceeded more than once per year.
[2] Due to lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective Dec. 7, 2006).
[3] Not to be exceeded more than once per year on average over three years.
[4] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentration from a single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.
[5] To attain this standard, the 3-year average of the 98th percentile of the 24-hour concentrations at each population-orientated monitor within an area must not exceed 35 µg/m^3 (effective Dec. 17, 2006).
[6] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
[7] (a)The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.
(b) As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas except fourteen 1-hour ozone nonattainment areas.

To insure that federal limits are not exceeded, ADEQ and PDEQ place air quality monitors around the state and county, respectively, to monitor the levels of the various pollutants. ADEQ has monitors throughout the state and in Mexico while PDEQ has 19 monitors in

the metropolitan Tucson area (Figure 2.1). Various pollutants are monitored at each location. For specific monitoring data: www.airinfonow.com/monsites/map_site.asp



Map No.	Name
1	TANGERINE
2	COACHLINE
3	ORANGE GROVE
4	CHILDREN'S PARK
5	PRINCE ROAD
6	CHERRY GLENN
7	GERONIMO
8	DOWNTOWN
9	BROADWAY/SWAN
10	22ND ALVERNON
11	22ND CRAYCROFT
12	SOUTH TUCSON
13	ROSE ELEMENTARY
14	SANTA CLARA SCHOOL
15	SAGUARO EAST
16	FAIRGROUNDS
17	CORONA DE TUCSON
18	GREEN VALLEY
19	GOLF LINKS/KOLB

Figure 2.1. PDEQ Air Quality Monitors in the Tucson Air Planning Area

Source: PAG, 2006

3. POPULATION PROJECTIONS AND POLLUTANT EMISSIONS

Increasing population and decreasing pollutant emissions are evident at the national, state and county levels. These emission reductions can be attributed to federal regulatory controls on vehicle emissions, and utility and industrial source reductions.

National

The U.S. population grew at an average rate of 1 percent per year from 1990-2005. According to the U.S. census data, the nation's population is projected to grow by 46 percent from 1990-2030. Recent trends in air pollutant emissions, however, show a 35 percent decline (Figure 3.1) (USEPA, 2006a).

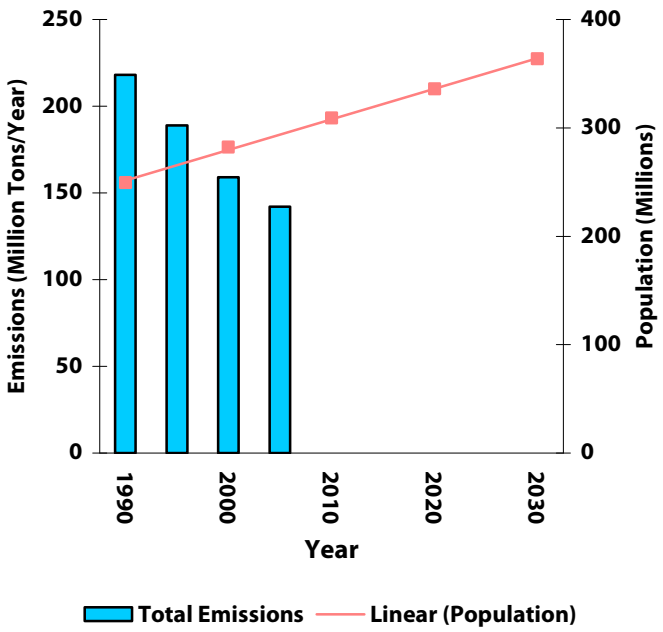


Figure 3.1. Actual and Estimated U.S. Population and Total Criteria Pollutant Emissions: 1990-2030

Source: Population: U.S. Census Bureau 2000, 2004; Emissions: USEPA, 2006a

State and Tucson Region

Arizona is currently one of the fastest growing states in the nation. Arizona's population has increased by an average rate of 3.3 percent per year over the past 15 years (ADES, 2006) and from 1990-2030, is projected to grow to over 10 million. In spite of this trend, state criteria pollutant emissions have declined, showing a 28 percent decrease from 1990-2001 (USEPA, 2005).

Pima County's population also has grown over the past 15 years, averaging over a 2.4 percent growth per year (ADES, 2006). Projections indicate a doubling of the population from 1990-2030 to 1.4 million people (ADES, 2006). Recent trends, from 1990-2001, indicate a 17 percent drop in air pollutant emissions (Figure 3.2) (USEPA, 2005).

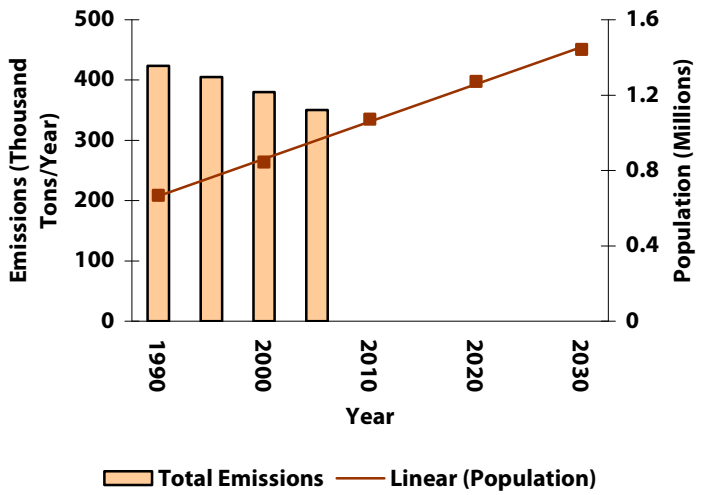


Figure 3.2. Actual and Estimated Pima County Population and Total Criteria Pollutant Emissions: 1990-2030

Source: Population: U.S. Census. 2000; AZDES, 2006; Emissions: USEPA, 2005

4. MAJOR POLLUTANTS IN EASTERN PIMA COUNTY

Mobile sources remain the largest emission source in the Tucson region. Locally we are driving more miles, yet air pollutant levels remain generally healthful. Carbon monoxide levels remain low largely due to cleaner vehicles and fuels. Levels of coarse and fine particles (PM_{10} and $PM_{2.5}$) have increased slightly from last year, but remain below the health standard. Ozone levels continue to be measured at close to 90 percent of the EPA health standard – as they have for the last decade.

The following chapter presents information on the major pollutants of concern: carbon monoxide, ozone and particulate matter. Details on trends for both pollutant emission sources and concentrations are provided at the national, state and local levels.

CARBON MONOXIDE

Carbon monoxide (CO) is an odorless, poisonous gas that results from the incomplete combustion of fossil fuels. This occurs when carbon or substances that contain carbon, such as gasoline, wood, or coal are not burned completely.

CO replaces oxygen in the blood and can affect the cardiovascular and nervous systems. It enters the blood via the lungs and permanently binds to hemoglobin (the iron-containing protein in red blood cells). CO prevents hemoglobin from carrying oxygen needed to sustain life. Lower concentrations of CO have been shown to affect people with heart disease, can cause dizziness, headaches and fatigue, and in high concentrations, even death.

Emissions primarily occur from on-road and nonroad vehicle exhausts (automobiles, buses, trucks, airplane, trains, construction equipment, lawn machinery) and some industrial processes. CO is normally found in its highest concentrations along the roadside, especially where there is heavy traffic. Other areas where high CO levels can occur include parking garages and poorly ventilated tunnels.

National

Nationwide, there has been a substantial reduction in CO emissions (Figure 4.1). This decline can be attributed to tougher restrictions on vehicle emissions, including stricter tailpipe emissions, increased use of new technology, vehicle testing, use of oxygenated fuels, and stricter regulation of industrial facilities.

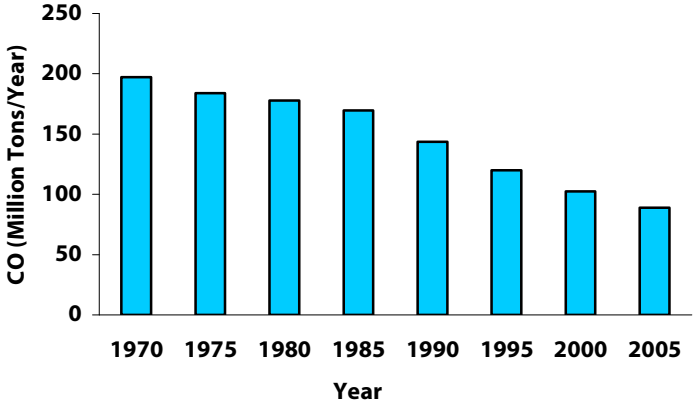


Figure 4.1. U.S. Emissions of Carbon Monoxide: 1970-2005

Source: USEPA, 2006a

EPA has developed ambient air quality trends for CO using a nationwide network of monitoring sites. From 1980-2006 the national average of CO concentrations dropped 74 percent (Figure 4.2).

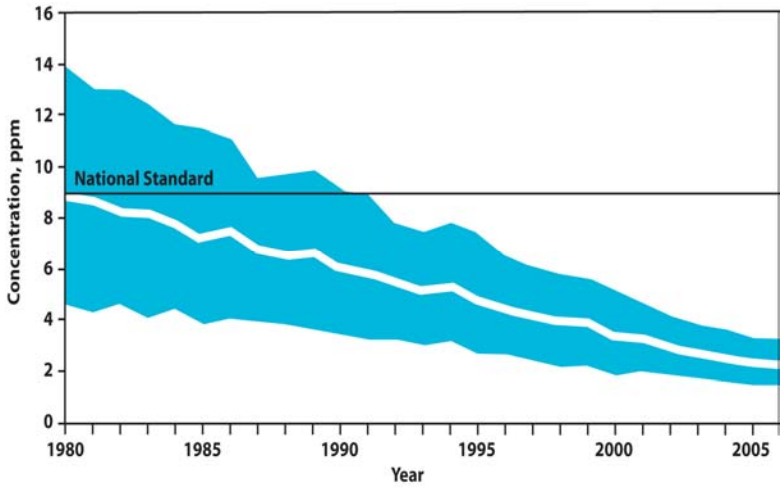


Figure 4.2. U.S. Carbon Monoxide Concentrations: 1980-2006
Based on annual 2nd maximum 8-hour average; data from 144 sites nationwide

Source: Adapted from USEPA, 2007b

State

National vehicle emission standards, use of oxygenated fuels, and the vehicle inspection program all have contributed to the state's declining CO emissions. From 1990-2001, Arizona's CO emissions decreased by 33 percent (USEPA, 2005). However, the state's major source of CO emissions continues to be motor vehicle emissions. In the metropolitan areas of the state, approximately 51 percent of CO emissions result from on-road motor vehicles; 45 percent originate from nonroad sources, off-road vehicles, construction, lawn and garden equipment and the remaining 4 percent from point and area sources (ADEQ, 2006).

Similar to national trends, the state's CO concentrations have declined dramatically since the mid 1970s. From 1981-1986, the Phoenix area exceeded national standards over 100 times each year, with the last exeedance in 1999. As is the case nationally, this improvement is largely due to new vehicle emission standards, the vehicle inspection and maintenance program and the use of oxygenated fuels during the winter months. Over the 2004-2005 time period, there were no violations of the CO standards in Maricopa, Pima, and Pinal counties (ADEQ, 2006).

Tucson Region

The declining CO emissions evident nationally and in Arizona are also apparent in Pima County. From 1990-2001, county CO emissions decreased by 20 percent (USEPA, 2005). As in the state, on-road vehicle emissions generate most of the CO emissions (56 percent). Nonroad vehicle emissions contribute 40 percent; area and point sources contribute 4 percent (Figure 4.3) (adapted from Causley, et al, 2001).

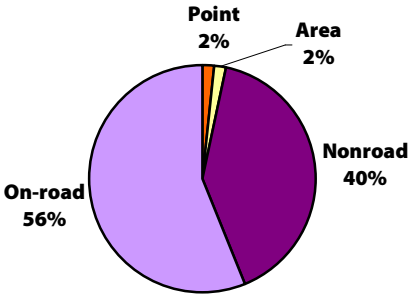


Figure 4.3. Sources of Carbon Monoxide Emissions in eastern Pima County, 2005

Source: Adapted from Causley, et al, 2001

Over the past 33 years, CO concentrations in Pima County have followed the downward trend evident in the U.S. and statewide (Figure 4.4). Although the CO standards were violated frequently in the region during the 1970s, there have been no violations of the CO standard since 1984. CO levels are currently around 25 percent of the EPA health standard. Therefore, CO is not considered a health threat in our region. Once again, technological advances leading to implementation of lower tailpipe emission standards for new cars, state vehicle inspection and maintenance programs, and use of oxygenated fuels during the winter months are responsible for these declines. Local programs which promote alternate travel modes, such as the RideShare Program, Travel Reduction Program, and the Pima County Clean Air Program, aid in reducing congestion and thus CO levels.

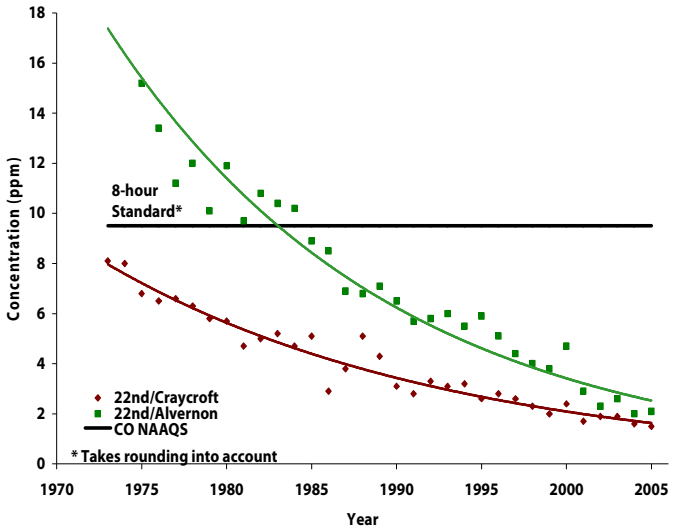


Figure 4.4. Eastern Pima County Carbon Monoxide Concentrations: 1973-2005
2nd maximum 8-hour average CO concentration

Source: PDEQ, 2006a, 2006b

CO concentrations tend to be highest in winter, when temperatures are cool, wind speeds are low, and a temperature inversion is present. This occurs when a stable atmospheric layer restricts the mixing of pollutants.

There is a strong correlation between peak traffic patterns and high CO concentrations. Figure 4.5 Illustrates hourly traffic patterns and CO levels over a 24-hour period near 22nd and Alvernon during a winter day in 2006. CO levels increase with rush hour traffic and congestion, and decrease with increased mixing of air during the day. Elevated CO concentrations are seen in the evening hours with less mixing, a more stable air mass and the possible onset of a temperature inversion.

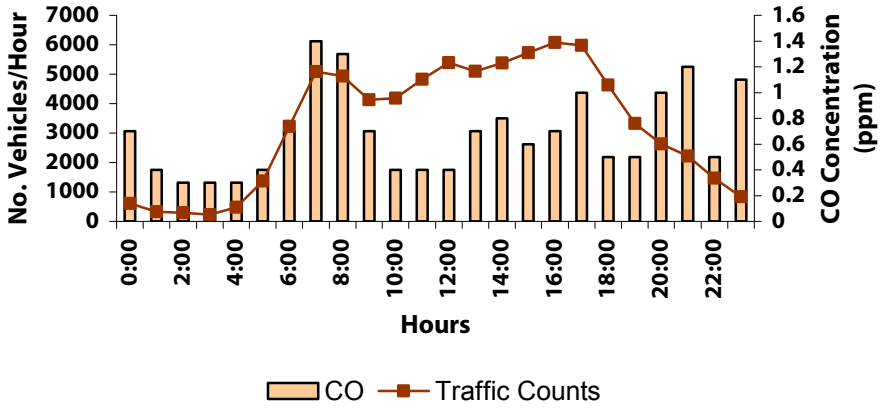


Figure 4.5. Average Vehicle Traffic and Average Carbon Monoxide Concentrations near 22nd and Alvernon Intersection - March 28, 2006

Source: CO Concentrations: PDEQ Air Info Now, 2006. Traffic Data: PAG, 2006

Pima County CO Monitoring Activities

A. Microscale Monitoring:

Two permanent microscale[1] monitors are located in the Tucson region. The first microscale monitor is located at 22nd Street/Alvernon and monitoring began in 1975. Data from this monitor provide a historical record and show how the Tucson region has reduced its CO levels over time. For the 2006-2007 CO season this site recorded lower CO readings than the previous year.

The second microscale monitor is sited at the southeast corner of Golf Links/Kolb and monitoring began in September 2002 to fulfill the CO LMP monitoring requirements. This microscale monitor continues to operate from October through April of each year.

B. Mobile Monitoring for the Limited Maintenance Plan:

PDEQ performed mobile monitoring at hot-spot intersections in the Tucson area. The monitoring was done with a mobile CO monitor at three different locations with monitoring sites selected by identifying intersections with the highest volume and worst congestion.

Highlights from the 2006-07 PDEQ CO Monitoring Report regarding mobile monitoring results are extracted here (PDEQ, 2007):

C. Microscale and Mobile Monitoring Comparisons:

Eight-hour rolling averages were determined for the mobile units during their respective sampling periods and the concurrent periods at the 22nd Street/Alvernon and Golf Links/Kolb, as well as for each of the sites monitored by the mobile units. The results are displayed in Table 4.1. This allows for a closer comparison between the hot-spot mobile sites and the PDEQ historical microscale CO sites. The highest reading recorded at Golf Links/Kolb was less than one-fifth of the standard (the NAAQS level for an 8-hour average is 9 ppm). These low readings strongly indicate that Tucson is not likely to exceed the CO standard in the future.

Speedway/Swan vs. 22nd/Alvernon
Monitoring data from this intersection tracked the current 22nd Street/Alvernon site very closely. The spikes which were higher than the 22nd Street/Alvernon site could indicate a higher level of congestion developing at the Speedway/Swan site.

Broadway/Kolb vs. 22nd/Alvernon
Data analysis recovered from the monitor indicates that concentrations at the Broadway/Kolb site tracked CO measurements at the 22nd Street/Alvernon site very closely. This indicates that the traffic patterns are very similar across the larger Tucson metro area.

[1] *Air quality measurements used to represent distributions near major roadways, in particular for carbon monoxide.*

Table 4.1. 8-Hour Carbon Monoxide PDEQ Monitored Concentrations (ppm) for Hot-Spot Intersections 2006-2007 CO Season

Site	8-hour max	8-hour 2nd high	Concurrent readings at 22nd St/Alvernon 8-hour max	Concurrent readings at Golf Links/Kolb 8-hour max
Speedway/Swan	1.6	1.3	2.1	1.3
Orange Grove/ Oracle	1.0	0.9	1.1	1.3
Broadway/Kolb	1.6	1.4	2.0	1.7
22nd St./Alvernon for entire sampling period	2.1	2.0		
Golf Links/Kolb for entire sampling period	1.7	1.7		

Source: PDEQ, 2007

Orange Grove/Oracle vs. 22nd/Alvernon
The analysis of the monitoring data indicated that the levels at Orange Grove/Oracle tracked 22ndStreet/Alvernon very well, showing very similar traffic patterns.

D. Modeling of Carbon Monoxide Hot-Spot Intersections

PAG conducts microscale CO modeling analyses as required by the LMP, using CAL3QHC Version 2. This model is used as a screening tool to highlight the levels of ambient CO concentrations that could be produced in those areas most susceptible to CO violations. Intersections are chosen based on their average daily traffic (ADT) and level of service (LOS), as well as for comparison with the intersections where microscale monitoring data are collected. Details of model parameters can be found in Appendix B.

Intersection Analyses
PAG Technical Services staff prepared a list of the intersections with the highest ADT and the worst LOS for 2006 based on traffic counts and travel demand modeling analyses. PAG Air Quality Planning staff selected the three highest ADT and the three worst LOS intersections as candidates for CAL3QHC microscale modeling. The intersections that qualified for hot-spot modeling are shown in Table 4.2

Table 4.2. Highest ADT and Worst LOS Intersections, 2006

Rank	Highest ADT	Worst LOS
#1	Ina/Oracle	Ina/Oracle
#2	Broadway/Kolb	Tanque Verde/Grant/Kolb
#3	Speedway/Campbell	Valencia/Kolb

Source: PAG Regional Planning, 2006

From the intersections selected for turning movement counts, the highest ADT and the worst LOS occurred at the Ina/Oracle intersection. The ADT was 104,832 vehicles and highest average delay per vehicle was 123 seconds (LOS 'F') during afternoon peak hour traffic (4:30 p.m. to 5:30 p.m.).

In addition, 22nd Street/Alvernon and Golf Links/Kolb were modeled. Both intersections have a CO microscale monitor and are modeled for historical purposes and for comparison to monitored values. Table 4.3 shows the modeling results for the 8-hour CO concentrations for the worst LOS, the highest ADT intersections, and the permanent microscale locations.

Table 4.3. Modeled 8-Hour Carbon Monoxide Concentrations (ppm) for Hot-Spot Intersections, 2006

Intersections	8-Hour Average Concentration (ppm) (background of 0.50 ppm, persistence factor of 0.56)
Tanque Verde/Grant/Kolb	3.2
Speedway/Swan	3.1
Golf Links/Kolb*	2.8
Broadway/Kolb	2.7
Ina/Oracle	2.6
22nd/Alvernon*	2.5
Orange Grove/Oracle	2.3
Valencia/Kolb	2.2

* PDEQ Microscale Monitors

Source: PAG modeling, 2006

PARTICULATE MATTER

Particulate matter (PM) is composed of small solid particles or liquid droplets from smoke, dust, fly ash and condensing vapors and can be suspended in the air for long periods of time. Particles can be directly emitted (primary), or can be formed when emissions of oxides of nitrogen (NO_x), sulfur oxides (SO_x), ammonia, organic compounds, and other gases react in the atmosphere (secondary).

Particulate matter is classified into two groups depending on particle size. PM coarse (PM_{10}) contains particles less than or equal to 10 micrometers in diameter while PM fine ($PM_{2.5}$) consists of particles measuring less than or equal to 2.5 micrometers in diameter. Generally, coarse PM is composed largely of primary particles and fine PM is composed mostly of secondary particles.

These microscopic particles can affect breathing and respiration, cause lung damage and possibly cause premature death with children, the elderly, and people suffering from heart or lung disease at greater risk. The larger particles, PM coarse, are mostly deposited in the nasal passages, while the very small particles can penetrate and be deposited deep in the lung sacs and membranes. Particulate matter can alter the body's defense systems and cause cancer. In addition to health concerns, particulate matter can damage paint, enhance metal corrosion, and soil buildings and clothing. Suspended particulates also reduce visibility (see regional haze section).

Fine particulate matter or $PM_{2.5}$ travels deeper into the lungs and can be more harmful than PM_{10}. It also can contain toxic substances such as metals and organic compounds. Many health studies have correlated increased exposure to $PM_{2.5}$ with increases in premature death as well as a range of serious respiratory and cardiovascular effects. Fine PM also can contain toxic substances such as metals and organic compounds. Many health studies have correlated increased exposure to $PM_{2.5}$ with increases in premature death as well as a range of serious respiratory and cardiovascular effects.

PM COARSE (PM_{10})

Coarse particulate matter (PM_{10}) can be generated from sources such as paved and unpaved road travel, woodsmoke, burning fuels, fugitive dust from earth moving, mining, construction, and agricultural activities and from vacant lots.

National

Over the past 35 years, there has been an 84 percent reduction in national PM_{10} emissions (Figure 4.6). Contributing to this trend is increased regulation of vehicle emissions and stricter controls on utility and industrial operations (USEPA, 2006a).

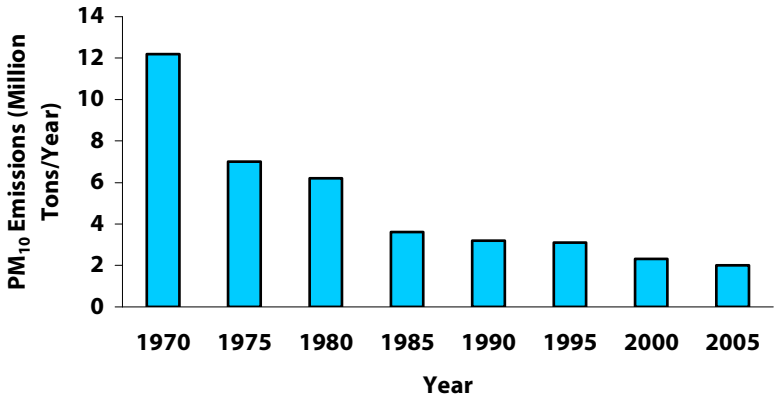


Figure 4.6. U.S. PM_{10} Emissions: 1970-2005

Source: USEPA, 2006a

Before 1988, particulate matter was measured as total suspended particulates. In 1987, there was a revision in the federal health standard for particulates, and the emphasis was changed to PM_{10}.

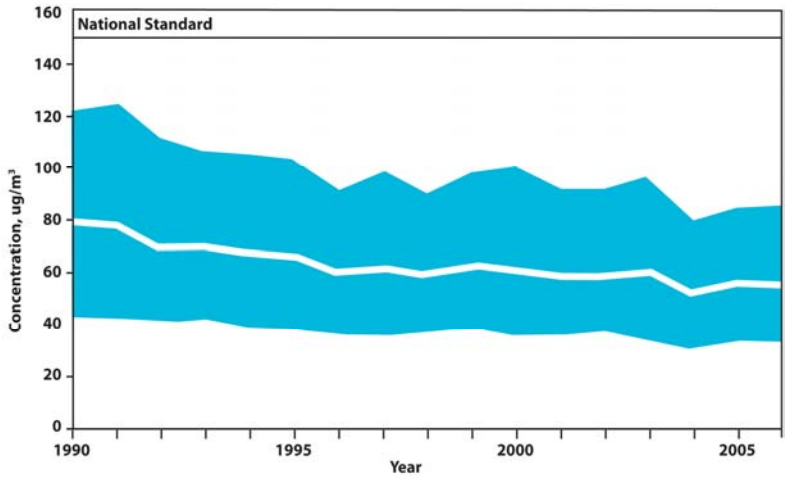


Figure 4.7. U.S. PM_{10} Concentration Trends: 1990-2006
Values based on seasonally weighted average; trend based on 391 sites

Source: USEPA, 2007b

Nationally, PM_{10} concentrations have been well below the NAAQS standards for the past 16 years and show a 30 percent reduction over this period (Figure 4.7) (USEPA, 2007b).

State

Declining Arizona PM_{10} emissions follow the national trend. From 1990-2001, state PM_{10} emissions have decreased by 13 percent (USEPA, 2005). Coarse particulate concentrations also have decreased in both urban and rural settings but standards are periodically violated, and can result from high wind events, and combinations of agricultural and earthmoving activities, road construction and vehicular traffic. ADEQ monitors PM_{10} in all

15 Arizona counties and Mexico. From 2003-2005, Maricopa County had 12 violations of the 24-hour standard; Cochise had one, Pinal had two, and one in Santa Cruz County.

Currently, 10 areas in Arizona have violated one or both of the PM_{10} standards frequently enough to be designated nonattainment areas by EPA. Depending on the location, the sources of the particulate matter in these nonattainment areas include: unpaved roads, mine tailings, agricultural activities, industrial processing and construction practices. The responsible air quality agency in these nonattainment areas has submitted documents to EPA detailing procedures to reduce PM_{10} emissions, including fugitive dust.

Tucson Region

In Pima County, on-road, area, point and nonroad source all contribute to PM_{10} emissions. From 1990-2001, there was a 20 percent decline in PM_{10} emissions (USEPA, 2005). Estimates using a 2000 emissions inventory indicate that on-road sources, including vehicle emissions, and dust from paved and unpaved roads, contributed 38 percent to total PM_{10} emissions. Area sources, such as residential fireplaces and woodstoves, produced 31 percent of emissions. Point sources, such as mining operations, concrete and asphalt production, contributed 21 percent, while nonroad sources (construction and mining equipment, and lawn and garden equipment) produced 10 percent (adapted from Causley, et al, 2001) (Figure 4.8).

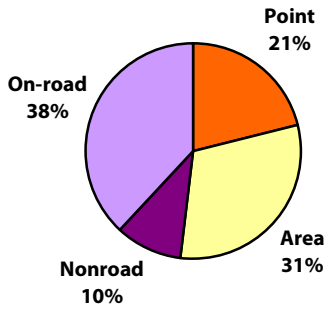


Figure 4.8. Sources of PM_{10} Emissions in eastern Pima County, 2005

Source: Adapted from Causley, et al, 2001

Elevated levels can occur during periods of high winds as well as under stable conditions when temperature inversions are present. Pima County is usually in compliance with the PM_{10} health standards but violated the 24-hour PM_{10} standard in 1999 with six recorded exceedances (Figure 4.9). High winds and unusually long dry periods were considered factors contributing to the high particulate readings for that year. In response, PDEQ developed a Natural Events Action Plan (NEAP) and submitted it to EPA on June 23, 2001. The plan was developed to protect public health and welfare from airborne fine dust particles during future high wind dust events. Since the submission of the NEAP, the Tucson region has experienced three exceedances of the 24-hour PM_{10} standard. In 2003, an exceedance of the 24-hour standard occurred (considered a natural event due to the

forest fires in the Catalina Mountains). No exceedances occurred during 2004 or 2005. PDEQ is currently engaging in outreach, education and increased enforcement activities to ensure compliance with the local regulations required under the NEAP.

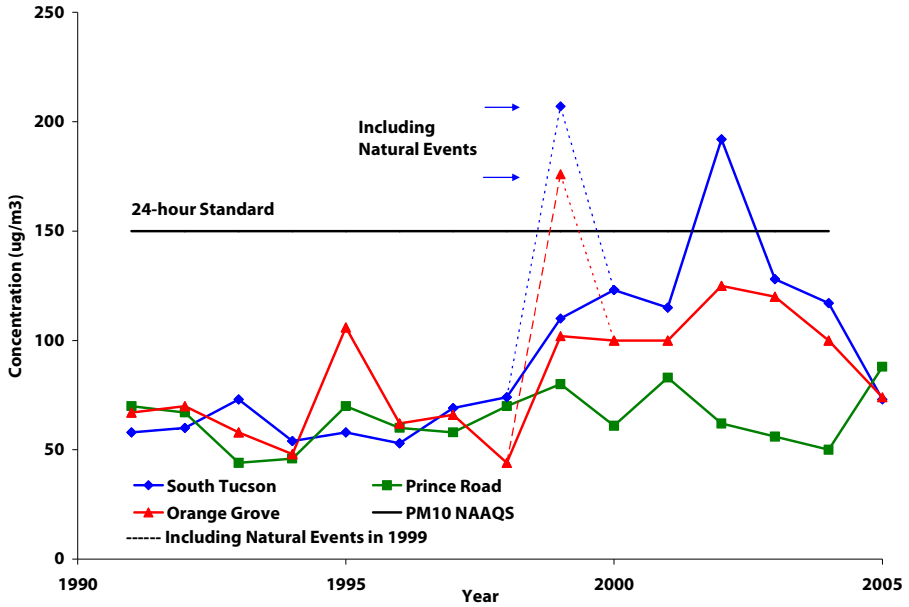


Figure 4.9. Eastern Pima County PM_{10} Concentrations: 1991-2005
2nd Maximum 24-hour PM_{10} Concentration

Source: PDEQ, 2006a, 2006b

Between the NEAP's implementation in fiscal year 2003-2004 and fiscal year 2005-2006, PDEQ's compliance staff conducted over 5,000 dust inspections, issuing 307 Notices of Opportunity to Correct, and 84 Notices of Violation. With an average of 108 inspections per month, the compliance staff continues to respond to airborne dust complaints, and provide surveillance throughout Pima County for fugitive dust activity (Wilhelmsen, 2006).

During this same timeframe, PDEQ's fugitive dust outreach and education staff conducted 155 public presentations and displays, and contacted nearly 11,000 people via letters, e-mails and phone calls regarding airborne dust issues. In total, outreach staff reached over 28,000 people between the program's inception in 2003 and June 2005. PDEQ continues to extend outreach efforts to contractors, haulers, street cleaners, landscapers, horse affiliations, private landowners, religious institutions, neighborhood organizations, businesses, schools, government agencies and the general public.

To aid PDEQ in gathering information on PM sources and to assist its jurisdictions, PAG has coordinated traffic counts on selected dirt roads since 2001. The goal of these counts is to protect public health. Roads are selected based upon their proximity to high population areas and input from local jurisdictions. Results from the 2006 roads count show that the highest volume dirt roads were located in the western portion of the Tucson region. Taylor Lane, 2006's busiest dirt road, averaged 1,281 vehicles per day (based on a 48 consecutive hour count). This data provides a tool for jurisdictions to identify potential

sources of PM, and to assist them in their planning efforts and prioritizing roads for dust abatement strategies.

PM FINE ($PM_{2.5}$)

Fine particulate matter ($PM_{2.5}$) is a complex mixture of extremely small particles and liquid droplets. Particles discharged directly, or primary emissions, are produced by sources such as diesel engines, wood-burning activities, and industrial and commercial combustion processes. Secondary particles are formed by reactions of atmospheric gases and organic carbon particles, to form particles.

National

EPA began estimating $PM_{2.5}$ emissions in 1990. Since then, there has been a 13 percent drop in emissions (USEPA, 2006a) (Figure 4.10). Reductions can be attributed primarily to federal regulations reducing vehicle and industrial emissions.

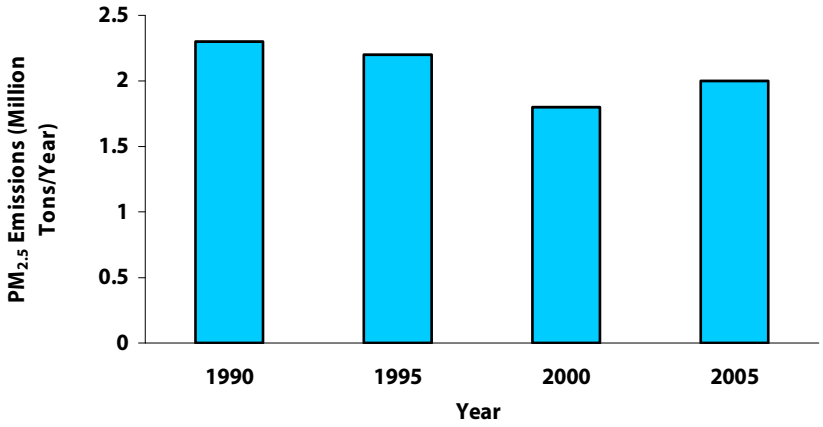


Figure 4.10. U.S. $PM_{2.5}$ Emissions: 1990-2005

Source: USEPA, 2006a

$PM_{2.5}$ standards were not established by EPA until 1997. At that time, a 24-hour and an annual standard were established to protect public health. Additional health studies led to a further strengthening of the 24-hour standard to 35 $\mu g/m^3$ in 2006. Nationally, there has been a 15 percent decline in concentrations over the past seven years (Figure 4.11) (USEPA, 2007b).

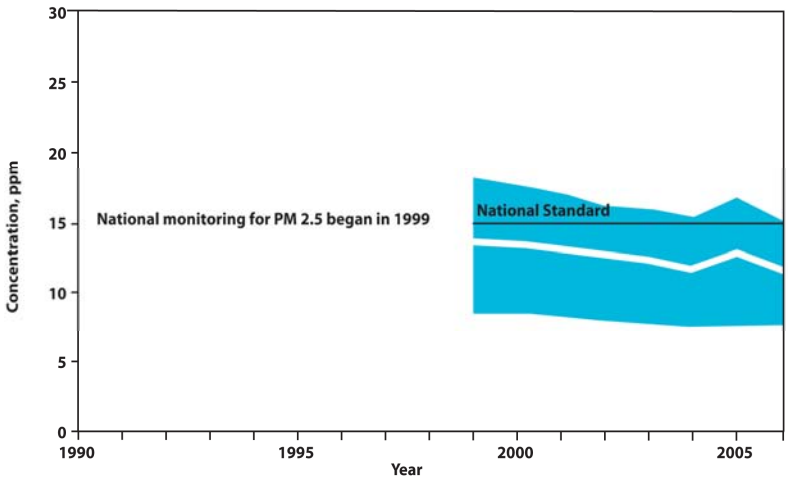


Figure 4.11. U.S. $PM_{2.5}$ Concentrations: 1999-2006
Values based on seasonally weighted annual average; trend based on 750 sites

Source: USEPA, 2007b

State

As in the United States, state $PM_{2.5}$ emissions also have decreased. From 1990-2001, state emissions have declined by 30 percent (USEPA, 2005).

Monitoring of $PM_{2.5}$ in Arizona began in the late 1990s, when EPA established the standards. State $PM_{2.5}$ concentrations continue to be well below the EPA health standards. ADEQ collects monitoring data from seven counties in Arizona and no violations occurred in these counties from 2003-2005 (ADEQ, 2006).

Tucson Region

Tucson, with a relatively small industrial sector, generally has low $PM_{2.5}$ emissions. County $PM_{2.5}$ emission totals have dropped 12 percent from 1990-2001 (USEPA, 2005). In the American Lung Association's 2007 *State of the Air* report, Pima County scored an "A" for fine particle pollution (American Lung Association, 2007).

PDEQ monitors indicate that local $PM_{2.5}$ concentrations are well below the EPA health standards (Figure 4.12).

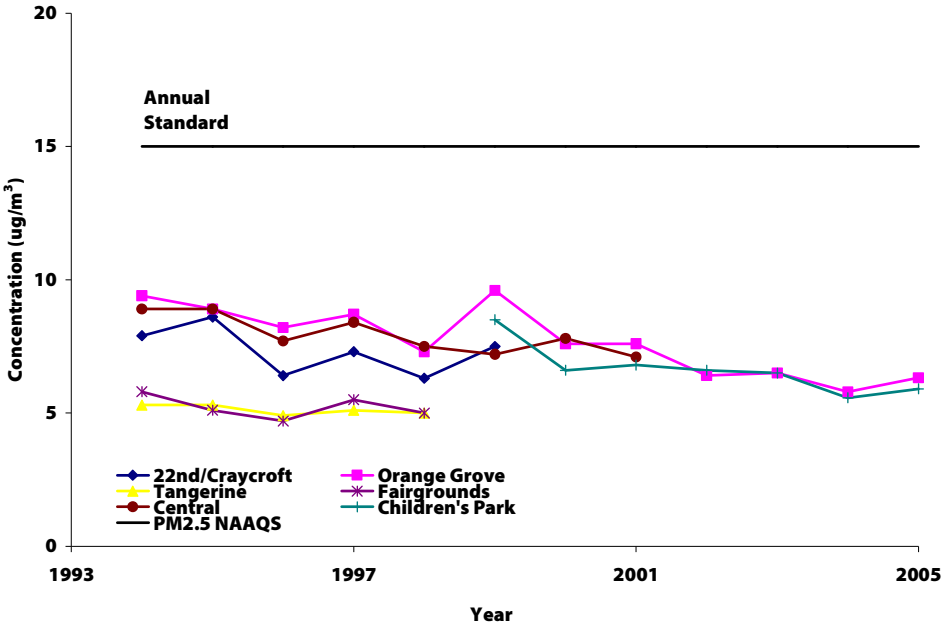


Figure 4.12. Annual Average eastern Pima County $PM_{2.5}$ Concentration: 1994-2005

Source: PDEQ, 2006a, 2006b

OZONE

Ozone (O_3) is an invisible gas which is a form of molecular oxygen (three oxygen atoms linked together). It occurs naturally in the upper atmosphere (about 9 to 13 miles above the earth's surface), and protects life on earth by filtering out harmful ultraviolet radiation from the sun. Ozone at ground levels, however, is a harmful pollutant and a major component of smog.

Ozone is a severe irritant to the respiratory system and can cause shortness of breath, coughing, wheezing and stinging eyes. It can damage lung tissue and make people more susceptible to respiratory infections. Ozone is especially harmful to children, the elderly and those with impaired health. This includes people with respiratory problems such as asthma, emphysema, chronic bronchitis and cardiovascular patients. It also inhibits plant growth and can cause damage to crops and forests.

Ozone is generally not emitted directly, but forms when ozone precursors, oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), react in the presence of sunlight. Typical urban sources of NO_x and VOCs are emissions from on-road mobile sources (cars, buses and trucks), nonroad mobile sources (construction vehicles, planes and trains), power plants and factories. VOCs also are naturally occurring and are emitted by plants and referred to as biogenic emissions.

National

Over the past 35 years, ozone precursor emissions (NO_x and VOC) have decreased 29 percent and 53 percent, respectively (Figure 4.13) (USEPA, 2006a).

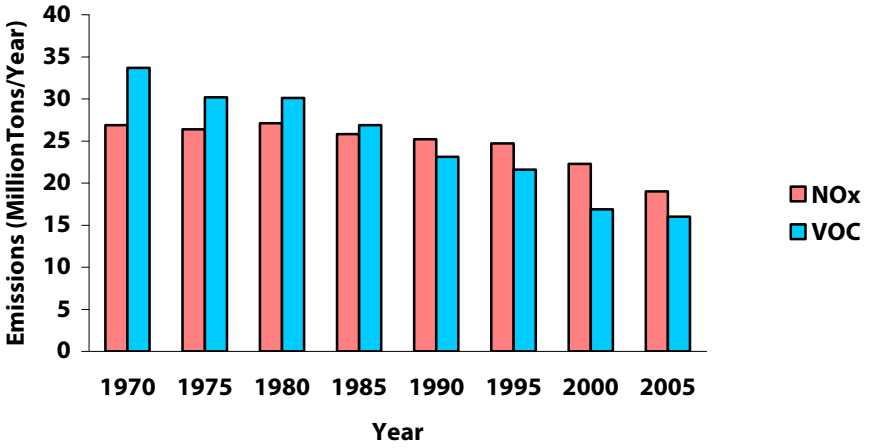


Figure 4.13. U.S. Emissions of the Ozone Precursors (Oxides of Nitrogen and Volatile Organic Compounds): 1970-2005

Source: USEPA, 2006a

According to EPA's 2006 *Air Emission Trends* report, the ambient 8-hour ozone levels have decreased 21 percent over the past 26 years (Figure 4.14). These reductions can be

attributed to control programs focused on ozone precursor emission reductions. These programs have targeted electric utilities, chemical manufactures, and mobile source emissions (vehicle emission inspection programs, reformulated gasoline, and strict tailpipe emission standards).

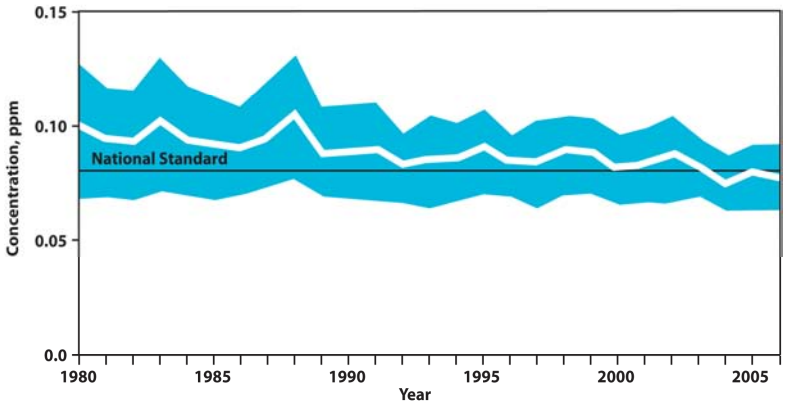


Figure 4.14. U.S. Ozone Concentrations: 1980-2006
Values based on annual 4th maximum 8-hour average; trend based on 275 sites

Source: USEPA, 2007b

State

Similar to the national trends, Arizona has experienced similar reductions in precursor emissions. From 1990-2001, ozone precursor emissions of VOC and NO_x have decreased 25 percent and 3 percent, respectively, (USEPA, 2005).

In 1990, a portion of Maricopa County was classified as a moderate one-hour ozone nonattainment area due to repeated violations of the ozone health standard. The area failed to come into compliance by the mandated deadline, and consequently, EPA reclassified the area as a serious nonattainment area in 1997. In 2000, ADEQ submitted plans to EPA designating detailed control measures to reduce ozone levels. No violations of the one-hour standard have been recorded since 1996. Maricopa Association of Governments (MAG) submitted a maintenance plan to reclassify the area to attainment and provided assurances that ambient ozone levels would continue to meet the one-hour standard. EPA approved the maintenance plan and redesignated the area as attainment for the one-hour standard.

In 2004, EPA designated Maricopa County and the Apache Junction portion of Pinal County nonattainment for the 8-hour ozone standard, due to repeated violations of eight-hour standard from 1995-2004. ADEQ is required to submit an air quality plan detailing control measures to EPA in 2007.

ADEQ monitors ozone levels from nine counties in Arizona. These include counties where national parks and monuments occur since ozone is a major component of smog and its precursors can impair visibility. No violations of the eight-hour standard occurred in these nine counties from 2003-2005 (ADEQ, 2006).

Tucson Region

From 1990-2001, county VOC emissions dropped 15 percent, while NO_x emissions increased by 7 percent (USEPA, 2005). Area sources such as residential fireplaces, architectural surface coating and gas stations are a significant source of VOCs (33 percent), but contribute less to total NO_x emissions. On-road sources and naturally occurring plant-generated VOCs (biogenics) also contribute significantly to local VOC emissions (Figure 4.15).

On-road sources represent a major contributor to NO_x emissions. Point sources, such as airports, natural gas facilities and power plants, also generate significant amounts of NO_x (adapted from Causley, et al, 2001).

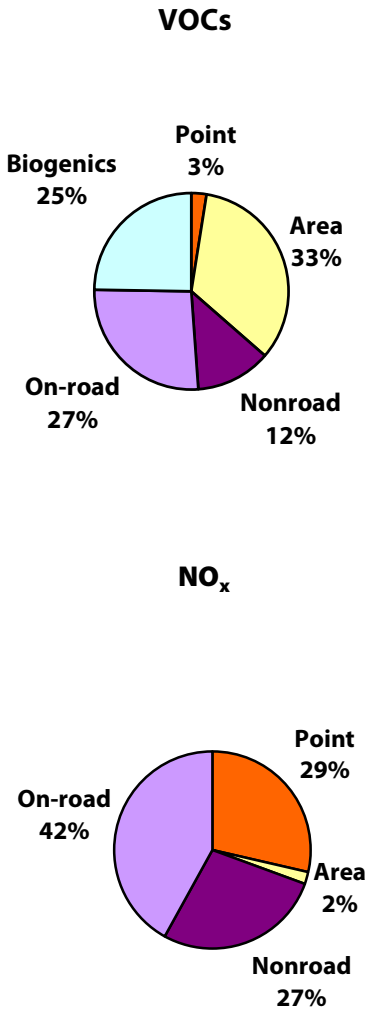


Figure 4.15. Sources of Ozone Precursors (VOCs and NO_x) in eastern Pima County, 2005

Source: Adapted from Causley, et al, 2001

Since PDEQ initiated ozone monitoring in 1973, levels have remained fairly uniform throughout the Tucson metropolitan area (Figure 4.16). Pima County scored a 'B' for ozone pollution in the most recent American Lung Association's *State of the Air* report (American Lung Association, 2007).

Recent local data indicate that the Tucson region experiences ozone levels at about 90 percent of the 8-hour standard set by the EPA. Currently, these standards are under review by the EPA and a more stringent standard has been recommended by the EPA Science Advisory Committee.

Higher ozone levels tend to be recorded in areas outside the central urban area and during summer afternoons. The scavenging of ozone by NO_x in the urban core accounts for the lower ozone levels in the metropolitan area and higher levels near the edges of the urban area.

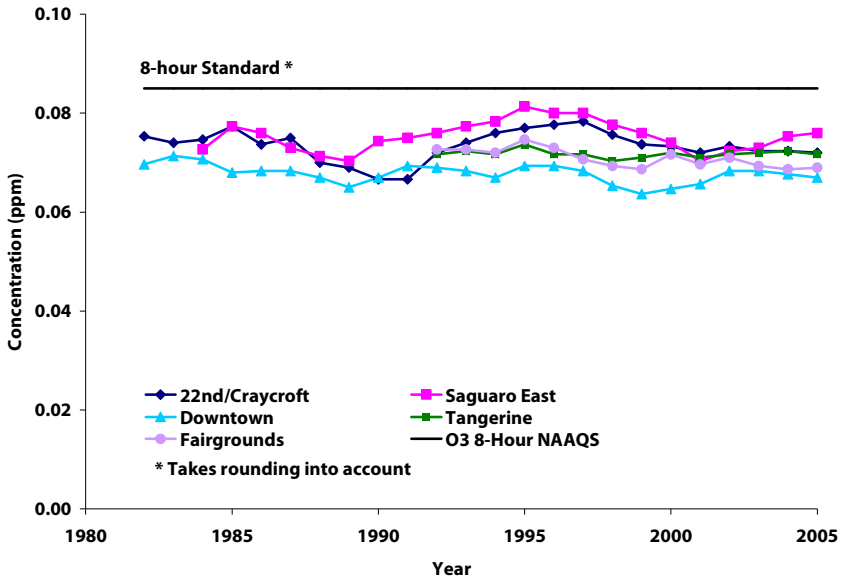


Figure 4.16. Eastern Pima County Ozone Concentrations: 1982-2005
3-year average of the 4th highest 8-hour ozone concentration

Source: PDEQ, 2006a, 2006b

Summer afternoons with intense sunlight, moderate heat and stable air conditions promote the formation and duration of elevated ozone levels. Ozone levels also are affected by mountain-valley air circulation. Typically, a daily reversal in wind direction with down-slope winds (from the southeast) occurs during the early morning with up-slope winds (from the northwest) occurring in the afternoon. The down-slope winds transport pollution westward/northward during the late evening and early morning. The up-slope winds transport pollution eastward during the afternoon and early evening, toward Saguaro National Park East which generally records higher ozone concentrations during the ozone season. In this manner, both ozone precursors and ozone itself are transported across the region (Diem, 2001).

One of the most effective control measures for ozone has been the Federal Motor Vehicle Control Program. This has reduced NO_x and VOC emissions by placing stringent emissions regulations on vehicle manufacturers. These regulations require manufacturers to develop systems capable of capturing excess gasoline vapors and cleansing tailpipe emissions. However, these systems don't always perform as designed and can deteriorate. In addition, poorly tuned vehicles and tampered vehicles can increase emissions. Promotion of alternate travel mode programs such as RideShare, the Travel Reduction Program, and Pima County's Clean Air Program, also help to reduce ozone levels.

PAG Ozone Studies

Several studies have been conducted by PAG in recent years in order to gain a better understanding of ozone concentrations, formation and transport in the Tucson region. A brief description of each study follows.

A. Evaluation of the Cost of Ozone Nonattainment and Ozone Control Measures in Pima County, 1999

Environmental Sciences Inc. was contracted by PAG and PDEQ to investigate ozone pollution in Pima County. The project had two major goals: evaluate the likely costs if Pima County violates the federal ozone standard, and determine possible steps that could be taken to delay or prevent a violation.

The principal findings of the ozone study were:

- The 8-hour standard could be exceeded, but it is not likely within the next few years (assuming no change in the existing standard).
- Annual costs of ozone nonattainment could exceed $50 million.
- Relationships between ozone and its precursors are complex and difficult to predict.
- More detailed information is needed on the sources of ozone precursors and the quantities of emissions before control measures can be prioritized.
- Vehicle emissions account for about 2/3 of all "man-made" emissions in Pima County.
- Natural sources of certain precursors also may be significant.
- Projected emissions from on-road vehicles indicate a downward trend in the medium to long term, primarily due to increasingly stringent emission standards for new vehicles.
- Increases or decreases in precursor emissions may not produce proportional changes in ozone levels.

As a result of these findings, further studies were conducted to gain greater insight into the annual emissions of ozone precursor compounds, as well as other criteria pollutants.

B. Emissions Inventories for the Tucson Air Planning Area (TAPA), 2000

The goal of the 2000 Tucson Region Emissions Inventory study was to develop an emissions inventory (EI) for stationary point and area sources, as well as nonroad mobile

sources within the TAPA. Ozone precursors, VOCs and NO_x, were the focus of the study, while secondary emphasis was given to CO, oxides of sulfur, and PM.

Base year emissions were estimated for the year 2000 and emissions projections were developed for 2005 and 2010. In addition, three day-specific emissions inventories were developed in an attempt to support future modeling work and to provide a better understanding of how emissions vary from day to day. The inventory data were developed to be suitable for input into a photochemical model.

C. Volatile Organic Compound Data Collection and Validation, 2001

In conjunction with the EI study, VOC samples were collected in Tucson during 2000 and 2001 to aid in understanding the types of VOCs contributing to ozone formation. The study's ultimate goal was to link these VOCs to possible emission sources and to assess possible emission controls to minimize ozone formation.

Sonoma Technology, Inc. (STI) was contracted by PAG to perform validation and select analyses of the VOC data collected for the Tucson region. STI recommended the use of the Measurement-based Analysis of Preferences in Planned Emission Reductions (MAPPER) model to assess the region's ozone chemistry.

The University of Arizona and Georgia State University researchers used the MAPPER model and VOC/NO_x ratios to evaluate the Tucson region's air chemistry from April through September from 1995 to 1998. Since both precursors are necessary for ozone formation, it is important to determine which reactant is limiting for ozone production and during which portion of the ozone season. In areas that are VOC-sensitive, the amount of ozone produced is limited by the amount of VOC available. In areas that are NO_x-sensitive, the amount of ozone produced is limited by the amount of NO_x available. Knowing when and which precursor is limiting can aid in the selection of control measures. Results indicated variable sensitivity depending on the time of year, as shown in Table 4.4.

Table 4.4. Monthly Ozone Sensitivities using MAPPER[2]

Method	April	May	June	July	August	September
MAPPER	NO_x-sensitive to transitional except for downtown (VOC-sensitive)	Transitioning to VOC-sensitive	By end of June, most of metro area is VOC-sensitive	Transitional to NO_x-sensitive	Transitional to NO_x-sensitive	VOC - sensitive

PAG staff conducted an additional analysis with MAPPER using April through September 2000-2001 data to verify these findings. Results showed that the Tucson region exhibits a

[2] *The MAPPER program uses measurements of ozone, nitric oxide (NO), and either NO_x ($NO + NO_2$) or NO_x (the sum of all oxidized nitrogen species) to compute the extent of reaction (ratio of instantaneous to maximum smog production) from the G. Johnson algorithm.*

great deal of transitional sensitivity (ozone is about equally sensitive to VOCs and NO_x) and that it also fluctuates between being VOC-sensitive and NO_x-sensitive throughout the year, depending on the season. Therefore, these analyses show that ozone concentrations will not substantially change without the implementation of control measures for both VOCs and NO_x (Diem, 2001).

D. System for Management, Observation, and GIS Modeling of Air Pollution (SMOGMAP), 2001

SMOGMAP, a multi-year project conducted by University of Arizona researchers, was completed in 2001 under a PAG contract. The goal of SMOGMAP was to integrate air quality-related data within a geographic information system (GIS) allowing for visualization-driven insight and analysis of those data.

The SMOGMAP project was comprised of two components: development of gridded, multi-temporal, atmospheric pollutant emission inventories and the mapping of ground-level, atmospheric pollution levels.

EIs were developed for ozone precursors, as well as several other pollutants, from stationary point and areas sources, biogenic VOCs, as well as nonroad and on-road mobile sources. The emission estimates included both annual and month-specific daily emissions for both typical weekdays and weekends during the mid-to late 1990s.

The results of the inventory show annual anthropogenic NO_x and VOC emissions for the Tucson Region (Figures 4.18 and 4.19). These maps illustrate graphically the location and relative concentrations of VOCs and NO_x in the Tucson region. As expected, the highest concentrations of both precursors are associated with vehicle emissions and occur along the major arterials and freeways. These emissions estimates were then used in statistical models to estimate ambient pollution concentrations across the Tucson region.

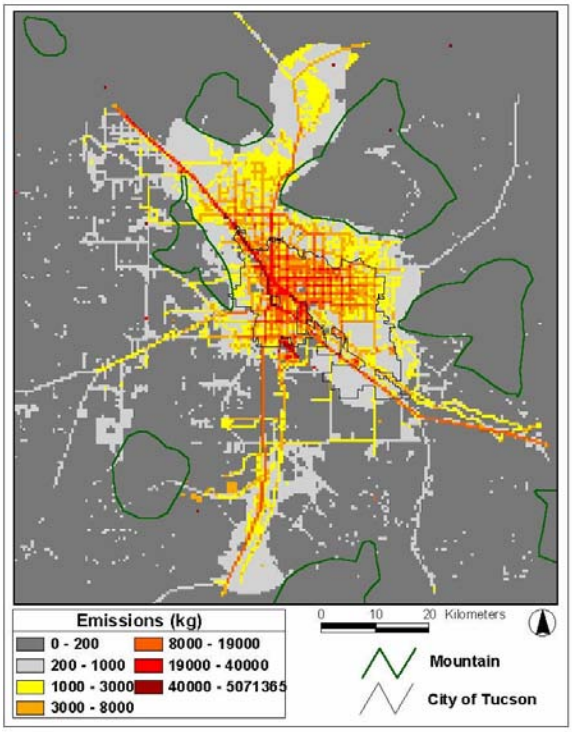
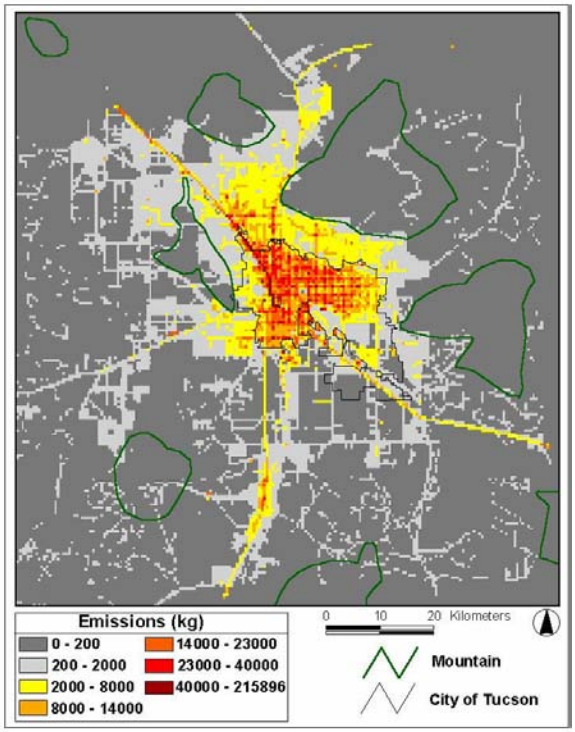


Figure 4.17. Map of Annual Anthropogenic NO_x Emissions for the Tucson Region

Source: SMOGMAP, 2001

Figure 4.18. Map of Annual Anthropogenic VOC Emissions for the Tucson Region

Source: SMOGMAP, 2001



5. REGIONAL HAZE

Visibility impairment results from the scattering and absorption of light by particles and gases in the atmosphere. Particles linked to serious health effects (sulfates, nitrates, organic carbon, soot, and soil dust) can also significantly reduce visibility. Two types of particles are responsible for reduced visibility: primary particles, emitted directly into the air, and secondary particles, formed from chemical reactions of emitted gases. Primary particles include coarse and fine soils, elemental carbon (soot) and organic carbon. Secondary particles include ammonium sulfate (formed from gaseous sulfur dioxide), ammonium nitrate (formed from gaseous NO_x), and organic carbon particles (formed from volatile organic carbon gases). Unlike the NAAQS for criteria pollutants, there are no established federal or state standards for acceptable levels of haze.

Visibility-reducing particles can be natural or anthropogenic (human-caused). Some natural sources include wildfire emissions, volcanic activity, and wind-blown coarse and fine soils. Anthropogenic emissions originate from point sources, (utility and industrial boilers, smelters, and refineries) and mobile sources (cars, trucks, and nonroad equipment).

Particle type and relative humidity have significant effects on the degree of reduced visibility. Some particles, such as elemental carbon, scatter and absorb light at high rates compared with soil particles while other particles, such as ammonium salts, are more efficient at scattering light and creating haze under high humidity conditions (Regional Haze State Implementation Plan for the State of Arizona, 2003). It is important to determine the composition of the particles and climatic conditions to characterize their impact on visibility and to establish appropriate control measures.

National

The Regional Haze Rule (RHR) was a milestone in EPA's efforts to improve visibility nationwide. It requires states to set periodic goals for improving visibility in 156 natural areas. Each state must develop a plan that contains enforceable measures and strategies for reducing visibility-impairing pollution. In June, 2005, the EPA amended the 1999 Regional Haze Rule by requiring emission controls known as best available retrofit technology, or BART, for industrial facilities. The goal of the regional haze program is for Class I[3] wilderness areas to attain the visibility level experienced with only natural sources affecting visibility. To comply with the RHR, each state must submit a plan addressing regional haze issues in their Class I areas.

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program is a national cooperative visibility monitoring network involving EPA, federal land management agencies, and state air agencies. IMPROVE's objective is to establish current visibility and aerosol conditions in Class I areas. Among their goals are to identify

[3] *Class I area designations were based on an evaluation required by Congress in the 1977 federal CAA amendments. The evaluation reviewed areas of parks and national forests which were confirmed as wilderness before 1977, were at least 6,000 acres, and have visual air quality as an important resource.*

chemical species and emission sources responsible for visibility impairments, document long-term trends, assess progress toward the national visibility goal, and to provide regional haze monitoring in all protected Class I federal areas (ADEQ, 2006). IMPROVE began monitoring natural areas in 1988 and has continually expanded its monitoring program since 1999, when EPA finalized the Regional Haze Rule (RHR). More information on the program is available at: http://vista.cira.colostate.edu/improve/

Results of IMPROVE's monitoring data indicate that natural visual range is approximately 45-90 miles in the eastern U.S. and 120-180 miles in the West. In the East, air quality data collected in 1999 showed the mean visual range for the worst days was 14.4 miles compared to a visual range of 50.4 miles on good days. In the West, visibility on the worst days has remained constant, ranging between 80-86 miles from 1990-1999 (USEPA, 2002).

In addition to differences in visibility between the eastern and western U.S., the composition of the pollutants vary (Table 5.1). Although sulfates are the major contributor in both regions, they constitute a greater percentage of the Eastern total (USEPA, 2002).

Table 5.1. Composition of Pollutants Impacting Visibility in the Eastern and Western U.S.

Pollutant	Percent Contribution	
	East	**West**
Sulfates	60-80	25-50
Organic Carbon	10-18	25-40
Nitrates	7-16	5-15
Elemental Carbon (soot)	5-8	5-15
Crustal Material (soil dust)	5-15	5-25

Source: USEPA, 2002

Several federal programs have reduced pollutants contributing to regional haze including: EPA's Acid Rain Program (reducing SO_2 and NO_x emissions), EPA's NAAQS; mobile source controls, and other strategies that reduce particulate emissions.

Western Region

Visibility-impairing pollutants travel across state and international borders moving far from the pollution source. Thus, visibility is not a localized phenomenon, but can involve large geographic areas. To that end, the Western Regional Air Partnership (WRAP) was formed in 1997 as a collaborative effort among tribal and state government representatives from 13 states (Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming) and several federal agencies (U.S. Department of the Interior, EPA, and the Forest Service). The goal of the partnership is to develop technology and policy tools to comply with the EPA's Regional Haze Rule (RHR) to improve visibility in the Western U.S.

State and Tucson Region

To develop more detailed information about state visibility issues, Arizona has been participating in the IMPROVE program. The Arizona Class I network consists of a visibility

monitoring sites established by ADEQ and by the IMPROVE committee. Monitoring is conducted for these 12 mandatory Class I federal areas in Arizona: Grand Canyon National Park, Petrified Forest National Park, Sycamore Canyon Wilderness, Mount Baldy Wilderness, Pine Mountain Wilderness, Mazatzal Wilderness, Sierra Ancha Wilderness, Superstition Wilderness, Saguaro Wilderness, Galiuro Wilderness, Chiricahua Wilderness, and Chiricahua National Monument Wilderness. As required by the RHR, ADEQ must develop a plan for each Class I area. Only the first four listed areas have been addressed in ADEQ's 2003 Regional Haze Plan; the other eight area plans must be submitted for EPA review by December 2007.

Since the early 1990s ADEQ has continuously taken optical measurements of visibility in the metropolitan areas of Tucson and Phoenix to characterize the extent of urban haze. Light extinction, the degree that light is reduced by its interaction with atmospheric particles and gases, is measured with a transmissometer. The units of measurement are inverse megameters (Mm^{-1}); the higher the light extinction value in Mm^{-1}, the greater the reduction in visibility. Figures 5.1 and 5.2 illustrate visibility trends for the urban areas of Phoenix and Tucson, respectively (ADEQ, 2006).

Overall, visibility in Phoenix has improved over the past 10 years. Visibility is expected to improve as controls are implemented to control ozone precursors and particulate matter. Significantly, the Tucson region has experienced a far greater improvement over this same 10-year period. However, a recent upward swing during 2003-2005 highlights the need to continue monitoring these trends (ADEQ, 2006).

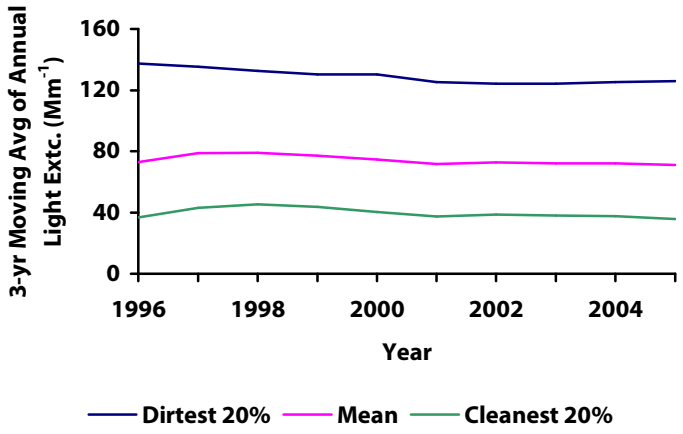


Figure 5.1. Light Extinction Trends for Phoenix: 1996-2005
Shown as three-year moving averages for all hours

Source: ADEQ, 2006

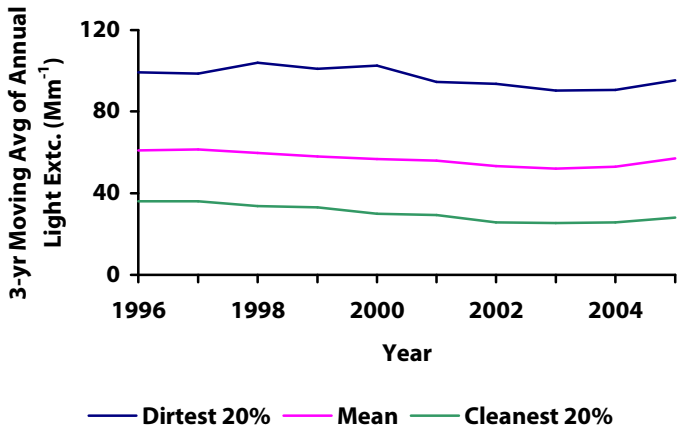


Figure 5.2. Light Extinction Trends for Tucson: 1996-2005
Shown as three-year moving averages for all hours

Source: ADEQ, 2006

6. GREENHOUSE GASES

Many chemicals in the atmosphere act as greenhouse gases (GHG) because they absorb infrared radiation and trap heat in the atmosphere. Some are naturally occurring such as water vapor, carbon dioxide (CO_2), methane, nitrous oxide (N_2O), and ozone. Human activities, such as burning fossil fuels, deforestation, farming and livestock practices, landfill emissions, and use of fluorinated gases add to the levels of these naturally occurring gases.

The various greenhouse gases do not have equal heat trapping potential. The Intergovernmental Panel on Climate Change (IPCC) developed a ranking system, the Global Warming Potential (GWP), to evaluate the warming potential of individual GHG relative to the same mass of carbon dioxide. Using the GWP values, based on a 100-year time frame, methane has a 20 times greater warming potential than CO_2, and nitrous oxide has over 300 times greater potential, with the fluorinated gases ranging from 140-24,000 times greater heating potential than CO_2 (USEPA, 2006c). A brief discussion of natural and anthropogenic sources of GHG follows.

Water Vapor
Water vapor is the most abundant greenhouse gas, varying from 0 percent to 2 percent in the atmosphere (EPA, 2006c). It is short-lived and is both naturally occurring and anthropogenic in origin. Anthropogenic emissions of water vapor are not included in national greenhouse gas emission inventories since human activity is considered to have a negligible effect on water vapor concentrations (EIA, 2006).

Carbon Dioxide
By far, CO_2 is the major anthropogenic component of greenhouse gas emissions. It is naturally present in the carbon cycle where billions of tons are removed by oceans and growing plants (sinks) and are emitted back into the atmosphere annually through natural processes. Fossil fuel combustion is the largest contributor of anthropogenic greenhouse gas emissions in the U.S. and in the world.

Methane
Methane is emitted from a variety of natural and human-related sources. Natural sources include wetlands, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and wildfires. Human related activities such as fossil fuel production, landfill emissions, and human and animal waste management all generate methane emissions. Approximately 60 percent of global methane emissions are related to human-related activities (IPCC, 2001).

Nitrous oxide
Nitrous Oxide (N_2O) is generated by both natural and human-related sources. Natural sources include a wide variety of biological processes in soil and water, particularly microbial action in wet tropical forests. Anthropogenic sources of N_2O include agricultural soil management, vehicle emissions, and management of human and animal wastes.

Fluorinated Gases
Fluorinated gases are emitted from a variety of industrial processes (aluminum production, semiconductor manufacturing, electrical power transmission, magnesium production and processing. Since they remain in the atmosphere almost indefinitely, concentrations of these gases will increase as long as emissions continue.

National

Since the industrial revolution in the mid-18th century, global atmospheric concentrations of CO_2 have risen about 35 percent due primarily to the combustion of fossil fuels (IPCC, 2001). Current CO_2 levels are at 377 ppm, up from the pre-industrial level of 280 ppm (USEPA, 2006c). The U.S. contributes about 25 percent to global carbon dioxide emissions from the burning fossil fuels, which produces the majority of anthropogenic greenhouse gas emissions (EIA, 2004). In 2005, human-generated CO_2 made up 83 percent of all U.S. GHG emissions (Figure 6.1). Two major sources of fuel combustion are electric power generation and on-road vehicle emissions (USEPA, 2006c).

Methane contributes almost 9 percent to total GHG emissions (Figure 6.1). In 2004, four major anthropogenic activities accounted for much of U.S. methane emissions: landfills (25 percent), natural gas systems (21 percent), livestock enteric fermentation (20 percent), and coal mining (10 percent) (USEPA, 2006c).

Nitrous oxide is another component of total GHG emissions (Figure 6.1). In 2004, the primary anthropogenic sources of N_2O were agricultural activities: soil and manure management (72 percent); mobile vehicle emissions (11 percent), and nitric acid production (4 percent) (USEPA, 2006c).

Fluorinated gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) contributed a combined 2.2 percent to the 2005 total (Figure 6.1) (EIA, 2006). The major source of fluorinated gas emissions in 2004 was from their use as a substitute for ozone-depleting gases (72 percent) (USEPA, 2006c). Fluorinated gas emissions are minimal compared to CO_2 but they have a greater potential than CO_2 to trap heat in the atmosphere over a 100-year period (USEPA, 2006c).

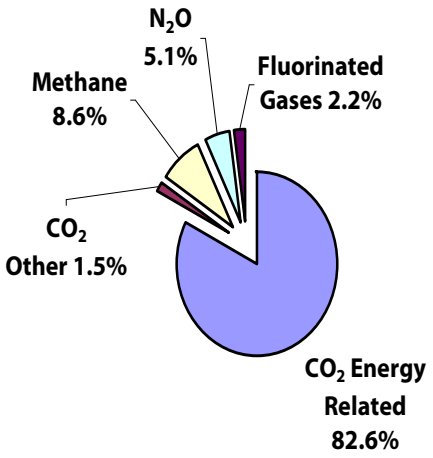


Figure 6.1. Composition of U.S. Greenhouse Gas Emissions, 2005

Source: EIA, 2006

Over the past 15 years, there was a 17 percent increase in total GHG emissions. However, the average 2005 annual rate of growth in total GHG emissions of 1 percent was somewhat lower than the 1.2 percent growth of 1990 (EIA, 2006).

From 1990 to 2005, emissions of CO_2 increased by 20 percent, N_2O increased by 10 percent, fluorinated gases have increased 84 percent, while methane emissions have decreased 13 percent, over this same period (Figure 6.2)(EIA, 2006).

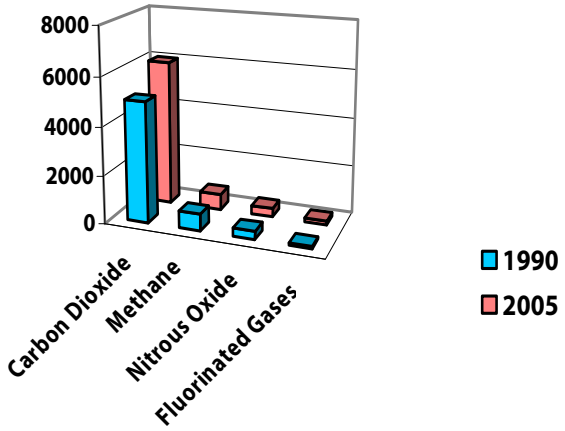


Figure 6.2. U.S. Greenhouse Gas Emissions 1990 vs. 2005
Values are millions of metric tons per year of carbon dioxide equivalent.

Source: EIA, 2006

Currently, the federal government is pursuing several strategies to address global climate change by implementing both domestic and international programs. Wide arrays of voluntary, regulatory and incentive-based programs are administered by the federal government and focus on energy efficiency, agricultural practices, and GHG reductions.

In 2002, the *Global Climate Change Initiative* set a national goal of reducing greenhouse gas intensity by 18 percent between 2002 and 2012 through voluntary measures. To achieve this goal a number of domestic programs were initiated to encourage partnerships among industry and researchers to employ alternate energy use and devise ways to improve current technology in reducing GHG emissions (USEPA, 2006c).

State

Arizona GHG emissions are rising rapidly compared to the United States, driven by the rapid rate of Arizona's population and economic growth. State GHG emissions were up 51 percent from 1990 to 2000, while national emissions rose by 23 percent during this period (Bailie, et al, 2006).

Combustion of fossil fuels in electricity production and in transportation accounted for almost 80 percent of Arizona's GHG emissions during 2000 (Figure 6.3) (Bailie, et al, 2006). Another 11 percent of GHG emissions originated from the remaining uses of fossil fuels – natural gas, oil products, and coal in the residential, commercial, and industrial sectors. Agricultural activities (manure management, fertilizer use, and livestock) resulted in methane and N_2O emissions that accounted for 5 percent of emissions. Although industrial processes contributed about 5 percent to state GHG, their emissions are rising due to increased use of fluorinated gases as substitutes for ozone-depleting chlorofluorocarbons, CO_2 released during cement and lime production, and methane released by natural gas systems and coal mines. Methane and N_2O releases from landfills and wastewater management facilities accounted for 2 percent of total state emissions. Landfill and wastewater facilities have reduced their emissions in recent years by capturing methane gas for energy use.

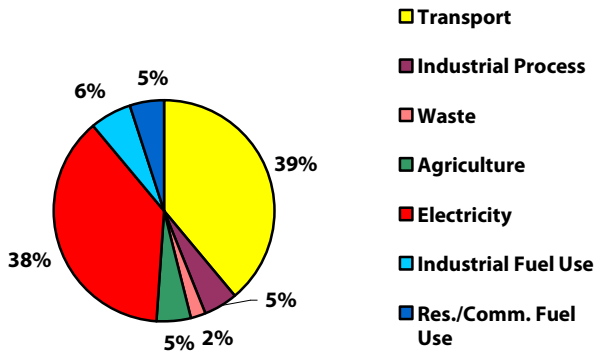


Figure 6.3. Arizona Greenhouse Gas Emissions by Sector, 2000

Source: Bailie, et al, 2006

Future projections of state GHG emissions indicate an increase in emissions from all sectors except agriculture (Figure 6.4). The state's projected rate of emissions growth is 3 percent per year from 2000 onward. Four factors are primarily responsible for the increase in emissions after 2010: electrical demand growth rate faster than population growth; increasing dependence on coal-based electric generation; freight traffic growth faster than population, and increasing hydrofluorocarbons emissions in refrigeration, air conditioning, and other applications (Bailie, et al, 2006).

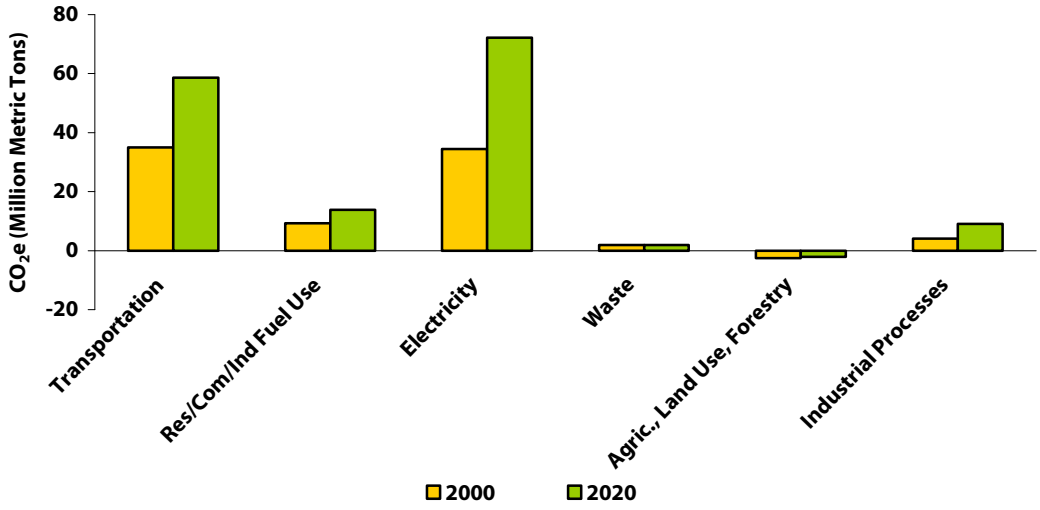


Figure 6.4. Actual and Projected Greenhouse Gas Emissions - Arizona 2000 vs. 2020

Source: Adapted from Bailie, et al, 2006

In 2005, Gov. Janet Napolitano signed an Executive Order establishing the 35-member Climate Change Advisory Group (CCAG). In addition to requiring the aforementioned inventory and forecast, this Executive Order directed the CCAG, in coordination with ADEQ, to develop a Climate Change Action Plan and provide recommendations for reducing Arizona GHG emissions. The CCAG recommended 49 policy recommendations focusing on various sectors of Arizona's economy: residential, commercial, industrial and waste management; energy supply; transportation and land use; and agriculture and forestry.

Based upon the CCAG's policy recommendations, Gov. Napolitano signed an Executive Order in 2006 establishing a statewide goal to reduce Arizona's future GHG emission to 2000 levels by 2020 and to reduce levels by 50 percent of 2000 levels by 2040. Executive Order 2006-13 also created the Climate Change Executive Committee whose task is to implement the recommendations of the CCAG's for reducing state GHG emissions. Additional information about the program is available at: www.azclimatechange.us

In February 2007, Gov. Napolitano joined with California, New Mexico, Oregon, and Washington, in signing the Western Regional Climate Action Initiative. By joining this partnership, these five states are committed to developing a collective regional target for reducing GHG by August 2007. They then have 18 months to devise a program to reach the target.

Tucson Region

In 1997, the City of Tucson contracted with Venture Catalyst to conduct a citywide greenhouse gas emissions inventory. This report pinpointed two major sources of greenhouse emissions: electricity use and generation and the burning of fossil fuels (gasoline, diesel, natural gas, jet fuel/propane, and coal) (Venture Catalyst, 1997). Total carbon dioxide production was estimated and allotted to five sectors depending on their use of electricity and/or fuels (Figure 6.5). Similar to other air pollutants, a considerable amount of CO_2 was generated by mobile sources. The industrial sector, which includes manufacturing, mining, and utilities, also contributed a significant amount to total CO_2 emissions.

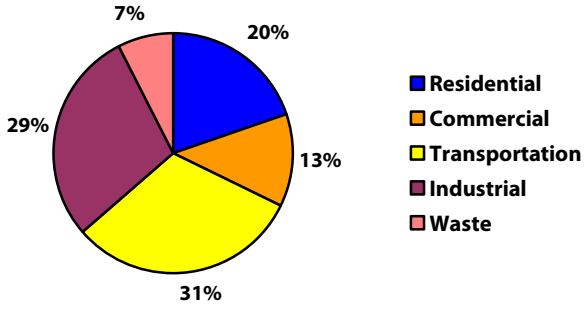


Figure 6.5. Tucson Greenhouse Gas Emissions by Sector, 1995

Source: Venture Catalyst, 1997

Pima County coordinates several programs addressing greenhouse gas reduction. Several of these programs focus on reducing energy use, thereby lowering demand on electric generating plants that are major sources of air pollutants. In 2006, Pima County proposed a Green Building Program which would offer incentives such as credits toward permitting fees, faster permit-processing time, and issuance of green building certificates to promote green building activities. Green or sustainable buildings use construction practices that enhance energy and water efficiency, improve waste management and air emissions. The program focuses on using local building materials and reusing and recycling existing structures and materials.

Tucson Electric Power (TEP) initiated a voluntary new home program in 1997 that guarantees heating and cooling costs for three years. The program addresses energy use on a square footage basis. Participants automatically receive a minimum of a 12 percent reduction in electric rates. Guarantee Program homes represented 56 percent of the regional new construction market in 2006. In an additional program to reduce GHG, TEP captures landfill gas and converts it to usable energy.

TEP, in partnership with the Tucson Clean and Beautiful organization's *Trees for Tucson,* offers residents up to two, five gallon-size trees at a nominal cost when planted on the west, east, or south side of their homes. The program has distributed more than 50,000 trees since its inception in 1993. The City of Tucson estimates that at maturity, each tree

will save about 300kWh of electricity annually by providing shade and reducing cooling costs.

Pima County, the City of Tucson, and the Town of Marana each have developed a Habitat Conservation Plan (HCP) to promote wise use and conservation of the desert environment. By designating how and where development occurs, these plans will preserve natural areas and benefit air quality by limiting urban sprawl and associated pollutants.

In addition to their Habitat Conservation Plan, Tucson is engaged in activities that foster the goals of the Climate Protection Agreement such as the City's General Plan, the Houghton Area Master Plan, the Tucson Sustainability Standard for new construction, and, and greater energy efficiency standards for city facilities and fleets.

In September 2006, Mayor Walkup endorsed the U.S. Mayor's Climate Protection Agreement, which sets GHG reduction targets, adopts and enforces land use policies to reduce sprawl, preserves open space, creates alternatives to private vehicle travel, and promotes use of clean alternative energy sources. In May 2007, Pima County adopted a resolution setting a broad set of goals relating to sustainability.

7. MOBILE SOURCE EMISSIONS REDUCTIONS

Mobile sources produce air pollution and include both on-road vehicles (cars, trucks, buses) and nonroad vehicles (airplanes, trains, marine vessels, recreational vehicles, lawn equipment). Through combustion and evaporation, mobile sources produce four major air pollutants: CO, hydrocarbons, NO_x, and PM. Toxics and GHG emissions also are produced, but are not covered in this section.

National

Although vehicle emissions are not the only source of air pollution, on-road mobile sources nationally account for 55 percent of CO emissions, 35 percent of NO_x, 27 percent of VOC, and 1 percent of PM_{10} emissions (FHWA, 2004). Even though a projected 29 percent increase in population and an 85 percent increase in VMT is anticipated from 2000-2030, pollutant levels are expected to decrease due to increased regulation of vehicle emissions (U.S. Census Bureau, 2004; FHWA, 2002, USEPA, 2006d).

National Strategies

Gasoline Engines

Starting in 1963 with the Clean Air Act, EPA has mandated standards for all new cars and trucks sold in the United States. Vehicle emissions also have been reduced by the provisions of the 1990 Clean Air Act Amendments. Restrictive Tier 1 emissions standards became effective in 1994, specifying exhaust emissions for VOCs and NO_x for all gasoline and diesel-powered on-road motor vehicles.

In 2004, stricter EPA tailpipe emission standards (Tier 2) for all new passenger vehicles went into effect. These standards regulate emissions from light-duty vehicles and trucks (including sport-utility vehicles and passenger vans). Tier 2 standards, phased in over 2004-2009, limit NO_x emissions to 0.07 grams per mile (gpm), an 86 percent reduction from pre-2004 vehicles. In addition, these regulations require refiners and importers to produce and handle gasoline averaging 30 ppm sulfur.

Since 2004, manufacturers of commercial vehicles (over 8,500 lbs.) are required to comply with heavy duty engine standards. These standards require the engines to emit approximately 50 percent lower NO_x levels compared to the 1998-2003 models. Additionally, these requirements reduce particulate matter emissions significantly and restrict the maximum sulfur content of diesel to 15 ppm (ultra low sulfur diesel).

Diesel Engines

Engines manufactured from 2004 onward are required to produce a 50 percent reduction in NO_x emissions compared to previous models. Beginning with the 2007 models, heavy duty trucks and buses will run on low sulfur diesel fuel, reducing pollution by over 90 percent by 2030. EPA states that lowering the sulfur content from 500 ppm to the 15 ppm level will reduce NO_x emissions by 2.6 million tons per year, particulate matter emissions

will be reduced by 110,000 tons/year, and acute respiratory incidents, hospital and emergency visits per year are estimated to be drastically lower (USEPA, 2006b).

National Tier 3 standards, phased in over 2006-2008, require more stringent control of NO_x, hydrocarbon, and PM emissions for new nonroad diesel engines (50 horsepower and greater). These standards will reduce NO_x emission by 60 percent and PM emissions by 40 percent from the Tier 1 emission levels (USEPA, 2003).

In 2004, EPA promulgated the Clean Air Nonroad Diesel Rule (Tier 4), phased in over 2008-2015, to reduce nonroad diesel engine emissions. By integrating engine modifications with fuel controls, the rule provides greater emission reductions. Beginning in 2007, engine manufacturers started producing engines with advanced emission control technologies that decrease emissions by more than 90 percent. Additionally, the rule required refiners to start producing low sulfur (15 ppm) diesel fuel by mid- 2006, a 97 percent reduction from previous levels (USEPA, 2006b). As part of the 2004 Clean Air Nonroad Diesel rule, EPA finalized new requirements for the diesel fuel rule that will decrease levels of sulfur in fuel used in marine vessels by 99 percent, beginning in 2007 (USEPA, 2007a).

In March 2007, EPA proposed a new control program that would dramatically reduce emissions from all types of marine engines (including those used on recreational and small fishing boats, yachts, tugs, and ocean going vessels). The proposal aims to cut PM emissions from these engines by 90 percent and NO_x emissions by 80 percent (USEPA, 2007a).

State

Over the next 20 years, state VMT and population increases are expected to drastically increase. A projected 71 percent population increase and a 105 percent increase in daily VMT are expected from 2000-2025 (Cambridge Systematics Inc., 2004; U.S. Census, 2000). In the Phoenix and Tucson metropolitan areas, on-road vehicle emissions account for about half of the CO and NO_x emissions, and one-third of the VOC emissions (ADEQ, 2006). In response to the current and future population and VMT increases, several programs are in place to reduce on-road vehicle emissions.

State Strategies

The Arizona Vehicle Emission Inspection Program (VEIP) began in 1977, and includes the metropolitan areas of Phoenix (Area A) and Tucson (Area B). As of January 2002, an on-board diagnostics (OBD) test was incorporated into the VEIP. This test, performed on 1996 and newer cars and light duty trucks, accesses engine operating data and identifies problems before they lead to engine damage and emissions system failure.

In the metro Phoenix area, an enhanced test is required biennially for most gasoline-powered vehicles manufactured between 1981 and 1995. During this test (known as I/M 147) the vehicle is driven on rollers at varying speeds to simulate an urban driving cycle while the exhaust is continuously measured for VOCs, CO, CO_2, and NO_x.

In addition to a stricter VEI program, the Phoenix region uses Arizona cleaner burning gas (CBG) throughout the year. CBG is formulated to reduce the amount of smog-forming emissions due to its reduced sulfur and benzene content, lower vapor pressure, and the addition of ethanol. Differences between the programs are due to the Tucson region's designation as a maintenance area for CO, while the Phoenix region's designation is maintenance for CO and nonattainment for ozone and PM_{10}.

In April 2005, a proposed revision to the VEIP was initiated when Gov. Napolitano signed House Bill 2357, exempting motorcycles and collectible vehicles from emissions testing in the Tucson area, and collectible vehicles in the Phoenix area. The final rule was published in the Federal Register in March 2007.

Tucson Region

The Tucson region continues to experience growth in population and vehicle miles of travel (VMT). From 2000 to 2030, the Pima County population is projected to increase by 48 percent while VMT is estimated to increase by approximately 152 percent (PAG, 2004, 2006b) (Table 7.1).

Since Pima County has few large industrial complexes, on-road mobile sources produce the majority of air pollution in the Tucson region. During 2001, on-road vehicles were responsible for 49 percent of total emissions, 57 percent of the CO, 50 percent of the NO_x and 36 percent of the VOC emissions (USEPA, 2005). In 2004, PAG staff completed the *2000 On-Road Mobile Emissions Inventory* to better understand air pollution, both spatially and temporally, in the TAPA.

At the request of the Environmental Planning Advisory Committee to support the planned Regional Transportation Authority's projects, PAG staff completed the gridded on-road emissions mapping project for the 2030 transportation network in 2006. Although VMT is expected to more than double from 2000 to 2030, it is estimated that total pollution from motor vehicles will decrease significantly (Table 7.1). This is largely due to stricter federal tailpipe emission standards and cleaner fuels required for new cars and trucks, as well as fleet turnover.

Table 7.1. Actual & Estimated VMT and On-Road Mobile Emissions in eastern Pima County

	Population	**VMT (mi/day)**	**Emissions (tons/year)**			
			CO	**VOC**	**NO_x**	**Total**
2000	848,385	17,684,396	164,021.7	16,108.6	15,842.9	195,973.2
2030	1,442,420	47,689,799	77,655.5	4,478.5	2,889.9	85,023.9

Source: 2000 VMT: PAG, 2004. Estimated VMT: PAG, 2006b. Emissions: PAG MOBILE6.2 Model, 2006.

In Figures 7.2 and 7.3 the gridded annual total pollutant emission map for 2000 and the projected emissions map for 2030 are shown using the same color scale for comparison. The 2030 emissions across the region are significantly less than those for 2000. On-road

emissions of CO, VOCs and NO_x follow the same pattern, with the highest levels emitted along the freeways and major arterial streets. Many of the large, heavily congested intersections also stand out as hotspots because of the high volume of traffic and slower speeds. It is anticipated that, in the future, cleaner cars and fuel will assist the region in maintaining pollutant levels below the federal health standards. PAG continues to follow trends to ensure that regional growth and subsequent expansion of the transportation network and travel along the outskirts do not overwhelm the benefits of cleaner cars and fuel.

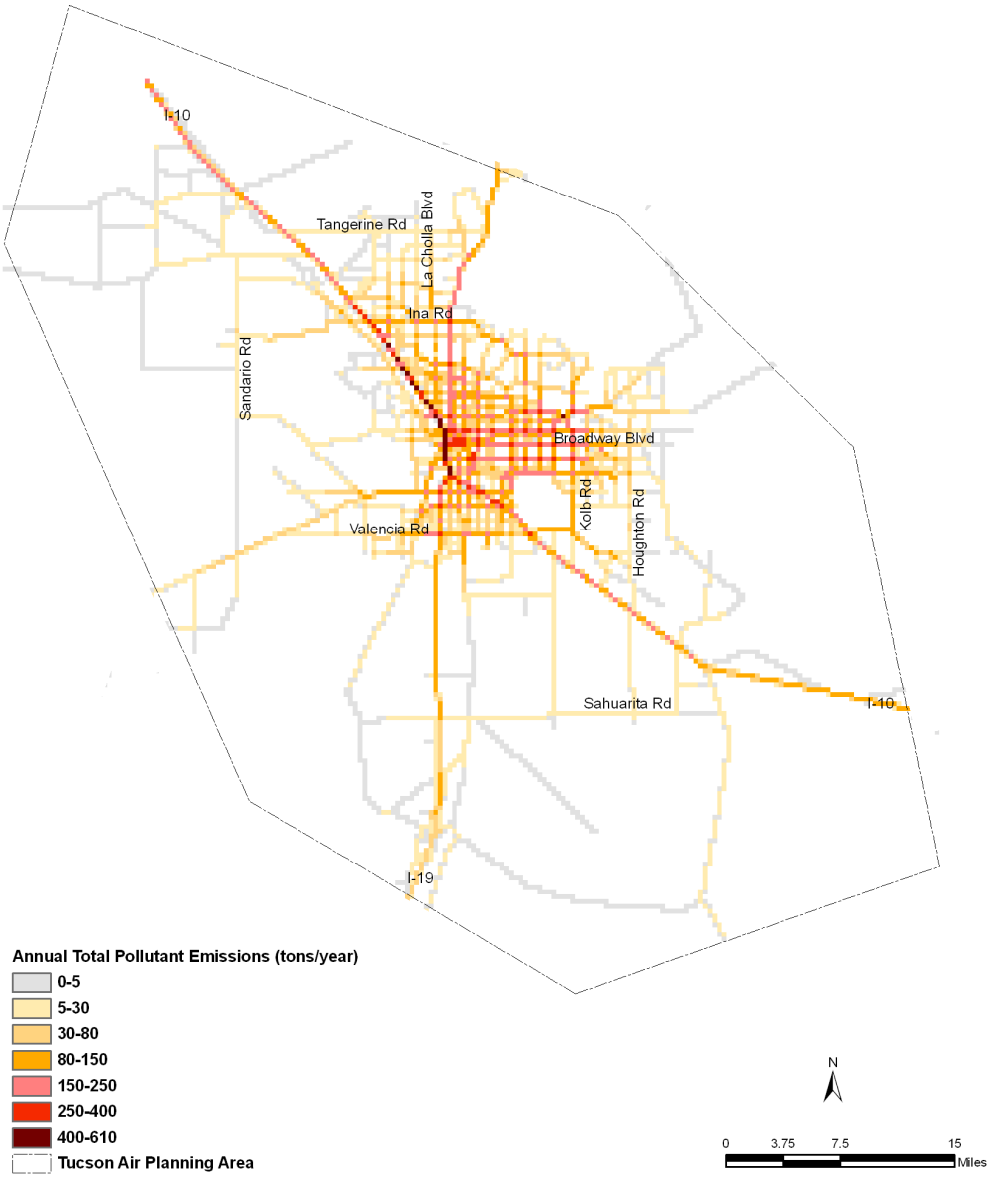


Figure 7.1. Annual Total Pollutant Emission Map for eastern Pima County, 2000 (tons/year)
Source: PAG 2000 On-Road Mobile Source Emissions Inventory, 2004

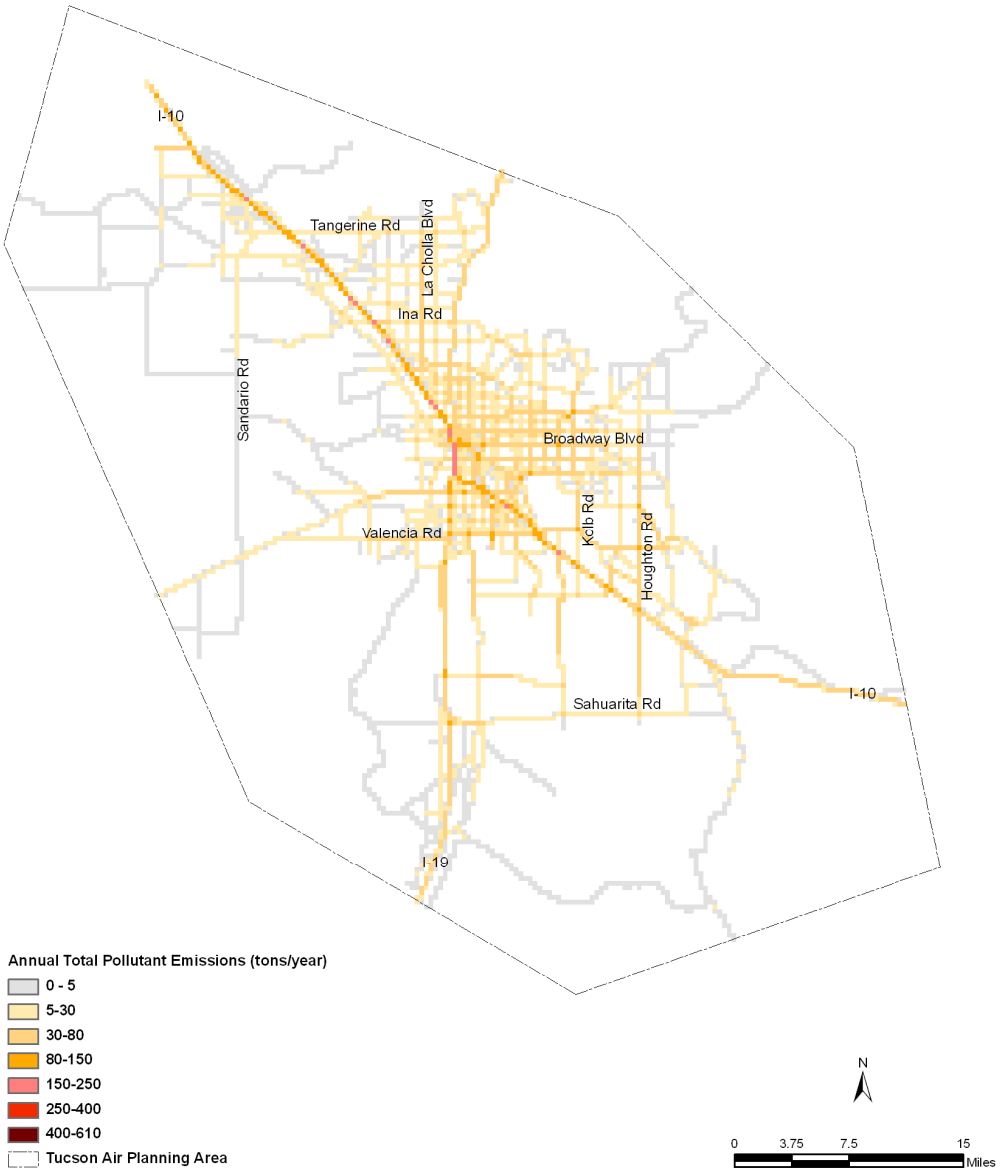


Figure 7.2. Projected Annual Total Pollutant Emission Map for eastern Pima County, 2030 (tons/year)

Source: PAG, 2006

County Strategies

Emissions Analysis - Vehicle Emissions Inspection Program (VEIP) and Oxyfuel Program

The VEIP and Oxyfuel Program are required elements of the Carbon Monoxide Limited Maintenance Plan. The state-operated VEIP began in 1977. This annual program uses the Basic Inspection Maintenance program to check whether the emissions control system on a vehicle is operating correctly. Testing is done for post-1967 vehicles. The On-Board Diagnostics test is required in the Tucson region for vehicles five years and older. The Oxyfuel Program was initiated in 1990. This program decreases CO tailpipe emissions in the winter months by adding ethanol and/or methyl tertiary butyl ether (MTBE) to all grades of motor fuel. Ethanol has been the predominant additive for the last nine years. The current oxygen content of winter motor fuels is 1.8 percent by weight. In 1996, the Arizona State Legislature approved a contingency plan for Pima County to raise the minimum oxygen content to 2.1 percent by weight in the event of a confirmed CO violation. A.R.S. 41-2125 gives PAG, with concurrence of the ADEQ director, the ability to increase the oxyfuel increment by not less than 0.3 percent by weight of oxygen and not more than the maximum allowed by EPA under specified conditions.

To evaluate these programs, PAG Air Quality Planning staff produced pollutant emission factor estimates for 2007 and 2011. The evaluation compares the emission reduction benefits with and without the VEIP and Oxyfuel Program in place. The evaluation also compares the emission reduction benefit derived from the current program (1.8 percent by weight oxygen) and a possible future scenario (in the event of a CO violation) if the oxygen content were raised by 0.3 percent to 2.1 percent by weight.

The EPA MOBILE6.2 model was used with the vehicle mix for Pima County (provided by ADOT) and an average area-wide vehicle speed of 29.5 mph with year specific traffic data. The "All Vehicle" category from the MOBILE6.2 model was used. MOBILE6.2 emissions modeling results reflect the averaging of the high and low altitude scenarios and the averaging of summer and winter values in the calculation of emission factors.

Table 7.2 illustrates the pollutant emissions benefits, in grams/mile traveled, for the combined total of CO, NOx, VOC, and PM_{10}, with and without the VEIP and the winter Oxyfuel Program, and including anti-tampering provisions (ATP). Detailed pollutant-specific emission factors can be found in Appendix A.

Table 7.2. Total Pollutant Annual Average Emission Factors (Combined CO, NO_x, VOC, and PM_{10}) (grams/mile)

Year	Case 1: No VEIP, no oxyfuel	Case 2: No VEIP, with winter 1.8% oxyfuel	Case 3: With VEIP, no oxyfuel	Case 4: With VEIP, with winter 1.8% oxyfuel*	Case 5: With VEIP, with winter 2.1% oxyfuel
2007	17.54	16.92	15.00	14.56	14.49
2011	13.44	13.08	11.11	10.84	10.80

* Case 4 describes the current programs in Tucson

The emission control measures adopted by the region are 1.8 percent by weight oxyfuel during the CO season (Oct. 1 - March 31), and an annual VEIP for vehicles five years and older. Table 7.3 reflects the combined emission savings resulting from the VEIP and Oxyfuel programs in tons/day for 2007.

Table 7.3. Modeled CO, NO_x, VOC, and PM_{10} Savings per Day due to State Vehicle Emissions Inspection and Oxyfuel Programs (tons/day)

Year	VEIP (No Oxyfuels)	VEIP and 1.8% Oxyfuel	VEIP and 2.1% Oxyfuel
2007	66.09	77.54	79.36

Source: PAG MOBILE6.2 modeling, 2007

In Pima County the emissions benefit of the VEIP in 2007 is estimated to be 66.09 tons/day total of CO, NO_x, VOC, and PM_{10} (PAG modeling, 2007). Pollutant emissions saved from the Oxyfuels Program are estimated to be 11.45 tons/day. The benefit of increasing the oxyfuel content to 2.1 percent from 1.8 percent by weight of oxygen is estimated to be 1.82 tons/day.

The benefits of the VEIP and Oxyfuel Program diminish over time due to projected fleet turnover, as older vehicles are retired from the Pima County fleet mix. One of the contributing factors is that most new cars are fitted with electronic fuel injection systems that automatically compensate for the proper air-to-fuel mixture to reduce emissions.

Other Programs

Reid Vapor Pressure

Reid Vapor Pressure (RVP) is a measurement of the stabilized pressure exerted by a volume of liquid at 100° F and therefore is considered a measure of gasoline volatility. Higher RVP and the warmer temperatures experienced in Tucson during winter can result in more gasoline vapors being generated, therefore producing uncontrolled exhaust emissions or enrichment. Lowering the RVP of gasoline can reduce the uncontrolled enrichment, thus decreasing CO exhaust emissions.

A.R.S. 41-2122 contains a contingency measure that allows for the establishment of a lower RVP (down to 9 psi) under certain circumstances, specifically if the CO NAAQS is violated. This only applies if the oxyfuels are already at their maximum level and a cost-benefit analysis of all other reasonable CO emission reduction measures that could be implemented in lieu of reducing RVP has been done. The lower RVP would then take effect beginning the winter following the CO NAAQS violation, and each winter thereafter. Following another violation of the NAAQS, the one psi waiver must be removed by ADEQ.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) use real-time, travel-related information to integrate all components of a traditional transportation system (roads, transit, traffic control devices, vehicles and drivers) into an interconnected network. ITS use advanced technologies in electronics, information processing, and communications to gather, process and distribute information necessary to maintain and increase the efficiency and safety of the functioning system.

The City of Tucson currently monitors and controls over 450 traffic signals from the City of Tucson Transportation Control Center. The City of Tucson, Arizona Department of Transportation, Pima County, Marana, Oro Valley, Sahuarita and the City of South Tucson are in partnership to provide a "seamless" traffic signal operation across jurisdictional boundaries. This has resulted in the interconnection of traffic signals, in and adjacent to the City of Tucson, into a centrally coordinated operation. This type of signal coordination improvement provides for improved traffic flow and is most effective in locally congested areas, where progressive flows can reduce stops and signal delay. The increase in flow rate and decrease in stops and idle time can lead to a significant reduction in vehicle emissions.

As part of a Federal Highway Administration (FHWA) case study, Tucson was analyzed for potential benefits related to planned ITS and operational improvements. FHWA modeling software was used along with data from the Tucson region travel forecast model to show the impacts of planned ITS and operational improvement through 2025. Study results showed an average reduction of 25 percent in travel time per day, and fuel use reduction of over 11 percent (nearly 60 gallons per Tucson resident) and a CO, hydrocarbon, and NO_x emission reduction of approximately 10, 12, and 16 percent, respectively (FHWA, 2005)

Clean Cities Program

The Clean Cities program is a national effort sponsored by the U.S. Department of Energy (DOE), to increase clean fuel vehicle usage, reduce the country's dependence on foreign petroleum sources, and improve air quality.

The local 71 member coalition consists of representatives from major utilities and other fuel providers, private companies, vehicle dealers, fleet owners and a variety of government agencies.

The program maintains a fuel-neutral position with respect to the promotion and use of all clean fuels. Currently, regional emphasis is placed on the use of biodiesel (B20 primarily used locally - 20 percent soybean oil, 80 percent diesel) E85 (85 percent ethanol, 15 percent gasoline), compressed natural gas (CNG), propane, hybrid electric, and truck and school bus idle reduction. The Coalition is working closely with school districts to implement clean fuel driver training programs, use of clean fuel vehicles, and an outreach program educating young drivers on alternatives to petroleum fuel.

The Coalition worked with the University of Arizona to implement an extensive E85 program in their FlexFuel Vehicles (FFVs). The University recently added a 4,000 gallon E85 tank to their facility at the motor pool site. The City of Tucson has also entered into an intergovernmental agreement with the University of Arizona to use E85 in their existing FFVs until other arrangements can be made. In December 2006, the City of Tucson modified all their diesel vehicles to run on B20.

Nationally, the number of clean fuel vehicles has grown, assisted by the Energy Policy Act of 1992; the act mandates federal and state governments to add a percentage of clean fuel vehicles to their fleets annually. Clean fuel vehicles are gaining acceptance and popularity as the public becomes more aware of their benefits. As reported by Coalition members, the number of local clean fuel vehicles continues to grow (Figure 7.3). In 2006, approximately 4.2 million gallons of gasoline were displaced with the implementation of Clean Cities strategies, which focus on the use of alternative fuels.

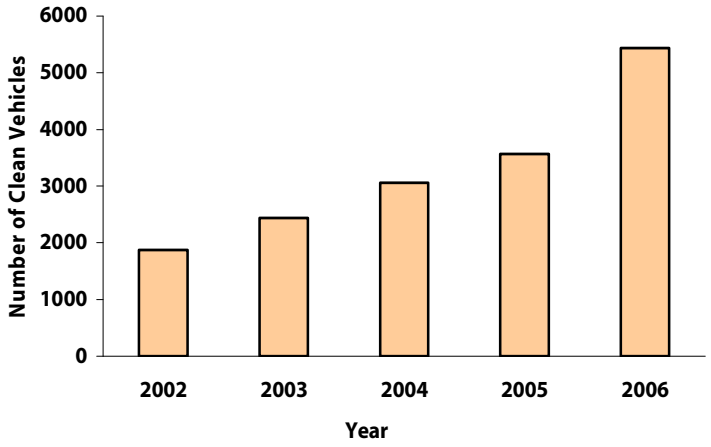


Figure 7.3. Number of Clean Fuel Vehicles in Pima County: 2002-2006

Source: PAG, 2006a; Crowninshield, 2007

A major obstacle to the proliferation of clean vehicles is the scarcity of adequate clean fueling infrastructure. Currently, the electric vehicle infrastructure is sufficient with five electric recharging stations throughout the Tucson area and one in Casa Grande. Propane refueling stations are available throughout the region. There is only one public-access CNG refueling station at the Tucson International Airport; a second CNG station is planned for the downtown area. There are 11 restricted-access (business/government) CNG stations throughout the county. Three public-access biodiesel outlets are available in the Tucson region. The state's first retail ethanol E85 station opened in December 2004, and since then, four more have opened in Tucson, one in Sierra Vista, and several are planned for Maricopa County. A map of alternative fueling sites in Pima County can be found at: http://www.pagnet.org/CleanCities/AFVSites.htm

Voluntary Vehicle Repair and Retrofit Program

The purpose of PDEQ's Voluntary Vehicle Repair and Retrofit (V2R2) Program is to reduce vehicle-related emissions by providing a financial incentive to repair older vehicles in order to pass the state emissions test. Established through state legislation in 1998, the V2R2 program began repairing vehicles in Pima County in 1999. On average, emissions are reduced by 81 percent per vehicle. At the end of 2005-06 fiscal year, over 3,360 vehicles have been repaired with a reduction of approximately 1,120 tons of emissions per year for the life of the repairs.

Gas Cap Replacement Program

PDEQ implemented the Gas Cap Replacement (GCR) Program in 2004-2005 with funding through ADEQ and a subsequent grant from the Gila River Indian Community. The program's goal is to reduce volatile organic compounds (VOCs) from mobile sources in southern Arizona. The objective of the GCR program is to provide replacement gas cap vouchers for leaky vehicle gas caps and locate vehicles with faulty gas caps that are exempt from the annual state emissions test. To date, 9,157 gas caps have been tested with 315 failures, a 3.4 percent failure rate. Based upon research from existing programs around the U.S., the potential reduction of air pollution per leaky gas cap replaced is estimated at 11.2 pounds of VOCs and four pounds of benzene per year. Based on the number of vouchers distributed through this program, it is estimated that up to 4,788 pounds of air pollution have been eliminated per year. Additionally, with the potential for as much as 30 gallons of gasoline evaporating per leaky gas cap, up to 9,450 gallons of gasoline will be saved per year through this program (PAG, 2006a) By replacing a leaking gas cap, a consumer could save approximately $76.00 per year (based on an average price of $2.52 /gallon of regular gasoline).

These values may underestimate gas cap leakage and subsequent program benefits under Arizona conditions. With our high temperatures and low humidity, we could realize greater reductions in VOC and benzene emissions per year.

PAG RideShare Program

The RideShare Program was established in 1974 and is administered by PAG. It offers a free computer-matching service for people interested in carpooling to work or college. In 2003, PAG conducted a database user's survey indicating that 29 percent of the RideShare applicants were actively carpooling. At the beginning of 2004, RideShare instituted an Internet-based application system for commuters seeking a carpool matching list. Since its inception, more than 500 commuters have registered for carpool matching through the PAG Web page.

In 2005, RideShare averaged over 2,200 carpool lists sent to commuters each month. At the close of 2006, in preparation for joining a statewide online carpool matching system, the RideShare carpool database was purged to approximately 2,000 current registrants representing over 500 employment locations.

At present, RideShare is working with Valley Metro in Phoenix and the Arizona Department of Transportation to develop a statewide interactive online carpool matching system. This system will benefit commuters traveling between counties and looking for carpool partners.

In 2002, RideShare launched the first regional guaranteed RideHome program for carpoolers. RideHome provides a safety net to the carpooler by offering four taxi rides per year for emergency purposes. In 2005, the RideHome was expanded to include Sun Tran bus riders from the more than 250 employers in the Travel Reduction Program. In 2006, over 300 vouchers were distributed for use by commuters, with four used for emergency rides.

Data from the 2003 American Community Survey, released in March 2005, indicate that carpool use in Tucson is significantly higher than the national average (Tucson, 12.2 percent and United States, 10.4 percent).

PAG Travel Reduction Program

The Travel Reduction Program (TRP) was created in 1988 when Pima County, Tucson, South Tucson, Marana and Oro Valley each passed Travel Reduction Ordinances (TROs). The town of Sahuarita passed its ordinance and joined the program in 1996. The ordinances are reviewed every three years, with the next review in 2008. The goals of the ordinances are to reduce traffic congestion and improve air quality. The TRP is implemented through PAG, working with major employers, those with 100 or more full-time equivalent employees at a single or contiguous site; an employer with less than 100 employees can voluntarily participate in the TRP.

Employers in the TRP encourage their employees to reduce the vehicle miles traveled through the use of alternate travel modes (carpooling, vanpooling, use of public transportation, bicycling, walking), compressed workweeks or teleworking. Employees participating in the TRP represent 29 percent of the total regional workforce in Pima County. Table 7.4 shows a comparison of the regional results from 1989 (base year) with the results of 2001 through 2005.

Table 7.4. Annual TRP Survey Results

Year	Average AMU (%)	Average VMT	Number of Job Sites	Total Employees	Average Survey Response Rate (%)
1989*	17.6	47.3	148	77,230	68.5
2001	31.0	56.2	269	111,086	87.7
2002	29.2	58.6	269	112,518	84.9
2003	28.6	58.1	271	108,705	86.0
2004	29.2	57.1	279	112,588	86.6
2005	30.4	57.4	283	113,242	86.4

* 1989 is the base year for the TRP

Source: PAG, 2006a

The TRP is evaluated annually based on two factors: reduction in the average weekly one-way motor vehicle miles traveled (VMT) and employee alternate mode usage (AMU). While the average VMT has increased over the past 16 years, a greater percentage of workers are using alternate modes of transportation (Table 7.4).

Data indicate that TRP respondents have been residing farther from their work site since 1989; however, the average weekly commute (one-way miles) has essentially held steady at approximately 57 miles from 2003-2005 (Figure 7.4).

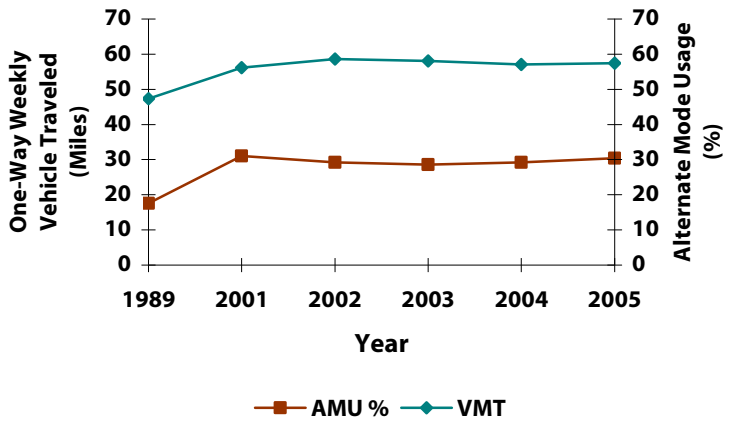


Figure 7.4. Annual Percentage of Alternate Mode Usage and One-Way Weekly Vehicle Miles Traveled: 1989-2005

Increasing alternate mode usage is directly associated with decreased gasoline use. Mileage and gasoline use also are reduced due to compressed workweeks, trips avoided by field workers, and less driving days due to teleworking. In calculating 2005 savings, an average fuel efficiency value of 20 miles per gallon and a driving cost of $0.405 per mile were used (U.S. Internal Revenue Service standard mileage rate for 2005). Therefore, each mile "not driven" saved $0.405. Pollution savings are calculated based on an average emission rate of one pound of pollution for every 23 miles driven (PAG Air Quality MOBILE6.2 model). The 2005 TRP savings based on the vehicle miles saved from alternate mode usage are shown in Table 7.5.

Table 7.5. 2005 TRP Savings from Alternate Mode Usage

Vehicle Miles Not Traveled	89.6 million miles
Gasoline Not Consumed	4.5 million gallons
Driving Costs Saved	36.3 million dollars
Pollution Prevented	3.9 million pounds

Source: PAG, 2006a

The TRP continues to be supported by the six jurisdictions, the Pascua Yaqui Tribe and Tohono O'odham Nation. PAG continued to support the USEPA and USDOT Best Workplaces for Commuters program. Forty employers in 2006 were awarded the

designation of a Best Workplaces for Commuters based on meeting the program's national standard of excellence to provide commuting benefits to their employees.

Vanpool Incentive Program

The TRP staff continues to promote and implement the Vanpool Incentive Program (VIP) developed in 2002 with a "Contributor Agreement" with Enterprise Rent-A-Car Inc. The program administers a $400 monthly subsidy, provided by PAG, per van to qualified TRP employees. The VIP has 17 vans on the road with growing interest among other TRP employees regarding vanpools. The current participants are: Raytheon Missile Systems (two vans), Federal Correctional Institution (five vans), Indian Health Services – Sells (eight vans), Town of Marana (one van), and Ventana Medical Systems (one van). Annual savings from these vans are: 938,040 miles, 46,452 gallons of gasoline, 413,423 dollars, 40,393 pounds of pollution, 153 less parking spaces, and 34,578 dollars saved in parking costs.

PDEQ Clean Air Program

The goals of the PDEQ's national award-winning program are to increase awareness of air quality issues and encourage actions to reduce air pollution. PDEQ's Clean Air Program (referred to as the Voluntary No-Drive Day Program in the SIP) is a state-mandated program that began in 1988 to address CO violations in Pima County. This Program employs several methods to achieve its goals including: Community Outreach, School and Youth Programs, and Annual Public Events.

During the 2005/2006 fiscal year:

- approximately 3,336 individuals attended Clean Air Program presentations,
- 106,700 participated in community events,
- 14 educators received air quality curricula or training,
- 78,950 mailings delivered program materials,
- 311,350 requests for information were made to the PDEQ Web site,
- 618,000 requests for information were made to the Air Info Now Web site,
- 1,450 calls were processed for the Smoking Vehicle Hotline,
- 148,500 educational brochures or items were distributed to the public.

Mass Transit

Sun Tran provides fixed-route transit service within the City of Tucson, and into Pima County, South Tucson, Marana, Oro Valley, and the Pascua Yaqui Tribe. The system's 37 fixed routes cover a 226-square-mile area.

Ridership on Sun Tran has grown for a fourth consecutive year. The system experienced an 8.4 percent increase in ridership during FY 2005-2006 compared to the previous fiscal year. Sun Tran set an annual ridership record, carrying more than 17.1 million riders in FY 05-06.

Currently, approximately 90 percent of Sun Tran's fleet is powered by clean-burning fuel

technologies (CNG, B20, and dual-fueled (CNG/diesel)). In 2005, Sun Tran added 38 new replacement buses to its fleet that are fueled with B20. Like compressed natural gas, B20 emits significantly fewer particulates than traditional diesel-fueled vehicles. Another 136 buses are either dedicated CNG or dual-fueled buses. Sun Tran expects to take delivery of 12 additional biodiesel replacement buses in 2007.

For added convenience to transit users, Sun Tran serves 20 free park and ride lots across the region. Each bus is equipped with bike racks and folding bicycles are accommodated on board. Rental bike lockers are available at a nominal charge at five of the park and ride lots and other select bus stop locations.

Through Sun Tran's commuter pass program, *Get on Board*, most governmental employers in Tucson offer reduced-cost bus passes as an employee benefit. A partnership with PAG enables Sun Tran to offer *Guaranteed RideHome*, which provides a free taxi ride home in an emergency. In addition to Travel Reduction Program companies, *Get on Board* members are qualified to join the program and are eligible for up to four free taxi vouchers a year.

Bicycling

The City of Tucson has had designated bicycle facilities since 1971 and Pima County has developed bikeways since the mid-1970s. The first comprehensive plan for bicycling was developed by PAG in 1974, and is updated every five years. The consistent addition of bikeways, including bike routes, bike lanes, roadway shoulders, and shared-use paths (classed as pedestrian facilities) has helped in maintaining constant bike usage.

In 1993, the City of Tucson first received designation as a Bicycle Friendly City by the League of American Bicyclists. In 2004, the League categorized Tucson as a Silver-level Bicycle Friendly Community, making it one of only four communities in the nation, and one of 12 communities to be ranked as a Bicycle Friendly City. In 2004, an effort was organized to achieve a regional Platinum Bicycle Friendly Community rating in 2006. This effort resulted in the PAG region receiving the League's first regional award, and a designation at the "Gold" level.

Bikeways in the metropolitan area are currently estimated at more than 650 miles. The adopted 2000 PAG Regional Plan for Bicycling calls for 800 miles of bikeways by 2010 and 1,200 miles of bikeways by 2020. In addition, it is local government policy to include bike lanes on all new street construction and reconstruction projects.

The 2000 PAG Tucson Household Travel Survey indicated, approximately 2 percent of the region’s residents used bicycle travel for their home-to-work commute, and it is estimated that slightly more than 3 percent of all travel is by bicycle (PAG, 2005).

Walking

Pedestrian travel has become an increasingly important issue in the Tucson region. Approximately 5 percent of all regional trips are by walking. Investment in pedestrian

facilities is now a major component of the transportation planning process in every jurisdiction for a variety of health, safety and mobility benefits.

In 2000, PAG completed the first Regional Pedestrian Plan, which is used to develop and improve pedestrian facilities throughout the Tucson region. The plan has a special focus on improving pedestrian safety, accessibility and connectivity along the existing roadway network and river park system.

It includes specific recommendations on the following issues:

- Design standards for sidewalks, ramps, crosswalks and traffic signals
- Compliance with the Americans Disability Act (ADA) accessibility guidelines
- Inclusion of pedestrian facilities in local land use development policy
- Pedestrian safety education and enforcement
- Sidewalk inventory and mapping
- Promotional activities for pedestrian travel, and
- Inclusion of pedestrian planning in all transportation planning processes.

In late 2003, PAG completed an inventory and map of existing sidewalks along all collectors and arterials within the Tucson region. The map identifies missing sidewalk gaps and wheelchair ramps that need to be constructed in compliance with federal ADA requirements. During the second phase of this project, a sidewalk project ranking system was developed by PAG with the guidance of local pedestrian planners, advocates and representatives from the disabled community.

The sidewalk inventory and ranking system was the basis for the development of a pedestrian element within the 20-year Regional Transportation Authority (RTA) plan, approved by voters in May 2006. The plan includes over $60 million for new sidewalks, paths, wheelchair ramps, signalized pedestrian crossings, and funding for the Safe Routes to Schools Program. This investment will greatly enhance pedestrian travel in the region.

8. CONCLUSIONS

Favorable air quality is essential to the economic viability of metropolitan Tucson, the physical health of its residents and the preservation of its desert ecosystem. We are fortunate that Tucson area residents generally breathe healthy air.

Carbon monoxide results from the incomplete combustion of fossils fuels. Nationally, carbon monoxide emissions and concentrations have decreased dramatically from 1970-2005. These reductions can be attributed to tougher federal restrictions on vehicle emissions, including stricter tailpipe emission standards, increased use of new technology, and to a lesser degree, stricter regulation of industrial facilities. Locally, more than 95 percent of carbon monoxide emissions are attributed to mobile sources, with almost 60 percent from on-road motor vehicle exhaust. The region last violated the EPA health standard in 1984.

Dust from paved and unpaved roads, wood smoke, earth moving, mining, and agricultural activities are all sources of particulate matter. Overall, particulate emissions and concentrations have been declining since the 1970s at the national, state and county levels. Contributing to this decline are control measures aimed at vehicle emissions, industrial regulations, and dust abatement practices. Locally, particulate matter concentrations tend to be below the EPA health standards. While vehicle tailpipe emissions of coarse particulates are minimal, fugitive dust from vacant lands, paved and unpaved roads contribute to elevated levels in the region, particularly in conjunction with dry and windy conditions.

Ground level ozone forms when its precursors, volatile organic compounds and oxides of nitrogen, react in sunlight. Ozone precursors are generated by motorized vehicles, power plants, and industrial facilities. Over the past 35 years, national ozone precursor emissions and concentrations have declined. While state precursor emissions have decreased, ozone concentrations in the Phoenix area have routinely exceeded the national health standard. In Pima County, on-road motor vehicles contribute over one third of the ozone precursor emissions. These precursor emissions have declined somewhat over the last decade, but ozone concentrations remain around 90 percent of the EPA health standard. The region has not experienced any violations of the ozone health standard.

Pollutants contributing to regional haze impair visibility in both urban and natural areas. However, stricter vehicle and fuel regulations and increased management of coal-fired power plants and closure of smelters have reduced sulfate and nitrogen oxide emissions that contribute to visibility impairment. Citizens in the western U.S. are generally able to enjoy a high degree of visibility. In the urban areas of Phoenix and Tucson, visibility on the worst days has increased over the last decade, with the Tucson area showing greater improvement during this period. On occasion, thermal inversions or high winds together with air pollutant emissions can lead to periods of impaired visibility.

The major source of anthropogenic U.S. greenhouse gas (GHG) emissions is the burning of fossil fuels. The Global Climate Change Initiative of 2002 sets national goals for reducing

GHG emissions through a variety of voluntary programs that encourage the use of alternate energy sources, establish cooperative agreements with industry, and promote smart growth. In Arizona, based on the results of a recent state inventory, GHG emissions have increased 56 percent from 1990 to 2005. Arizona's Gov. Napolitano has taken a leadership role by establishing a Climate Change Executive Committee, in cooperation with state industry representatives, to work on implementing recommendations to reduce state GHG emissions to mandated target levels. Arizona also has partnered with several western states to develop regional GHG reduction targets. Locally, utility companies, builders, and local officials are initiating policies and programs that promote more efficient energy use, increase use of alternative modes of transportation and alternate fuels, and reduce urban sprawl.

Mobile sources are responsible for the majority of air pollution in the Tucson region. Federal programs have successfully reduced mobile source emissions primarily by targeting vehicle manufacturers and fuel suppliers. State and county programs such as the vehicle inspection programs, use of oxygenated fuels, reformulated gas (Phoenix) and travel reduction have also reduced state and local mobile source emissions. In the Tucson region, the emissions reduction from the vehicle emissions inspection program and use of oxygenated fuels in winter was modeled and resulted in a pollution savings of 76 tons/day for 2007.

Currently, the Tucson area meets all federal health standards. Should EPA adopt more stringent standards, particularly for ozone, the region could exceed regulatory limits and require implementation of local measures to improve air quality. These could include cleaner burning fuels or a more stringent vehicle inspection program. However, with the increasing availability of cleaner fuels and vehicles along with stricter regulation of vehicle tailpipe emissions, it is expected that air quality will continue to improve nationally and in the Tucson region.

9. LIST OF ACRONYMS

A.R.S. - Arizona Revised Statutes

ADA - American Disability Act

ADEQ - Arizona Department of Environmental Quality

ADOT - Arizona Department of Transportation

AFV - Alternative Fuel Vehicles

ADT - Average Daily Traffic

AMU - Alternate Mode Usage

ATP - Anti-Tampering Provisions

B20 - Biodiesel containing 20 percent vegetable oil and 80 percent diesel

BART - Best Available Retrofit Technology

CAA - Clean Air Act

CBG - Cleaner Burning Gas

CCAG - Climate Change Advisory Group

CFR - Code of Federal Regulations

CNG - Compressed Natural Gas

CO - Carbon Monoxide

CO_2 - Carbon Dioxide

DOE - U.S. Department of Energy

E85 – Fuel Blend of 85 percent Ethanol and 15 percent Gasoline

EI - Emissions Inventory

EPA - U.S. Environmental Protection Agency

GPM - Grams per Mile

GHG - Greenhouse Gases

GWP - Global Warming Potential

HB - House Bill

HCP - Habitat Conservation Plan

IPCC - Intergovernmental Panel on Climate Change

ITS - Intelligent Transportation System

LMP - Limited Maintenance Plan

MAG - Maricopa Association of Governments

MPH - Miles per Hour

MTBE - Methyl Tertiary Butyl Ether

NAAQS - National Ambient Air Quality Standards

NEAP - Natural Events Action Plan

NO_x - Oxides of Nitrogen

NO_2 - Nitrogen Dioxide

N_2O - Nitrous Oxide

O_3 - Ozone

OBD - On-Board Diagnostics

PAG - Pima Association of Governments

PDEQ - Pima County Department of Environmental Quality

PM - Particulate Matter

PPM - Parts per Million

RHR - Regional Haze Rule

RTA - Regional Transportation Authority

RTP - Regional Transportation Plan

RVP - Reid Vapor Pressure

SIP - State Implementation Plan

SO_2 - Sulfur Dioxide

SO_x - Sulfur Oxides

TAPA - Tucson Air Planning Area

TCM -Transportation Control Measure

TIP -Transportation Improvement Program

TRO - Travel Reduction Ordinance

TRP - Travel Reduction Program

V2R2 - Voluntary Vehicle Repair and Retrofit

VEIP - Vehicle Emissions Inspection Program

VIP - Vanpool Incentive Program

VMT - Vehicle Miles Traveled

VOC - Volatile Organic Compounds

WRAP - Western Regional Air Partnership

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APPENDIX A: Emission Analysis

CASE 1: No VEIP, No Winter Oxyfuel

	Emission Factors (g/mi) 2007		
	Winter	Summer	Average
VOC	1.63	1.53	1.58
CO	16.03	12.15	14.09
NO_x	1.89	1.74	1.82
PM_{10}	0.05	0.05	0.05
Total	**19.60**	**15.47**	**17.54**

	Emission Factors (g/mi) 2011		
	Winter	Summer	Average
VOC	1.23	1.16	1.20
CO	12.85	9.12	10.99
NO_x	1.32	1.12	1.22
PM_{10}	0.04	0.04	0.04
Total	**15.44**	**11.44**	**13.44**

CASE 2: No VEIP, 1.8% Winter Oxyfuel

	Emission Factors (g/mi) 2007		
	Winter	Summer	Average
VOC	1.58	1.53	1.56
CO	14.85	12.15	13.50
NO_x	1.89	1.74	1.82
PM_{10}	0.05	0.05	0.05
Total	**18.37**	**15.47**	**16.92**

	Emission Factors (g/mi) 2011		
	Winter	Summer	Average
VOC	1.19	1.16	1.18
CO	12.09	9.12	10.61
NO_x	1.32	1.20	1.26
PM_{10}	0.04	0.04	0.04
Total	**14.64**	**11.5165**	**13.08**

CASE 3: With VEIP, No Winter Oxyfuel

	Emission Factors (g/mi) 2007		
	Winter	Summer	Average
VOC	1.46	1.38	1.42
CO	13.40	10.21	11.81
NO_x	1.80	1.66	1.73
PM_{10}	0.05	0.05	0.05
Total	**16.71**	**13.3**	**15.00**

	Emission Factors (g/mi) 2011		
	Winter	Summer	Average
VOC	1.08	1.03	1.06
CO	10.39	7.33	8.86
NO_x	1.21	1.09	1.15
PM_{10}	0.04	0.04	0.04
Total	**12.72**	**9.49**	**11.11**

CASE 4: With VEIP, 1.8 % Winter Oxyfuel

Emission Factors (g/mi) 2007

	Winter	Summer	Average
VOC	1.42	1.38	1.40
CO	12.55	10.21	11.38
NO_x	1.80	1.66	1.73
PM_{10}	0.05	0.05	0.05
Total	**15.82**	**13.3**	**14.56**

CASE 5: With VEIP, 2.1 % Winter Oxyfuel

Emission Factors (g/mi) 2007

	Winter	Summer	Average
VOC	1.41	1.38	1.40
CO	12.41	10.21	11.31
NO_x	1.8	1.66	1.73
PM_{10}	0.05	0.05	0.05
Total	**15.67**	**13.3**	**14.49**

With VEIP, 1.8 % Winter Oxyfuel

Emission Factors (g/mi) 2011

	Winter	Summer	Average
VOC	1.05	1.03	1.04
CO	9.91	7.30	8.61
NO_x	1.21	1.09	1.15
PM_{10}	0.04	0.04	0.04
Total	**12.21**	**9.46**	**10.84**

With VEIP, 2.1 % Winter Oxyfuel

Emission Factors (g/mi) 2011

	Winter	Summer	Average
VOC	1.05	1.03	1.04
CO	9.83	7.30	8.57
NO_x	1.21	1.09	1.15
PM_{10}	0.04	0.04	0.04
Total	**12.13**	**9.47**	**10.80**

APPENDIX B: CAL3QHC Modeling Details

Model Settings for MOBILE6.2 Runs:

- Free flow link speeds were set at 35 miles per hour (mph) for each link.
- Emission factors were derived using the MOBILE6.2 model, averaging high and low altitude scenarios for 2006, with the current Tucson region Vehicle Emissions Inspection Program (VEIP), Reid Vapor Pressure (RVP) of 10.12 pounds per square inch (psi) (actual 2005-2006 winter average), and oxyfuels at 1.8 percent by weight (100 percent ethanol blend).
- The idle emission factor was obtained by multiplying the 2.5 mph emission factor by 2.5 (standard methodology).
- The mixing height was set at 1,000 meters, with a stability class of 4 (D).
- Wind speed was set at 1 meter per second. Concentrations were calculated for multiple wind directions at 10° intervals for 360°. This allowed for the calculation of the highest CO concentration at the receptor using all wind directions (at 10° intervals).
- The receptor height was set at 1.8 meters. The background concentration used was 0.50 ppm. This concentration reflects the average 1-hour concentration at the 22nd Street/Craycroft monitor for the months of November through January of the last two CO seasons (2004-2005 and 2005-2006).
- The persistence factor to convert the 1-hour CO concentration derived from the model to reflect an 8-hour average was calculated to be 0.56. This was obtained from the 10 highest non-overlapping 8-hour averages at the 22nd Street/Alvernon monitor, using the ratio of the 8-hour average to the maximum 1-hour average concentration for that 8-hour period. Concentrations were calculated for the 2006 modeling scenario.
- The background concentration calculated for this modeling effort is lower than last year's, and the persistence factor is slightly higher than the 2005 value.

Appendix F

Arizona Revised Statutes Section authorizing contingency measures for
CO Limited Maintenance Plan

41-2122. Standards for oxygenated fuel; volatility; exceptions

A. From and after September 30 through March 31 of each year, in a county with a population of one million two hundred thousand or more persons and in any portion of a county contained in area A, blends of gasoline with ethanol shall not exceed the volatility requirements prescribed by section 41-2083 and rules adopted by the director under that section. From and after September 30, 1999 through March 31, 2000 and from and after September 30 through March 31 of each year thereafter, in area B, blends of gasoline with ethanol may exceed the volatility requirements prescribed by section 41-2083 and rules adopted by the director under that section by up to one pound per square inch if the base fuel meets the requirements of ASTM D4814 and the final gasoline-ethanol blend contains at least six per cent ethanol by volume but does not exceed United States environmental protection agency waivers. For any other locations and period of time, blends of gasoline with ethanol shall meet the volatility requirements as determined by department rule.

B. Notwithstanding subsection D of this section, the director of the department of weights and measures in consultation with the director of the department of environmental quality shall approve alternate fuel control measures that are submitted by manufacturers or suppliers of gasoline and that the directors determine will result in motor vehicle carbon monoxide emission reductions that will equal or exceed the reductions that result under subsection D of this section. In making those determinations, the directors shall compare the alternative measure against the emission reduction that would be obtained from a fuel with the maximum vapor pressure standard prescribed by subsection D of this section and the minimum oxygen standard prescribed by section 41-2123 or 41-2125. Alternative fuel control measures approved by the director of the department of weights and measures in consultation with the director of the department of environmental quality may be used by any manufacturer or supplier of gasoline unless the approval is rescinded by the director of the department of weights and measures at least one hundred eighty days before the beginning of any oxygenate period in the future. Manufacturers and suppliers who choose to use an approved alternate fuel control measure shall annually submit a compliance plan to the director of the department of weights and measures not later than sixty days prior to the start of the oxygenate period.

C. From and after September 30 through March 31 of each year, all blends of gasoline with alcohol other than ethanol shall satisfy all of the requirements prescribed by section 41-2083 and rules adopted by the director under that section and the provisions of a waiver issued by the United States environmental protection agency pursuant to 42 United States Code section 7545(f).

D. Notwithstanding subsection A of this section, if the director of the department of environmental quality has previously raised the minimum oxygen content to the maximum percentage of oxygen allowed for each oxygenate as provided by section 41-2125, the designated air quality planning agency for area B has considered, analyzed and reviewed the costs and benefits of all other reasonable and available control measures in lieu of reducing volatility requirements to nine pounds per square inch and the director of the department of environmental quality finds that area B has failed to maintain the carbon monoxide national ambient air quality standards by violating the standard, beginning with the oxygenate period beginning on the following September 30 and for each oxygenate period thereafter in area B, the volatility requirements described by section 41-2083, subsection G may be reduced to nine pounds per square inch. If a violation of the carbon monoxide national ambient air quality standards is recorded after the volatility requirements have been reduced to nine pounds per square inch, the director of the department of environmental quality shall remove the one pound per square inch waiver for gasoline-ethanol blends.

E. Beginning on January 1, 2005, gasoline that is supplied or sold by any person and that is intended as a final product for the fueling of motor vehicles within this state shall not contain the following:

1. Methyl tertiary butyl ether that exceeds 0.3 per cent by volume.

2. Beginning on January 1, 2006, a total of more than 0.10 per cent oxygen by weight collectively from all of the following oxygenates:

(a) Diisopropylether (DIPE).

(b) Ethyl tert-butylether (ETBE).

(c) Iso-butanol.

(d) Isopropanol.

(e) Methanol.

(f) N-butanol.

(g) N-propanol.

(h) Sec-butanol.

(i) Tert-amylmethylether (TAME).

(j) Tert-butanol.

(k) Tert-pentanol (tert-amylalcohol).

F. Subsection E of this section does not prohibit the transshipment through this state, including storage incident to that transshipment, of gasoline that contains the oxygenates prescribed by subsection E of this section if both of the following apply:

1. The gasoline is used or disposed outside this state.

2. The gasoline is segregated from gasoline that is intended for use inside this state.

41-2125. Area B; sale of gasoline; oxygen content

A. From and after September 30 through March 31 of each year, all gasoline that is supplied or sold by any person and that is intended as a final product for the fueling of motor vehicles within area B or that is consumed in a motor vehicle within area B by a fleet owner shall contain not less than 1.8 per cent by weight of oxygen nor more than the maximum percentage of oxygen allowed by the provisions of a waiver issued by the United States environmental protection agency.

B. Notwithstanding subsection A of this section, at any time earlier than sixty days before September 30 of each year, the designated air quality planning agency for area B with the concurrence of the director of the department of environmental quality may give notice, pursuant to the applicable plan required under section 49-406 for the Tucson air planning area, to the director of the department of weights and measures that the minimum oxygen content for the ensuing oxygenate seasons will be increased not less than .3 per cent by weight of oxygen and not more than the maximum percentage of oxygen allowed for oxygenates by provisions of a waiver issued or other limits established by the United States environmental protection agency. Before making a determination to increase the minimum oxygen content pursuant to this subsection, the designated air quality planning agency for area B shall consider and conduct a cost-benefit analysis on all reasonable carbon monoxide emission reduction measures that could be implemented in lieu of increasing the minimum oxygen content.

Appendix G

Resolutions from the PAG jurisdictions concerning priorities for Transportation Improvement Programs

RESOLUTIONS RELATING TO COMMITMENTS MADE BY EACH PAG JURISDICTION TO IMPLEMENT TRANSPORTATION IMPROVEMENTS WITHIN ITS JURISDICTION AS REQUIRED BY THE CONTINGENCY ELEMENT IN THE 1996 CARBON MONOXIDE LIMITED MAINTENANCE PLAN FOR THE TUCSON AIR PLANNING AREA

ADOPTED BY THE
MAYOR AND COUNCIL

JUN 24 1996

RESOLUTION NO. 17319

RELATING TO AIR QUALITY; COMMITTING THE CITY OF TUCSON TO IMPLEMENT TRANSPORTATION IMPROVEMENTS AS REQUIRED BY THE CONTINGENCY PLAN ELEMENT IN THE 1996 CARBON MONOXIDE MAINTENANCE PLAN.

WHEREAS, the Tucson Air Planning Area qualifies for the Limited Maintenance Plan Option for nonclassifiable carbon monoxide nonattainment areas as announced by the Environmental Protection Agency; and

WHEREAS, the 1996 Carbon Monoxide Maintenance Plan is scheduled for adoption by the Pima Association of Governments on June 26, 1996; and

WHEREAS, the Pima Association of Governments has adopted the Mobility Management Plan which includes a congestion mitigation strategy to implement traffic operations improvement, such as the installation of traffic surveillance and control equipment, computerized signal systems, motorist information systems, integrated traffic control systems, roadway channelization, and intersection improvements; and

WHEREAS, Environmental Protection Agency approval of the 1996 Carbon Monoxide Maintenance Plan depends upon a commitment by each Pima Association of Governments jurisdiction that the jurisdiction will ratify the Plan and will implement specific transportation system management improvements such as additional signal light coordination, turn lanes, and other measures as may be required for "hot-spot" mitigation through the procedures set up in the contingency plan elements of the 1996 Carbon Monoxide Maintenance Plan; and

WHEREAS, such "hot-spot" mitigation measures will be required by the 1996 Carbon Monoxide Maintenance Plan only where "hot-spot" violations of the Carbon Monoxide National Ambient Air Quality Standard are predicted by Pima Association of Governments staff to occur within five years without defined transportation system management improvements.

NOW, THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, AS FOLLOWS:

Section I. That the City of Tucson will implement appropriate transportation and system management improvements to fully mitigate any identified potential "hot-spot" violation of the Carbon Monoxide National Ambient Air Quality Standards as predicted by Pima Association of Governments staff prior to the date of the projected violation, by providing highest priority to required mitigation improvements at such identified "hot-spot" intersections in the City of Tucson Capital Improvement Program.

Section 2. The City Clerk is hereby authorized and directed to send a copy of this Resolution to the Director of the Pima Association of Governments.

Section 3. The various City officers and employees are authorized and directed to perform all acts necessary or desirable to give effect to this resolution.

Section 4. WHEREAS, it is necessary for the preservation of the peace, health and safety of the City of Tucson that this resolution become immediately effective, an emergency is hereby declared to exist and this resolution shall be effective immediately upon its passage and adoption.

PASSED, ADOPTED AND APPROVED BY THE MAYOR AND COUNCIL OF THE CITY OF TUCSON, ARIZONA, JUN 24 1996.

George Miller

MAYOR

ATTEST:

CITY CLERK

APPROVED AS TO FORM:

CITY ATTORNEY

REVIEWED BY:

CITY MANAGER

TR:cds
6/5/96

I:\1work\cd\carreso.doc

RESOLUTION NO. (R)96-38

A RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF ORO VALLEY, ARIZONA, AUTHORIZING A COMMITMENT TO IMPLEMENT 1996 CARBON MONOXIDE LIMITED MAINTENANCE PLAN FOR THE TUCSON AIR PLANNING AREA BY IMPLEMENTING TRANSPORTATION IMPROVEMENTS WITHIN ITS JURISDICTION.

WHEREAS, the Tucson Air Planning Area qualifies for the Limited Maintenance Plan Option for non-classifiable CO Nonattainment areas as announced by EPA on October 6, 1995; and

WHEREAS, the Plan is scheduled for adoption by the Pima Association of Governments (PAG) on June 26, 1996; and

WHEREAS, The Town of Oro Valley is a member of PAG; and

WHEREAS, PAG has adopted the Mobility Management Plan which includes a congestion mitigation strategy to implement "Traffic operations improvements, such as the installation of traffic surveillance and control equipment, computerized signal systems, motorist information systems, integrated traffic control systems, roadway channelization, and intersection improvement;" and

WHEREAS EPA approval of the Plan depends upon a commitment by each PAG jurisdiction that they will ratify the Plan and implement specific transportation system management improvements such as additional signal light coordination, turn lanes, etc., as required for hot-spot mitigation through the procedures set up in the contingency element of the plan; and

WHEREAS, such hot-spot mitigation measures will only be required by the Plan where hot-spot violations of carbon monoxide National Ambient Air Quality Standards are predicted by PAG staff to occur within five years without defined transportation system management improvements.

NOW, THEREFORE, BE IT RESOLVED that the Mayor and Town Council of the Town of Oro Valley, Arizona, hereby:

1. That the Town of Oro Valley will implement appropriate transportation system management improvements to fully mitigate the problem prior to the date of the projected violation by giving high priority to such improvements in their capital improvement program.

2. That the Mayor of the Town of Oro Valley and other administrative officials are hereby authorized to take such steps as may be necessary to execute and carry out said agreement.

PASSED AND ADOPTED by the Mayor and Town Council of the Town of Oro Valley, Arizona this 5th day of June, 1996

TOWN OF ORO VALLEY, ARIZONA

MAYOR

ATTEST:

Kathryn E. Cuveller, Town Clerk

APPROVED AS TO FORM:

Tobin Sidles, Town Attorney

SOUTH TUCSON

THE PUEBLO WITHIN A CITY

RESOLUTION NO. 96-16

A COMMITMENT OF THE CITY OF SOUTH TUCSON TO IMPLEMENT TRANSPORTATION IMPROVEMENTS WITHIN ITS JURISDICTION AS REQUIRED BY THE CONTINGENCY PLAN ELEMENT IN THE 1996 CARBON MONOXIDE LIMITED MAINTENANCE PLAN (THE PLAN)

WHEREAS, the Tucson Air Planning area qualifies for the Limited Maintenance Plan Option for Non-classifiable CO Non-attainment areas as announced by EPA on October 6, 1995; and

WHEREAS, The Plan is scheduled for adoption by the Pima Association of Governments (PAG) on June 26, 1996; and

WHEREAS, PAG has adopted the Mobility Management Plan which includes a congestion mitigation strategy to implement "Traffic operations improvements, such as the installation of traffic surveillance and control equipment, computerized signal systems, motorist information systems, integrated traffic control systems, roadway channelization, and intersection improvements"; and

WHEREAS, EPA approval of The Plan depends on a commitment by each PAG jurisdiction that they will ratify The Plan and implement specific transportation system management improvements such as additional signal light coordination, turn lanes, etc., as required for hot-spot mitigation through the procedures setup in the Contingency Plan element of The Plan; and

WHEREAS, such hot-spot mitigation measures will only be required by The Plan where hot-spot violations of the carbon monoxide National Ambient Air Quality Standard are predicted by PAG staff to occur within five years without defined transportation system management improvements.

NOW, THEREFORE, BE IT RESOLVED THAT the City of South Tucson will implement appropriate transportation system management improvement to fully mitigate the problem prior to the date of the projected violation by giving highest priority to such improvements in their capital improvement program.

PASSED AND ADOPTED BY the Mayor and Council of the City of South Tucson, Arizona this 10th day of June, 1996.

Shirley Villegas, Mayor
By John Garcia, Vice Mayor

ATTEST:

Marie Dolores Robles
City Clerk

APPROVED AS TO FORM:

City Attorney

RESOLUTION AND ORDER NO. 1996 - 120

RESOLUTION OF THE BOARD OF SUPERVISORS OF PIMA COUNTY COMMITTING TO IMPLEMENT TRANSPORTATION IMPROVEMENTS WITHIN ITS JURISDICTION AS REQUIRED BY THE CONTINGENCY PLAN ELEMENT IN THE 1996 CARBON MONOXIDE LIMITED MAINTENANCE PLAN (THE PLAN)

WHEREAS, the Tucson Air Planning Area qualifies for the Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment areas as announced by EPA on October 6, 1995; and

WHEREAS, the Plan is scheduled for adoption by the Pima Association of Governments (PAG) on June 26, 1996; and

WHEREAS, PAG has adopted the Mobility Management Plan which includes a congestion mitigation strategy to implement "Traffic operations improvements, such as the installation of traffic surveillance and control equipment, computerized signal systems, motorist information system, integrated traffic control systems, roadway channelization, and the intersection improvements; " and

WHEREAS, EPA approval of the Plan depends on a commitment by each PAG jurisdiction that they will ratify the Plan and implement specific transportation system management improvements such as additional signal light coordination, turn lanes, etc., as required for hot-spot mitigation through the procedures set up in the Contingency Plan element of the Plan; and

WHEREAS, such hot-spot mitigation measures will only be required by the Plan where hot-spot violations of the carbon monoxide National Ambient Air Quality Standard are predicted to occur within five years without defined transportation system management improvements,

NOW, THEREFORE, be it resolved that Pima County will implement appropriate transportation system management improvements to fully mitigate predicted violations prior to the date of the projected violation by giving highest priority to such improvements in their capital improvement program.

PASSED, ADOPTED AND APPROVED this 18th day of June, 1996.

PIMA COUNTY
BOARD OF SUPERVISORS

Paul G. Marsh
CHAIRMAN OF THE BOARD
JUN 18 1996

APPROVED AS TO FORM:

Chris Curtis 6-12-96
DEPUTY COUNTY ATTORNEY

ATTEST:

Jane S. Williams
CLERK OF THE BOARD

MARANA RESOLUTION NO. 96-55

A RESOLUTION OF THE MAYOR AND COUNCIL OF THE TOWN OF MARANA, ARIZONA, COMMITTING THE TOWN TO IMPLEMENT TRANSPORTATION IMPROVEMENTS WITHIN ITS JURISDICTION AS REQUIRED BY THE CONTINGENCY PLAN ELEMENT IN THE 1996 CARBON MONOXIDE LIMITED MAINTENANCE PLAN.

WHEREAS, the Tucson Air Planning Area qualifies for the Limited Maintenance Plan Option for Nonclassifiable CO Nonattainment areas as announced by the EPA on October 6, 1995; and

WHEREAS, the Plan is scheduled for adoption by the Pima Association of Governments (PAG) on June 26, 1996; and

WHEREAS, PAG has adopted the Mobility Management Plan which includes a congestion mitigation strategy to implement "traffic operations improvements, such as the installation of traffic surveillance and control equipment, computerized signal systems, motorist information systems, integrated traffic control systems, roadway channelization, and intersection improvements"; and

WHEREAS, EPA approval of the Plan depends on a commitment by each PAG jurisdiction that they will ratify the Plan and implement specific transportation system management improvements such as additional signal light coordination, turn lanes, etc., as required for hot-spot mitigation through the procedures set up in the Contingency Plan element of the Plan; and

WHEREAS, such hot-spot mitigation measures will only be required by the Plan where hot-spot violations of the carbon monoxide National Ambient Air Quality Standard are predicted by PAG staff to occur within five years without defined transportation system management improvements.

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Council of the Town of Marana, Arizona that the Town will implement appropriate transportation system management improvements of fully mitigate the problem prior to the date of the projected violation by giving highest priority to such improvements in their capital improvement program.

PASSED AND ADOPTED by the Mayor and Council of the Town of Marana, Arizona, this 18th day of June, 1996.

Mayor ED HONEA

ATTEST:

Sandy Groseclose
Town Clerk

APPROVED AS TO FORM:

Daniel J. Hochuli
Town Attorney

Appendix H

Public Participation, Hearing and Process Documentation

Public Notice and Affidavit
Public Hearing Agenda
Public Hearing Sign-in Sheet
Public Hearing Transcript
Responsiveness Summary

PUBLIC NOTICE

Pima Association of Governments (PAG) is accepting public comments on the proposed Carbon Monoxide Limited Maintenance Plan (CO LMP) Renewal for the Tucson Air Planning Area. This CO LMP Renewal will ensure maintenance of the air quality standards in the region for a second 10-year period through year 2020. The 30-day public comment period begins on Friday, March 28, 2008. A public hearing will be held on Tuesday, April 29, 2008, at 4:30 p.m. at PAG in the 5th floor conference room, 177 N. Church Ave., Tucson, Arizona.

Interested parties will be given an opportunity at the public hearing to submit relevant comments, orally and in writing. The close of the comment period will be at 6:30 p.m. on Tuesday, April 29, 2008. The maintenance plan renewal demonstrates continued attainment and compliance with the Environmental Protection Agency's National Ambient Air Quality Standards for carbon monoxide through 2020 for the Tucson area.

Written comments should be addressed, faxed or e-mailed to:

Lee Comrie
Pima Association of Governments
177 N. Church Ave.
Tucson, AZ 85701
Phone: (520) 792-1093
Fax: (520) 620-6981
E-mail: lcomrie@pagnet.org

The 30-day public comment period begins on Friday, March 28, 2008, and copies of the proposed plan are available for review at the following locations:

PAG Office, 4th floor
The PAG Web site at www.pagnet.org/default.aspx?tabid=179
All branches of the Pima County library system
Pima County Department of Environmental Quality
Public Works' offices for the cities of Tucson and South Tucson, and for the towns of Marana, Oro Valley and Sahuarita
Tribal offices of the Pascua Yaqui Tribe and Tohono O'odham Nation

The PAG Regional Council is expected to take action on the proposed plan at its May meeting. The time and place for this meeting will be announced at the public hearing and will be posted on the PAG Web site in advance of the meeting. After approval and adoption of the proposed Carbon Monoxide Limited Maintenance Plan by the Regional Council, the plan will be submitted to the state for approval and submission to EPA.

TUCSON NEWSPAPERS

Tucson, Arizona

STATE OF ARIZONA)
COUNTY OF PIMA)

Debbie Capanear, being first duly sworn deposes and says: that she is the Legal Advertising Representative of **TNI PARTNERS, DBA TUCSON NEWSPAPERS,** a General Partnership organized and existing under the laws of the State of Arizona, and that it prints and publishes the Arizona Daily Star and Tucson Citizen, daily newspapers printed and published in the City of Tucson, Pima County, State of Arizona, and having a general circulation in said City, County, State and elsewhere, and that the attached

Legal Notice

was printed and published correctly in the entire issue of the said Arizona Daily Star and Tucson Citizen on each of the following dates, to-wit:

March 27, 2008

Debbie Capanear

Subscribed and sworn to before me this 2 day of April, 2008

Silvia H Valdez

Notary Public

SILVIA H VALDEZ
Notary Public - Arizona
Pima County
Expires 12/15/09

My commission expires _____

TNI AD NO. 6150658

PUBLIC NOTICE

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Pima County Department of Environmental Quality
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Tribal offices of the Pascua Yaqui Tribe and Tohono O'odham Nation

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Publish March 27, 2008
Arizona Daily Star
Tucson Citizen

Partnering
Planning
Projecting

PUBLIC HEARING ON THE STATE IMPLEMENTATION PLAN (SIP) REVISION: CARBON MONOXIDE LIMITED MAINTENANCE PLAN RENEWAL FOR THE TUCSON AIR PLANNING AREA

177 N. CHURCH AVE., 5TH FLOOR CONFERENCE ROOM
Tuesday April 29, 2008
4:30 – 6:30 PM

AGENDA

1. **Welcome**

2. **Purpose of Hearing**

3. **The SIP Revision, public participation process and procedure for making public comments**

4. **Overview of the Carbon Monoxide Limited Maintenance Plan**

5. **Questions from the Audience** (The audience is invited to ask questions and request clarification outside of the formal comment portion of this proceeding)

6. **Formal Comments** (Comments received at this hearing may be received in writing or verbally. The comment period closes at the conclusion of this public hearing at 6:30 p.m. All comments received will be compiled and answered in a Response to Comments document that will be made a part of the administrative record of this proceeding)

7. **Adjournment**

Pima Association of Governments is an association of local, state and tribal governments with a mission to build consensus among its members and the public on regional planning for transportation, air quality and water quality. Please visit www.pagnet.org for more information.

Pima Association of Governments
177 N. Church Ave, Suite 405
Tucson, AZ 85701
(520) 792-1093 [*tel*]
(520) 792-9151 [*fax*]
www.pagnet.org [*web*]

Pima Association of Governments
Carbon Monoxide Limited Maintenance Plan
Public Hearing

SIGN-IN SHEET

Date: April 29, 2008
Time: 4:30-6:30 p.m.
Place: PAG Conference Room, 177 N. Church Ave.

Name	Address	Contact info (phone/e-mail)
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		
9)		
10)		

Public Hearing
State Implementation Plan Revision: Carbon Monoxide Limited Maintenance Plan Renewal for the Tucson Air Planning Area
April 29, 2008

AGENDA ITEM 1.
Welcome
Good afternoon and welcome to the formal public hearing for the revision to the State Implementation Plan and the renewal of the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area. My name is Lee Comrie and I am the Air Quality Planning Manager for Pima Association of Governments and will serve as the hearing officer for this public hearing.

Pima Association of Governments (PAG) was established in 1972 and is a federally recognized metropolitan planning organization. Its governing board is composed of officials from the member jurisdictions which include Pima County, the Cities of Tucson and South Tucson, the Towns of Marana, Oro Valley and Sahuarita, and the Pasqua Yaqui and the Tohono O'odham tribes.

PAG is also the designated air quality planning agency for eastern Pima County and develops regional air quality plans and analyzes air quality conformity of transportation plans to ensure compliance with federal, state and local requirements.

AGENDA ITEM 2.
Purpose of Hearing
The purpose of this hearing is to provide the public an opportunity:
(1) to hear about the substance of the proposed State Implementation Plan revision
(2) to ask questions regarding the draft Carbon Monoxide Limited Maintenance Plan renewal, and
(3) to present viewpoints and or data regarding the proposed State Implementation Plan revision in the form of comments on the record.

AGENDA ITEM 3.
State Implementation Plan Revision
This State Implementation Plan Revision documents how the Tucson Air Planning Area will remain in attainment for carbon monoxide and ensure maintenance of the air quality standards in the region for a second 10-year period through year 2020 under a Limited Maintenance Plan. It contains enforceable control measures and the procedures and contingency measures to be implemented in response to a probable or actual violation of the carbon monoxide standard. The current Limited Maintenance Plan is valid until 2010. PAG is required to adopt a State Implementation Plan revision after eight years have passed.

Part of the State Implementation Plan Revision's public process is conducting a public hearing. This public hearing is required to receive public comments. This public hearing is being recorded and a transcript of this public hearing will form part of the administrative record for the consideration of this plan as will copies of all comments received.

The Public Process
Public notice of this hearing was published in the local newspapers on March 27, 2008 and a press release was issued on April 22, 2008. The document was made available at local libraries and jurisdictional offices as well as on- line and at PAG on March 28, 2008.
This public hearing to accept public comment is taking place now and will conclude at 6:30 p.m. The conclusion of this hearing at 6:30 p.m. will mark the end of the verbal and written public comment period. A responsiveness summary will then be prepared. I am incorporating

by reference a copy of the Carbon Monoxide Limited Maintenance Plan renewal and appendices, the public notice and the non-substantive clarifying changes from PAG staff. The plan will be presented to PAG's Environmental Planning Advisory Committee on May 2. Thereafter, it goes to the PAG Regional Council on June 26, 2008. With the approval and adoption by the PAG Regional Council, this State Implementation Plan Revision will be sent to the Arizona Department of Environmental Quality for their approval and submission to EPA by July 10, 2008.

Procedure for Making Public Comments

Comments received at this hearing may be received in writing or verbally. Anyone wishing to make a verbal comment should please raise their hand or complete a comment card and they will be called in turn to make statements. It is noted that there are no attendees at this time. The comment period will however remain open until 6:30 p.m.

It is not incumbent upon PAG staff to respond to comments this evening although if there is a simple response one will be provided. All comments received will be compiled and answered in a Response to Comments document that will also be made a part of the administrative record of this proceeding. Comments may or may not result in a revision to the plan as presented to PAG's Regional Council.

AGENDA ITEM 4.

Presentation

I am representing Pima Association of Governments, and will proceed with a brief presentation on the Carbon Monoxide Limited Maintenance Plan if requested. A Powerpoint presentation is available and will now be included as part of the public record. This presentation was not given due to lack of attendees.

AGENDA ITEM 5.

Questions from the Audience

Are there any questions from the audience for clarification outside the formal comment portion of this proceeding?

AGENDA ITEM 6.

Formal Comments

The comment period will remain open until 6:30 p.m. Formal comments can now be received in writing or verbally. The comment period closes at 6:30 p.m. All comments received will be compiled and answered in a Response to Comments document that will be made a part of the administrative record of this proceeding.

It is 6:30 p.m. and we are now closing the public hearing and comment period for the renewal of the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area. The Regional Council is scheduled to consider the SIP revision on June 26, 2008

AGENDA ITEM 7.

Adjournment

POWERPOINT PRESENTATION FOR PUBLIC HEARING ON 4-29-08

Carbon Monoxide Limited Maintenance Plan Renewal

Public Hearing
4-29-08

Lee Comrie
Air Quality Planning Manager

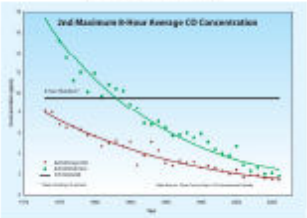
Pima County air quality areas

Brief History of Carbon Monoxide in the Tucson Region

- Region designated nonattainment in 1978
- Last violation in 1984
- SIP Revisions proposed and submitted 1979 to 1987
- CAAA 1990 – region designated "not classified/ nonattainment"
- SIP Revision, under a CO Limited Maintenance Plan (CO LMP), submitted in 1996, revised in 1997
- Region designated in attainment in 2000

Carbon Monoxide Trends

CO MONITOR CONCENTRATIONS (ppm)
1973-2006 2nd Maximum



Currently at about 25% of EPA Health Standard

CO LMP

- Ten-year plan (to be renewed after eight years)
- Plan renewal continues with monitoring as the focus - indicator of attainment
- Continuing with programs in place such as VEIP, oxyfuels, Travel Reduction, RideShare and Clean Air Programs
- Contingency plan with additional monitoring, intersection improvements and fuel changes - implemented if needed (>85% health standard), as before
- No constraining emissions budget – modeling and reporting of on-road CO emissions done annually, as before

Important Dates

- ✓ **March 11** - special AQS meeting to finalize draft plan for public comment
- ✓ **March 28** – distribute copies of draft CO LMP and advertise start of comment period and public hearing in newspaper
- **April 29** (4:30-6:30 p.m.) - public hearing and close of comment period
- Staff to prepare responsiveness summary
- **May** - submit plan to EPAC
- **June** – submission of CO LMP to Regional Council for approval and adoption and then to ADEQ
- **Before July 10** – ADEQ submission of SIP package to EPA
- **December** - EPA completeness check (technical/legal review), and approval thereafter

RESPONSIVENESS SUMMARY
to
Testimony Taken at Oral Proceedings and Written Comments Received on Proposed 2008 Revision to the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area for 2010

The oral proceeding on the Proposed 2008 Revision to the Carbon Monoxide Limited Maintenance Plan for the Tucson Air Planning Area for 2010 was held on Tuesday, April 29, 2008, 4:30 p.m. to 6:30 p.m., at Pima Association of Governments, 177 N. Church Ave., Tucson, Arizona. The public comment period closed at 6:30 p.m. on Tuesday, April 29, 2008. No oral or written comments were received during the public comment period. During its final review of the proposed plan, the Pima Association of Governments determined no further clarifications were needed.