MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

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MARICOPA
ASSOCIATION of
GOVERNMENTS

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MARICOPA ASSOCIATION of GOVERNMENTS

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Technical Assistance Provided By:

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Arizona Department of Transportation
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U.S. Environmental Protection Agency

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CHAPTER ONE

INTRODUCTION

The Maricopa County nonattainment area has attained the National Ambient Air Quality Standards for carbon monoxide and has been redesignated as a maintenance area by the Environmental Protection Agency (EPA). In 1978, the Governor of Arizona designated the Maricopa Association of Governments (MAG) as the lead air quality planning agency for Maricopa County in accordance with the Clean Air Act Section 174(a). Together with the State, MAG is responsible for determining which elements of the State Implementation Plan will be planned, implemented and enforced by State and local governments in Arizona. In 1992, the Arizona Legislature recertified MAG as the regional air quality planning agency in accordance with Section 174 of the 1990 Clean Air Act Amendments (A.R.S. Section 49-406A.). MAG coordinates with the Arizona Department of Environmental Quality, Arizona Department of Transportation, and the Maricopa County Air Quality Department in developing the plans necessary to attain and maintain the national standards.

There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996. The Revised MAG 1999 Serious Area Carbon Monoxide Plan demonstrated attainment by 2000 and was submitted to EPA in 2001. The MAG Carbon Monoxide Redesignation Request and Maintenance Plan demonstrated maintenance of the carbon monoxide standards through 2015 and was submitted to EPA in 2003. On March 9, 2005, EPA published final approval of the Serious Area Plan, Maintenance Plan, and redesignation of the Maricopa County area to attainment status, effective April 8, 2005.

Section 175A(b) of the Clean Air Act requires that eight years after redesignation of an area as an attainment area, an additional plan revision for maintaining the primary air quality standard for ten years after the expiration of the initial ten year period must be submitted to EPA. In accordance with the Clean Air Act, the MAG 2013 Carbon Monoxide Maintenance Plan has been prepared. The plan demonstrates continued maintenance of the carbon monoxide standards through 2025 with a maximum eight-hour concentration of 4.0 parts per million and establishes a 2025 motor vehicle emissions budget of 559.4 metric tons per day for the carbon monoxide maintenance area.

OUTLINE OF THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN

The purpose of this document is to present the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. The plan was prepared to address the relevant portions of the September 4,1992 EPA memorandum entitled, “Procedures for Processing Requests to Redesignate Areas to Attainment” that are pertinent to maintenance plans.

The MAG 2013 Carbon Monoxide Maintenance Plan is composed of the following major sections:

1. Introduction (This Chapter) - Includes a general discussion of the prior Serious Area Plan and Maintenance Plan approvals, redesignation to attainment status, and the outline of the MAG 2013 Carbon Monoxide Maintenance Plan.

2. Continued Attainment of the Carbon Monoxide Standards - Includes the historical perspective; carbon monoxide monitoring network; monitoring results and continued attainment demonstration; and quality assurance program.

3. Maintenance Plan - Includes the maintenance plan control measures; emissions inventories; maintenance demonstration; monitoring network and verification of continued attainment; contingency provisions; transportation conformity budget; and subsequent maintenance plan revisions.

CHAPTER TWO

CONTINUED ATTAINMENT OF THE CARBON MONOXIDE STANDARDS

Attainment of the National Ambient Air Quality Standards for carbon monoxide (CO) is demonstrated when two consecutive years of monitoring data for each site show no more than one exceedance per year of the eight-hour (9 ppm) and one-hour (35 ppm) standards. The following information demonstrates that the Maricopa County maintenance area has continued to attain the national standards for carbon monoxide for the past 15 years. This is based on quality assured monitoring data representing all carbon monoxide monitoring locations in the maintenance area.

HISTORICAL PERSPECTIVE

Data from the regional monitoring network indicates that the Maricopa County maintenance area has not experienced a violation of the eight-hour standard for carbon monoxide since 1996. The last violation of the one-hour standard was recorded in 1984. In addition, both the frequency of exceedance days and the magnitude of observed CO concentrations have declined dramatically since air quality monitoring began in the late 1960's.

In contrast to the lack of eight-hour violations since 1996, eighty-six exceedance days were recorded in 1984. There was a noticeable decline in the number of exceedance days from 1984 through 1990. In 1994 through 1996 period, there were a total of eight exceedance days, three each in 1994 and 1995, and two in 1996. There were two violation sites in 1994 (West Indian School and West Phoenix sites), and one each in 1995 and 1996 (both at the Phoenix Grand Avenue microscale monitor). A single exceedance of the eight-hour standard occurred in 1999 at the Phoenix Grand Avenue site, but this one exceedance did not constitute a violation of the standard. There have been no exceedances of the CO standard since 1999.

The Maricopa County maintenance area has been in attainment of the National Ambient Air Quality Standards for carbon monoxide since 1997 and has had a continuous downward trend in concentrations. In the past ten years, the annual eight-hour maximum concentration has decreased by approximately 57 percent, from 7.5 ppm in 2001 to 3.2 ppm in 2011. Since 2008, the maximum eight-hour concentrations reported at the CO monitoring locations have been less than half of the 9 ppm standard (9.4 ppm due to rounding).

CARBON MONOXIDE MONITORING NETWORK

The ambient air monitoring network for carbon monoxide in the Maricopa County maintenance area consists of 12 State and Local Air Monitoring Stations (SLAMS). The Buckeye station is located west of the maintenance area in Maricopa County and also monitors carbon monoxide. Twelve of these sites are operated by the Maricopa County

Air Quality Department and one monitor is operated by the Arizona Department of Environmental Quality. The CO monitoring sites are identified, along with summary data from 2008 through 2011, in Tables 2-1 through 2-4. Figure 2-1 shows the geographical distribution of the regional monitoring network.

MONITORING RESULTS AND CONTINUED ATTAINMENT DEMONSTRATION

The monitoring data presented in Tables 2-1 through 2-4 verify that the Maricopa County maintenance area has remained in attainment of the national standards for carbon monoxide, in accordance with the federal requirements of 40 CFR 50.8. Data recovery rates for the monitors exceed the 75 percent completeness requirements for all years and all state and federal quality assurance procedures have been followed. Figure 2-2 illustrates the downward trend in the second-highest carbon monoxide concentrations at all monitors in the maintenance area.

QUALITY ASSURANCE PROGRAM

Carbon monoxide data for the Maricopa County area has been collected and quality-assured in accordance with 40 CFR, Part 58, Appendix A "Quality Assurance Requirements for SLAMS, SPMs, and PSD Air Monitoring" and EPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality Monitoring Program". The data are recorded in the EPA Air Quality System and are available for public review through sources such as the EPA AirData website and air quality monitoring reports produced by the Maricopa County Air Quality Department and the Arizona Department of Environmental Quality.

TABLE 2-1

2008 CARBON MONOXIDE MONITORING DATA SUMMARY FOR THE MARICOPA COUNTY MAINTENANCE AREA STANDARDS: 1-HOUR: 35 PPM; 8-HOUR: 9 PPM*

Site Name	1-Hour		8-Hour	
	Max ppm	2nd Max ppm	Max ppm	2nd Max ppm
Buckeye, 26449 W. 100th Dr.[s+]	0.7	0.7	0.5	0.5
Central Phoenix, 1645 E. Roosevelt	3.6	3.5	2.6	2.2
Dysart, 16825 N. Dysart Rd.[s]	1.5	1.4	1.0	1.0
Glendale, 6001 W. Olive[s]	2.1	2.0	1.6	1.5
Greenwood, 1128 N. 27th Ave.	3.0	3.0	2.7	2.4
JLG Supersite, 4530 N. 17th Ave.	3.1	3.1	2.5	2.4
Mesa, 310 S. Brooks[s]	1.7	1.7	1.4	1.3
North Phoenix, 601 E. Butler Dr.[s]	2.1	2.0	1.3	1.3
South Phoenix, 33 W. Tamarisk Ave.[s]	3.7	3.2	2.2	2.0
South Scottsdale, 2857 N. Miller Rd.[s]	2.0	2.0	1.5	1.4
Tempe, 1525 S. College Ave.[s]	2.4	2.3	1.8	1.4
West Chandler, 275 S. Ellis[s]	1.8	1.7	1.4	1.4
West Indian School, 3315 W. Indian School Rd.	3.9	3.6	2.8	2.8
West Phoenix, 3847 W. Earll	4.7	4.5	3.1	3.0

* Due to mathematical rounding, values ≥ 35.5 and 9.5 ppm are necessary to exceed the standard.

[S] Seasonal monitor operating September 1st to April 1st.

[+] The Buckeye monitor is located outside the carbon monoxide maintenance area.

Sources: Environmental Protection Agency Air Quality System; Maricopa County Air Quality Department 2008-2011 Air Monitoring Network Reviews.

TABLE 2-2

2009 CARBON MONOXIDE MONITORING DATA SUMMARY FOR THE MARICOPA COUNTY MAINTENANCE AREA STANDARDS: 1-HOUR: 35 PPM; 8-HOUR: 9 PPM*

Site Name	1-Hour		8-Hour	
	Max ppm	2nd Max ppm	Max ppm	2nd Max ppm
Buckeye, 26449 W. 100th Dr.[s+]	1.2	1.1	0.6	0.5
Central Phoenix, 1645 E. Roosevelt	3.6	3.0	2.2	2.1
Dysart, 16825 N. Dysart Rd.[s]	1.0	0.9	0.9	0.8
Glendale, 6001 W. Olive[s]	2.0	1.9	1.3	1.2
Greenwood, 1128 N. 27th Ave.	3.5	3.2	2.6	2.4
JLG Supersite, 4530 N. 17th Ave.	2.9	2.8	2.3	2.3
Mesa, 310 S. Brooks[s]	2.0	1.9	1.5	1.3
North Phoenix, 601 E. Butler Dr.[s]	5.9	2.1	1.3	1.3
South Phoenix, 33 W. Tamarisk Ave.[s]	4.1	3.4	2.6	2.2
South Scottsdale, 2857 N. Miller Rd.[s]	2.9	1.9	1.4	1.4
Tempe, 1525 S. College Ave.[s]	4.0	3.6	2.9	2.1
West Chandler, 275 S. Ellis[s]	2.1	2.1	1.7	1.5
West Indian School, 3315 W. Indian School Rd.	5.6	5.0	4.2	3.3
West Phoenix, 3847 W. Earll	4.9	4.8	4.6	3.3

* Due to mathematical rounding, values ≥ 35.5 and 9.5 ppm are necessary to exceed the standard.

[S] Seasonal monitor operating September 1st to April 1st.

[+] The Buckeye monitor is located outside the carbon monoxide maintenance area.

Sources: Environmental Protection Agency Air Quality System; Maricopa County Air Quality Department 2008-2011 Air Monitoring Network Reviews.

TABLE 2-3

2010 CARBON MONOXIDE MONITORING DATA SUMMARY FOR THE MARICOPA COUNTY MAINTENANCE AREA STANDARDS: 1-HOUR: 35 PPM; 8-HOUR: 9 PPM*

Site Name	1-Hour		8-Hour	
	Max ppm	2nd Max ppm	Max ppm	2nd Max ppm
Buckeye, 26449 W. 100th Dr.[s+]	1.9	1.3	0.6	0.6
Central Phoenix, 1645 E. Roosevelt	3.2	3.2	2.4	2.2
Dysart, 16825 N. Dysart Rd.[s]	2.0	1.8	0.9	0.6
Glendale, 6001 W. Olive[s]	9.0	8.9	3.0	1.5
Greenwood, 1128 N. 27th Ave.	4.3	3.9	3.0	2.3
JLG Supersite, 4530 N. 17th Ave.	2.9	2.7	2.1	2.1
Mesa, 310 S. Brooks[s]	2.0	2.0	1.4	1.4
North Phoenix, 601 E. Butler Dr.[s]	2.9	2.4	1.7	1.6
South Phoenix, 33 W. Tamarisk Ave.[s]	4.4	4.3	3.1	3.1
South Scottsdale, 2857 N. Miller Rd.[s]	2.1	2.0	1.6	1.6
Tempe, 1525 S. College Ave.[s]	3.4	2.4	1.9	1.6
West Chandler, 275 S. Ellis[s]	2.0	2.0	1.9	1.6
West Indian School, 3315 W. Indian School Rd. (Closed June 30, 2010) [#]	3.7	3.3	2.3	2.3
West Phoenix, 3847 W. Earll	4.3	4.2	3.3	3.2

* Due to mathematical rounding, values $\geq$ 35.5 and 9.5 ppm are necessary to exceed the standard.

[S] Seasonal monitor operating September 1st to April 1st.

[#] Less than 75 percent data available.

[+] The Buckeye monitor is located outside the carbon monoxide maintenance area.

Sources: Environmental Protection Agency Air Quality System; Maricopa County Air Quality Department 2008-2011 Air Monitoring Network Reviews.

TABLE 2-4

2011 CARBON MONOXIDE MONITORING DATA SUMMARY FOR THE MARICOPA COUNTY MAINTENANCE AREA STANDARDS: 1-HOUR: 35 PPM; 8-HOUR: 9 PPM*

	1-Hour		8-Hour	
Site Name	**Max ppm**	**2nd Max ppm**	**Max ppm**	**2nd Max ppm**
Buckeye, 26449 W. 100th Dr.[s+]	1.8	1.2	0.9	0.8
Central Phoenix, 1645 E. Roosevelt	3.8	3.5	2.1	2.1
Dysart, 16825 N. Dysart Rd.[s]	1.0	0.9	0.5	0.5
Glendale, 6001 W. Olive[s]	1.9	1.8	1.3	1.2
Greenwood, 1128 N. 27th Ave.	3.0	2.9	2.5	2.5
JLG Supersite, 4530 N. 17th Ave.[#]	2.5	2.5	2.3	2.1
Mesa, 310 S. Brooks[s]	1.9	1.8	1.5	1.3
North Phoenix, 601 E. Butler Dr.[s]	2.9	2.7	1.6	1.5
South Phoenix, 33 W. Tamarisk Ave.[s]	3.0	2.9	2.6	2.0
South Scottsdale, 2857 N. Miller Rd.[s]	1.8	1.7	1.4	1.3
Tempe, 1525 S. College Ave.[s]	3.6	3.4	3.2	2.9
West Chandler, 275 S. Ellis[s]	1.8	1.7	1.4	1.3
West Phoenix, 3847 W. Earll	4.4	3.9	3.0	2.9

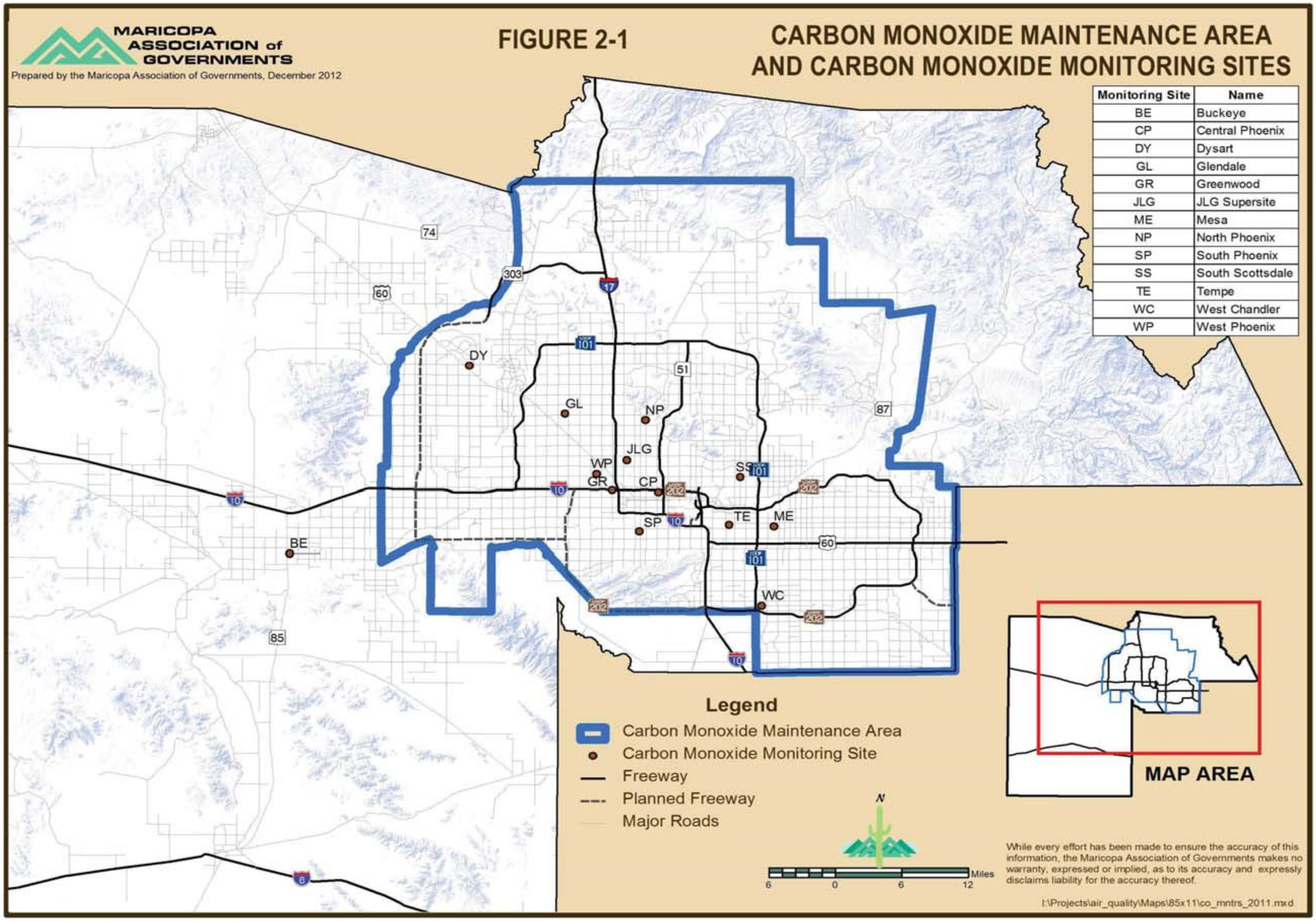
* Due to mathematical rounding, values ≥ 35.5 and 9.5 ppm are necessary to exceed the standard.

[S] Seasonal monitor operating September 1st to April 1st.

[#] Less than 75 percent data available.

[+] The Buckeye monitor is located outside the carbon monoxide maintenance area.

Sources: Environmental Protection Agency Air Quality System; Maricopa County Air Quality Department 2008-2011 Air Monitoring Network Reviews.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Prepared by the Maricopa Association of Governments, December 2012
FIGURE 2-1
CARBON MONOXIDE MAINTENANCE AREA
AND CARBON MONOXIDE MONITORING SITES
Monitoring Site | Name
BE | Buckeye
CP | Central Phoenix
DY | Dysart
GL | Glendale
GR | Greenwood
JLG | JLG Supersite
ME | Mesa
NP | North Phoenix
SP | South Phoenix
SS | South Scottsdale
TE | Tempe
WC | West Chandler
WP | West Phoenix
Legend
Carbon Monoxide Maintenance Area
Carbon Monoxide Monitoring Site
Freeway
Planned Freeway
Major Roads
MAP AREA
6 0 6 12 Miles
While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.
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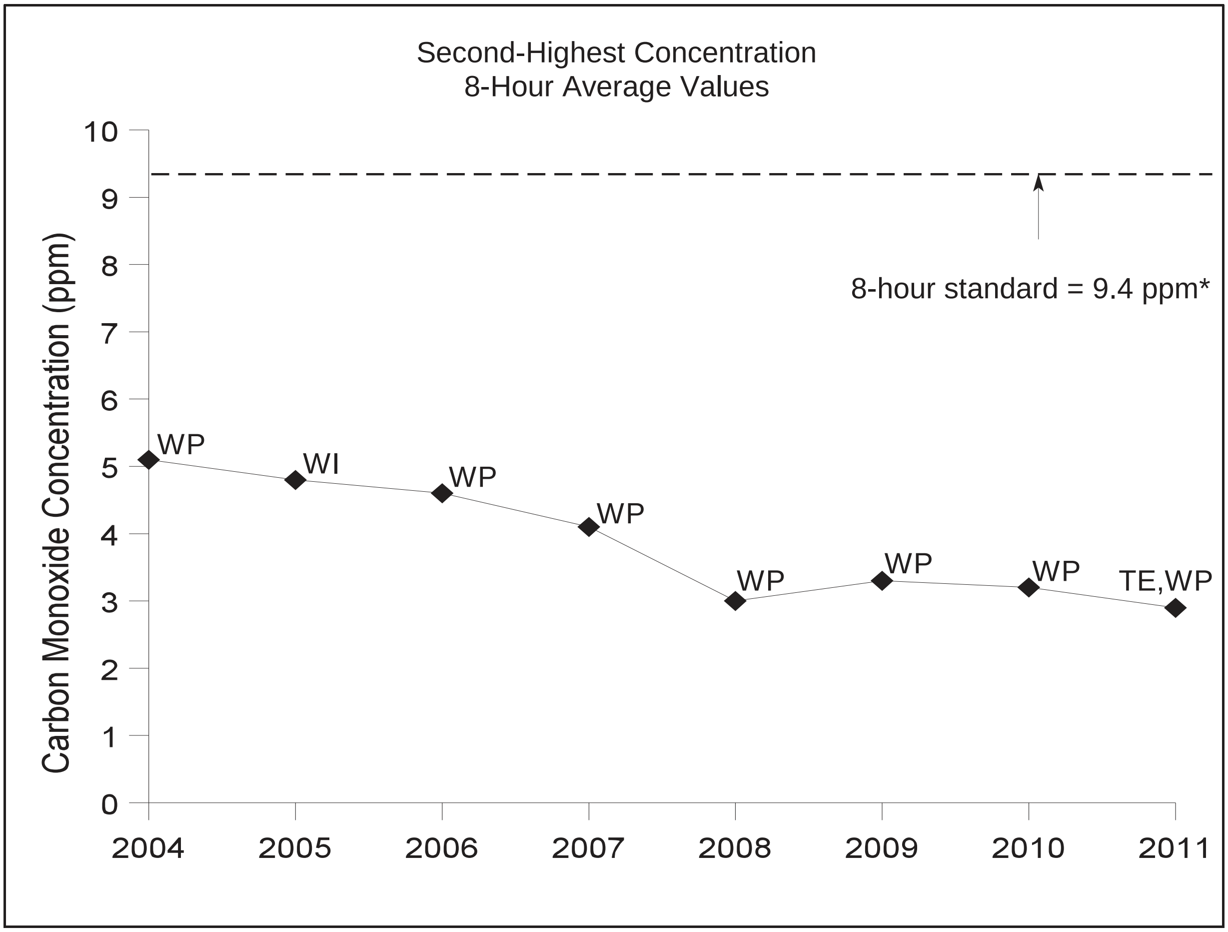
FIGURE 2-2

CARBON MONOXIDE TRENDS (2004-2011)



* Due to mathematical rounding, values ≥ 9.5 ppm are necessary to exceed the standard.

<u>Monitors Where the Second-Highest Reading Occurred</u>

(TE) Tempe
(WI) West Indian School Road
(WP) West Phoenix

Source: Environmental Protection Agency Air Quality System.

CHAPTER THREE

MAINTENANCE PLAN

No violation of the one-hour National Ambient Air Quality Standard for carbon monoxide has occurred in Maricopa County since 1984 and no violation of the eight-hour carbon monoxide standard has been recorded at any monitor since 1996. The Revised MAG 1999 Serious Area Carbon Monoxide Plan for the Maricopa County Nonattainment Area was submitted to the Environmental Protection Agency (EPA) in 2001 (MAG, 2001). The Carbon Monoxide Redesignation Request and Maintenance Plan for the Maricopa County Nonattainment Area was submitted to EPA in 2003 (MAG, 2003).

The Revised 1999 Serious Area Carbon Monoxide Plan demonstrated attainment of the carbon monoxide standards by 2000. The 2003 Carbon Monoxide Maintenance Plan demonstrated continued maintenance of the carbon monoxide standards through 2015. EPA approved the Revised 1999 Serious Area Carbon Monoxide Plan and the 2003 Carbon Monoxide Maintenance Plan and redesignated the Maricopa County area to attainment, effective April 8, 2005 (EPA, 2005).

Section 175A(b) of the Clean Air Act Amendments states that *"8 years after redesignation of any area as an attainment area under section 107(d), the State shall submit to the Administrator an additional revision of the applicable State implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the initial 10-year period".* Thus, a second carbon monoxide maintenance plan for the years 2016 through 2025 for the Maricopa county area is required for submittal to EPA by April 8, 2013.

This second carbon monoxide maintenance plan (hereafter referred to as the 2013 CO Maintenance Plan) demonstrates maintenance of the National Ambient Air Quality Standards for carbon monoxide in the Maricopa County area through 2025 and establishes a 2025 conformity budget for onroad mobile source emissions using the latest version of the EPA Motor Vehicle Emission Simulator (MOVES) model, MOVES2010b. The 2008 Periodic Emissions Inventory for Carbon Monoxide for the Maricopa County, Arizona Maintenance Area is also included in Appendix A, Exhibit 1.

MAINTENANCE PLAN CONTROL MEASURES

The Maricopa County area will continue to implement the maintenance measures in the 2003 Carbon Monoxide Maintenance Plan. The first nine measures in Table 3-1 were used for numeric credit in demonstrating maintenance of the carbon monoxide standards through 2015. These measures are described in Chapter Two of the 2003 CO Maintenance Plan. The tenth measure, Expansion of Area A Boundaries, was one of three contingency measures in the 2003 Carbon Monoxide Maintenance Plan. This measure is described in Section VII-2-2 of the Technical Support Document in Appendix A, Exhibit

TABLE 3-1
MAINTENANCE MEASURES IN THE 2013 CARBON MONOXIDE MAINTENANCE PLAN

1.	California Phase 2 Reformulated Gasoline with 3.5% Oxygen Content From November 1 Through March 31
2.	Off-Road Vehicle and Engine Standards
3.	Phased-In Emission Test Cutpoints
4.	One-time Waiver from Vehicle Emissions Test
5.	Defer Emissions Associated with Government Activities
6.	Coordinate Traffic Signal Systems
7.	Develop Intelligent Transportation Systems
8.	Tougher Enforcement of Vehicle Registration and Emissions Test Compliance
9.	Clean Burning Fireplace Ordinances
10.	Expansion of Area A Boundaries

2 of the 2003 Carbon Monoxide Maintenance Plan (MAG, 2003). The reason for converting this measure from contingency to maintenance in the 2013 Carbon Monoxide Maintenance Plan is discussed below.

In November 2012, EPA proposed to approve the 110(l) SIP revision submitted by the Arizona Department of Environmental Quality (ADEQ, 2009; ADEQ, 2011) that will eliminate the requirement for motorcycles to participate in the Arizona vehicle emissions inspection and maintenance (VEI) program (EPA, 2012a). EPA has indicated that the benefits of the contingency measure, Expansion of Area A Boundaries, in the 2003 Carbon Monoxide Maintenance Plan may be used to offset the increase in emissions attributable to the exemption of motorcycles from the VEI program. Like other contingency measures in the 2013 CO Maintenance Plan, this measure was implemented early, in accordance with EPA guidance (EPA, 1993).

Therefore, the Expansion of Area A Boundaries is included as a maintenance measure in the 2013 Carbon Monoxide Maintenance Plan. As discussed in the Contingency Provisions section of this chapter, ADEQ has made a commitment to re-institute the VEI program requirement for motorcycles, if there is a future violation of the carbon monoxide standard.

EMISSIONS INVENTORIES

The emissions inventories used in performing the maintenance demonstration are presented in Table 3-2, for 2006, 2008, 2015 and 2025 in the carbon monoxide modeling domain, and Table 3-3, for 2008 and 2025 in the CO maintenance area. The 2008 emissions in both tables are based on the latest periodic emissions inventory (PEI) for carbon monoxide (CO) contained in Appendix A, Exhibit 1 (MCAQD, 2012). The PEI estimates CO emissions for a typical weekday during the winter months, November - January.

Emission reduction credit for two measures in Table 3-1, California Phase 2 Reformulated Gasoline and Off-Road Vehicle and Engine Standards, is reflected in the emissions inventories shown in Tables 3-2 and 3-3. The EPA MOVES2010b model estimates that California Phase 2 Reformulated Gasoline will reduce CO emissions by 128.9 metric tons per day in 2025, a reduction in CO maintenance area emissions of about 17 percent. The EPA NONROAD2008a model estimates that Off-Road Vehicle and Engine Standards will reduce CO emissions by 15.0 metric tons per day in 2025, which represents a two percent reduction in CO maintenance area emissions.

While other maintenance measures in Table 3-1 will continue to be implemented, their collective carbon monoxide reduction impact in 2025 is anticipated to be less than one percent. Therefore, no numeric credit has been taken for these measures in the maintenance demonstration. In addition to Reformulated Gasoline and Off-Road Vehicle and Engine Standards, the maintenance demonstration in this plan is dependent upon the emission reduction benefits of tighter federal emission standards for new onroad and nonroad engines, fuel requirements, and continuing fleet turnover to lower emissions from onroad and nonroad vehicles. These emission reduction benefits are reflected in the onroad and nonroad emissions shown in Tables 3-2 and 3-3.

TABLE 3-2
AVERAGE WEEKDAY EMISSIONS DURING THE WINTER SEASON IN THE CARBON MONOXIDE MODELING DOMAIN

Source Category	CO Emissions (metric tons/day)			
	2006	**2008**	**2015**	**2025**
Point	0.4	0.7	18.0	18.0
Area	26.4	25.8	29.6	33.1
Nonroad	227.1	187.0	133.1	129.4
Onroad	549.1	410.0	297.9	223.4
Total	**803.0**	**623.5**	**478.6**	**403.9**

TABLE 3-3
AVERAGE WEEKDAY EMISSIONS DURING THE WINTER SEASON IN THE CARBON MONOXIDE MAINTENANCE AREA

Source Category	CO Emissions (metric tons/day)	
	2008	**2025**
Point	0.7	19.8
Area	37.8	47.3
Nonroad	281.5	213.1
Onroad	581.6	359.4
Total	**901.6**	**639.6**

The data used to derive growth factors for estimating point and area source emissions were derived from the MAG Socioeconomic Projections of Population, Housing and Employment by Municipal Planning Area and Regional Analysis Zone in Maricopa County (MAG, 2007). These projections, which cover the period 2010 through 2030, are based on the 2005 Special U.S. Census conducted in Maricopa County and were approved by the MAG Regional Council in May 2007.

Onroad mobile source emissions for the 2013 Carbon Monoxide Maintenance Plan were estimated using the MOVES2010b model and traffic assignment data output by the MAG TransCAD travel demand model. The socioeconomic projections adopted by the MAG Regional Council in 2007 were also used as input to the travel demand model.

Nonroad equipment emissions were developed with the EPA NONROAD2008a model, using default NONROAD2008a activity growth rates for Maricopa County, with one exception. Equipment population and activity levels for commercial lawn and garden equipment were based on a survey performed as part of Cap and Trade Oversight Committee work (ENVIRON, 2003).

The Emissions and Dispersion Modeling System (EDMS) and Federal Aviation Administration Terminal Area Forecast system database were used to estimate future emissions for all airports, except Luke Air Force Base (AFB). Luke AFB emissions were derived from the 2008 Mobile Source Emissions Inventory for Luke AFB (Weston, 2010) and the F-35A Training Basing Environmental Impact Statement (USAF, 2012).

Details regarding the technical inputs and assumptions used in preparing the emissions inventories are provided in Chapter II of the TSD (Appendix A, Exhibit 2). The percentage contributions of CO emissions by source category are illustrated in Figures 3-1 and 3-2 for the CO modeling domain and maintenance area, respectively.

MAINTENANCE DEMONSTRATION

The 2013 Carbon Monoxide Maintenance Plan relies on a series of technical analyses to demonstrate maintenance of the National Ambient Air Quality Standards for carbon monoxide through 2025. The maintenance demonstration assumes that the measures in Table 3-1 will continue to be implemented through 2025.

Three different modeling analyses were performed to estimate the effects of growth and emission reduction strategies on future carbon monoxide concentrations in the Maricopa County area. In addition, two weight of evidence evaluations were conducted using actual trends in air quality and meteorological data to reinforce the modeling analyses. The results of these five quantitative assessments provide assurance that there will continue to be compliance with the federal carbon monoxide standards through 2025.

A modeling protocol was developed to detail the technical approaches and assumptions to be used in demonstrating maintenance of the federal standards for carbon monoxide. The modeling protocol is contained in Appendix I of the Technical Support Document for the 2013 CO Maintenance Plan (TSD), contained in Appendix A, Exhibit 2.

FIGURE 3-1
2008 AND 2025 CARBON MONOXIDE EMISSIONS BY SOURCE CATEGORY FOR THE CARBON MONOXIDE MODELING DOMAIN

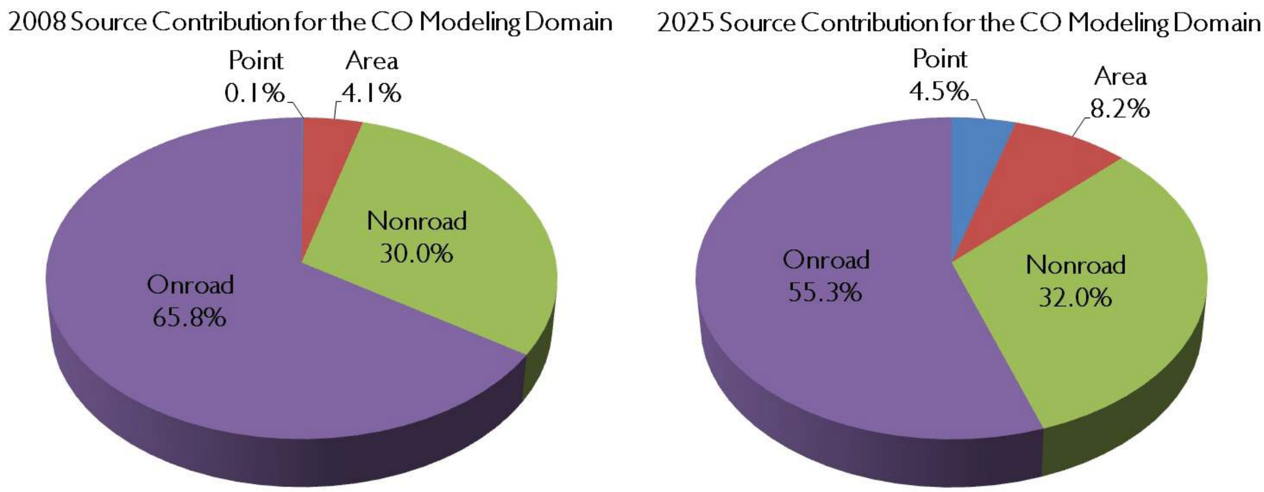
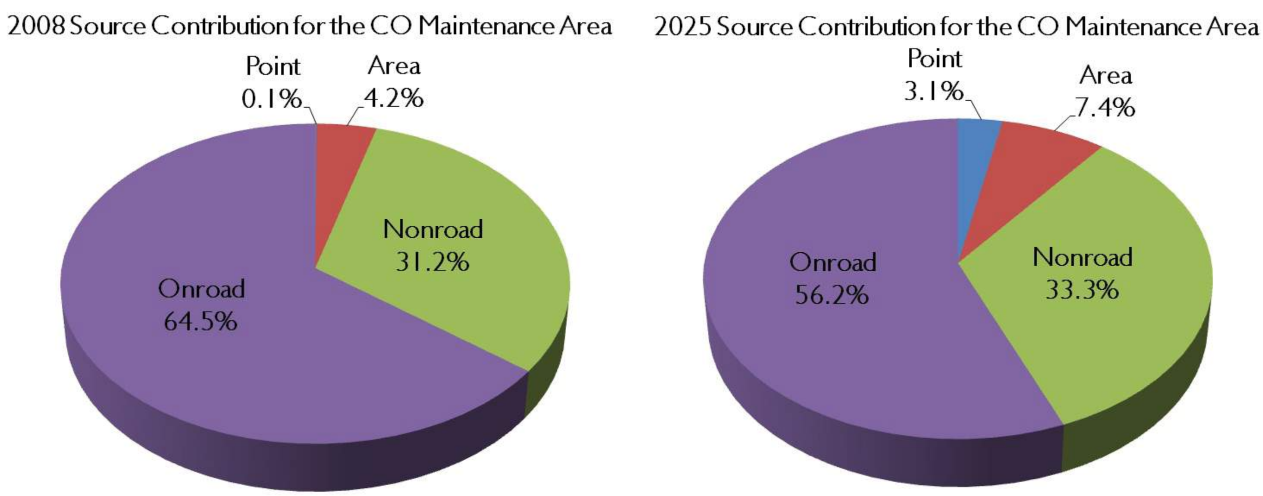


FIGURE 3-2
2008 AND 2025 CARBON MONOXIDE EMISSIONS BY SOURCE CATEGORY FOR THE CARBON MONOXIDE MAINTENANCE AREA



For the maintenance demonstration, two sets of carbon monoxide emissions inventories were developed representing: (1) the carbon monoxide modeling domain in 2006, 2008, 2015, and 2025 and (2) the carbon monoxide maintenance area in 2008 and 2025. The carbon monoxide modeling domain and maintenance area are illustrated in Figure 3-3. The modeling domain covers 792 square miles, while the maintenance area represents 1,814 square miles. Both of these areas are located within Maricopa County.

The 2008 Periodic Emissions Inventory for Carbon Monoxide in the Maricopa County Maintenance Area is provided in Appendix A, Exhibit 1 (MCAQD, 2012). This inventory was used to establish the 2008 base case emissions, back-cast the 2006 emissions, and project the 2015 and 2025 future emissions with control measures in place.

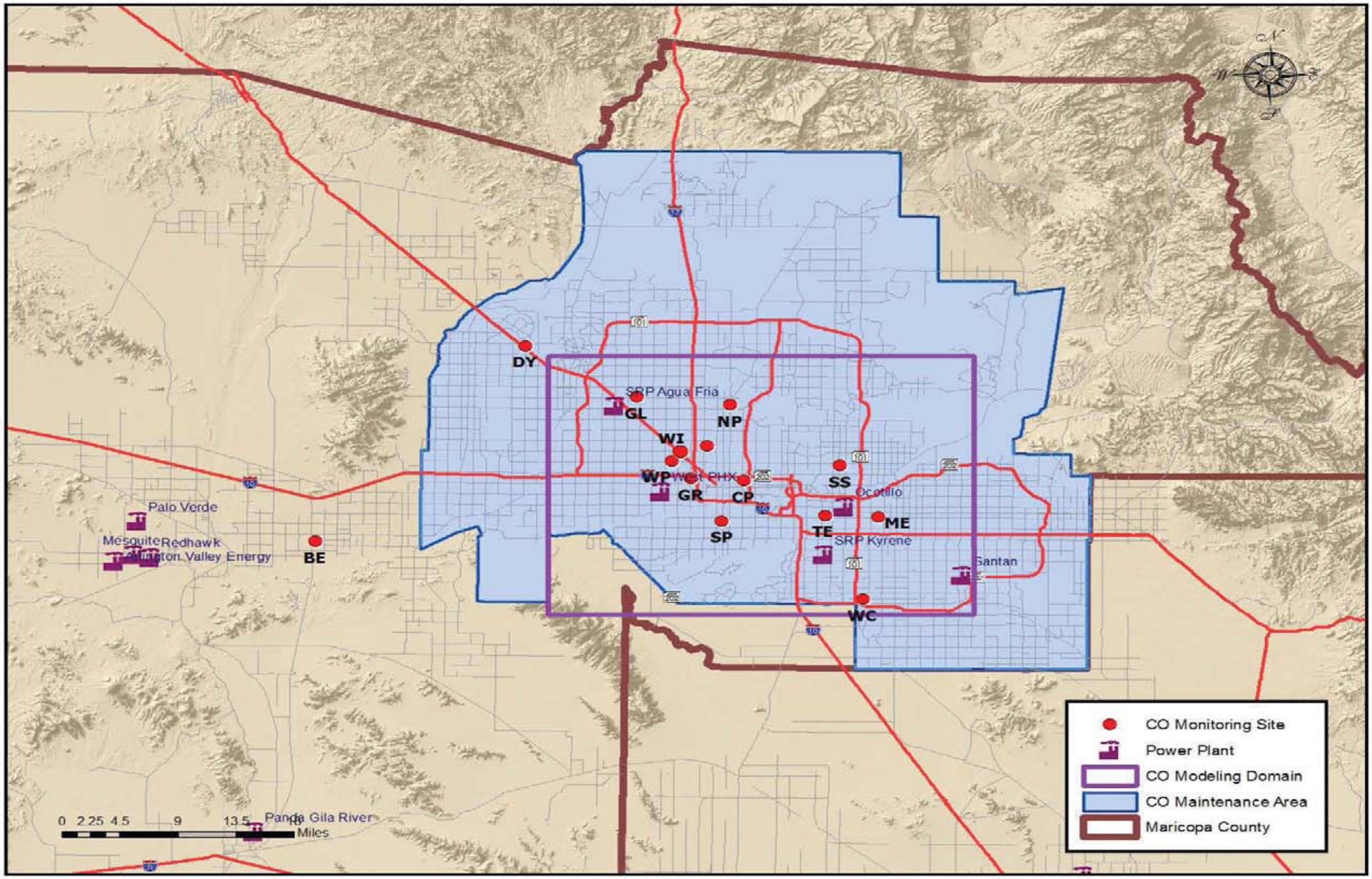
The modeling for the 2013 CO Maintenance Plan was conducted using three approaches: (1) an emissions inventory comparison, (2) a scaling of the Urban Airshed Model/CAL3QHC maximum concentration, and (3) a CAL3QHC intersection hotspot analysis. The first approach demonstrates maintenance of the standard by showing a continuing decrease in emissions levels in 2015 and 2025 compared with emissions levels in 2006 and 2008. The second approach scales the UAM/CAL3QHC maximum eight-hour concentrations for 2006 and 2015 derived from the 2003 CO Maintenance Plan based on the ratio of future year to base year total anthropogenic carbon monoxide emissions. The scaled UAM/CAL3QHC maximum concentration in 2025 was used to demonstrate maintenance of the eight-hour carbon monoxide standard.

In the third approach, CAL3QHC modeling was performed for six intersections which are expected to experience the heaviest traffic volumes and congestion in 2025. The CAL3QHC maximum eight-hour CO concentration projected for each intersection was added to the estimated background concentration for 2025. The combined background and CAL3QHC maximum eight-hour concentration at each intersection was also used to demonstrate maintenance of the eight-hour carbon monoxide standard in 2025.

In addition to the three modeling approaches described above, two weight of evidence analyses were performed to demonstrate maintenance through 2025. These include an evaluation of historical one-hour and eight-hour carbon monoxide concentration trends at monitoring sites and a regional meteorological analysis. For the first weight of evidence analysis, historical CO concentration trends for each monitoring site were developed and the trend was extended to 2015 and 2025 using regression analysis. For the second weight of evidence approach, a meteorological analysis was performed to demonstrate that the historical improvements in CO concentrations in the Maricopa County area are not due to unusually favorable meteorological conditions.

Summaries of the five technical analyses conducted as part of the maintenance demonstration are described in the subsections that follow. Details regarding these analyses and underlying technical assumptions are documented in Section IV of the TSD (Appendix A, Exhibit 2).

FIGURE 3-3
CARBON MONOXIDE MODELING DOMAIN AND MAINTENANCE AREA



Emissions Inventory Comparison

The emissions in the carbon monoxide modeling domain shown in Table 3-2 were estimated using the latest emissions models and planning assumptions. Table 3-4 compares the total 2006 and 2015 CO emissions in Table 3-2 with emissions derived with older models and assumptions as part of the 2003 CO Maintenance Plan. In order to estimate the maximum eight-hour CO concentration in 2025, the maximum concentration in 2006 of 5.3 ppm at the West Indian School monitor was multiplied by the ratio of 403.9 metric tons per day in 2025 divided by 803.0 tons per day in 2006. This results in an estimated maximum eight-hour concentration in the CO modeling domain of 2.7 parts per million (ppm) in 2025.

Table 3-3 indicates that total emissions in the CO maintenance area are 639.6 metric tons per day in 2025 and 901.6 metric tons per day in 2008. Applying this ratio to the maximum eight-hour CO concentration of 3.1 ppm at the West Phoenix monitor in 2008, results in an estimated maximum eight-hour CO concentration of 2.2 ppm In 2025. These two emissions inventory comparisons reveal that the maximum concentration will remain well below the eight-hour standard of 9 ppm in both the CO modeling domain and the CO maintenance area through 2025.

Scaled UAM/CAL3QHC Maximum Eight-Hour Concentrations

In the MAG 2003 CO Maintenance Plan, the eight-hour carbon monoxide concentrations in the modeling domain were estimated for the years 2006 and 2015 using the EPA-approved Urban Airshed Model (UAM) and intersection hotspot model (CAL3QHC). Since the UAM/CAL3QHC predictions were derived from the emissions inventories based on older versions of models (e.g., MOBILE6) available at the time the MAG 2003 CO Maintenance Plan was developed, emissions inventories for the years 2006 and 2015, as well as the maintenance year 2025, were newly developed, as shown in Table 3-4, using the latest versions of models and updated input data. The UAM/CAL3QHC projections for the years 2006 and 2015 were adjusted by the ratio of the new to old emissions inventory totals. The adjusted 2006 and 2015 UAM/CAL3QHC estimates from the MAG 2003 CO Maintenance Plan were scaled for the maintenance year 2025.

Although the Phoenix Grand Avenue and West Indian School monitors were deactivated in 1993 and 2010, respectively, modeling conducted for the Revised MAG 1999 Serious Area CO Plan (MAG, 2001) and the MAG 2003 CO Maintenance Plan (MAG, 2003) projected that these monitored intersections would have some of the highest levels of traffic congestion and CO concentrations in future years. In addition, the West Indian School monitor recorded the peak CO concentration of 10.5 ppm during the 1994 episode that was modeled in both plans. The adjusted and scaled maximum concentrations for these two intersections, as well as the highest eight-hour CO concentrations predicted by UAM/CAL3QHC in the modeling domain, are shown in Table 3-5. The scaled maximum UAM/CAL3QHC eight-hour CO concentration for 2025 is 4.0 ppm, which is less than half the eight-hour CO standard of 9 ppm.

TABLE 3-4
TOTAL CARBON MONOXIDE EMISSIONS IN THE CARBON MONOXIDE MODELING DOMAIN

Source	Total CO Emissions (metric tons/day)		
	2006	2015	2025
2003 CO Maintenance Plan	912.3	901.2	N/A
2013 CO Maintenance Plan	803.0	478.6	403.9

TABLE 3-5
UAM/CAL3QHC MAXIMUM EIGHT-HOUR CARBON MONOXIDE CONCENTRATION ADJUSTMENTS AND SCALED ESTIMATES FOR 2025

(units = ppm)

	2006		2015		2025	
	UAM/ CAL3QHC	Adjusted	UAM/ CAL3QHC	Adjusted	Based on 2006	Based on 2015
WI Monitor*	7.28	6.41	6.59	3.50	3.22	2.95
WI Receptor #9	8.25	7.26	8.08	4.29	3.65	3.62
WI Receptor #8	8.08	7.11	7.84	4.16	3.58	3.51
WI Receptor #20	7.85	6.91	7.44	3.95	3.48	3.33
PHGA Monitor**	N/A	N/A	N/A	N/A	N/A	N/A
PHGA Receptor #30	8.24	7.25	7.81	4.15	3.65	3.50
PHGA Receptor #46	8.08	7.11	7.45	3.96	3.58	3.34
PHGA Receptor #29	8.03	7.07	7.39	3.92	3.56	3.31
UAM/CAL3QHC Maximum	8.92	7.85	8.06	4.28	3.95 (rounded to 4.0)	3.61

WI = West Indian School
PHGA = Phoenix Grand Avenue

*The WI Monitor was deactivated on June 30, 2010
**The PHGA monitor values were not available (N/A) for the 1994 episode modeled with UAM/CAL3QHC (MAG, 2001; MAG, 2003), because the monitor was deactivated on March 31, 1993, due to impending reconstruction of the adjacent intersection.
*** The UAM/CAL3QHC maximum was rounded to one decimal place.

Intersection Hotspot Analysis

The three intersections projected to have the highest traffic volumes and the three intersections projected to have the worst traffic congestion were identified using the MAG TransCAD traffic assignment for the year 2025. Detailed data sets were collected for each of the six intersections and they were modeled using CAL3QHC to determine the maximum eight-hour CO concentration in 2025. The modeling input assumptions and results are detailed in Section III of the TSD (Appendix A, Exhibit 2). The background eight-hour CO concentration used for all intersections was determined to be 1.3 ppm. The maximum eight-hour CO concentration in 2025, which is the sum of the intersection maximum impact and the background concentration, was projected to be 1.7 ppm at two intersections: 16th Street and Camelback Road and Priest Drive and Southern Avenue, as shown in Table 3-6. The results from the CAL3QHC intersection hotspot analysis support the conclusion that high traffic volumes and congestion will not contribute to exceedances of the eight-hour carbon monoxide standard in 2025.

Continued Monitored Attainment

In addition to the three modeling analyses described above, MAG conducted two weight of evidence evaluations to support the maintenance demonstration. The first of these assessed the historical trends in one-hour and eight-hour concentrations measured at carbon monoxide monitors in the Maricopa County area. To demonstrate attainment, carbon monoxide concentrations at each monitor should not exceed the one-hour standard of 35 ppm more than once per year for two consecutive years. In addition, the eight-hour standard of 9 ppm can not be exceeded more than once per year for two consecutive years.

The trends in the second-highest eight-hour carbon monoxide concentrations at eighteen monitors for the years 1996 - 2011 are shown in Table 3-7. Similar tables showing the highest and second-highest one-hour CO concentrations and highest eight-hour CO concentrations recorded at these eighteen monitors are shown in Section IV-3-1 of the TSD (Appendix A, Exhibit 2). The one-hour carbon monoxide standard has not been violated at any monitor since 1984. The highest and second highest one-hour CO concentrations at all monitors in 2011 were 4.4 ppm and 3.9 ppm, respectively.

The second-highest eight-hour carbon monoxide concentration of 10.0 ppm was recorded at the Grand Avenue monitor in 1996. Since then, no monitor has violated the eight-hour CO standard. Eight-hour CO concentrations have continued to decline over the past decade. The highest and second highest eight-hour CO concentrations in 2011 were 3.2 ppm and 2.9 ppm, respectively.

To predict future concentrations based on the historical monitored carbon monoxide concentrations, a regression analysis was performed using data recorded at fourteen CO monitors for the period 1980 to 2011. The regression equations were used to project carbon monoxide concentrations to 2015 and 2025. Figure 3-4 shows the historical and projected

TABLE 3-6
MAXIMUM CAL3QHC EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS IN 2025

(units = ppm)

Intersection	CAL3QHC Maximum One-Hour CO Concentration	Maximum Eight-Hour CO Concentration	Background CO Concentration	Total Maximum Eight-Hour CO Concentration
16th St & Camelback Rd	0.5	0.4	1.3	1.7
107th Ave & Grand Ave	0.4	0.3		1.6
Priest Dr & Southern Ave	0.5	0.4		1.7
7th Ave & Van Buren St	0.4	0.3		1.6
Germann Rd & Gilbert Rd	0.4	0.3		1.6
Thomas Rd & 27th Ave	0.4	0.3		1.6

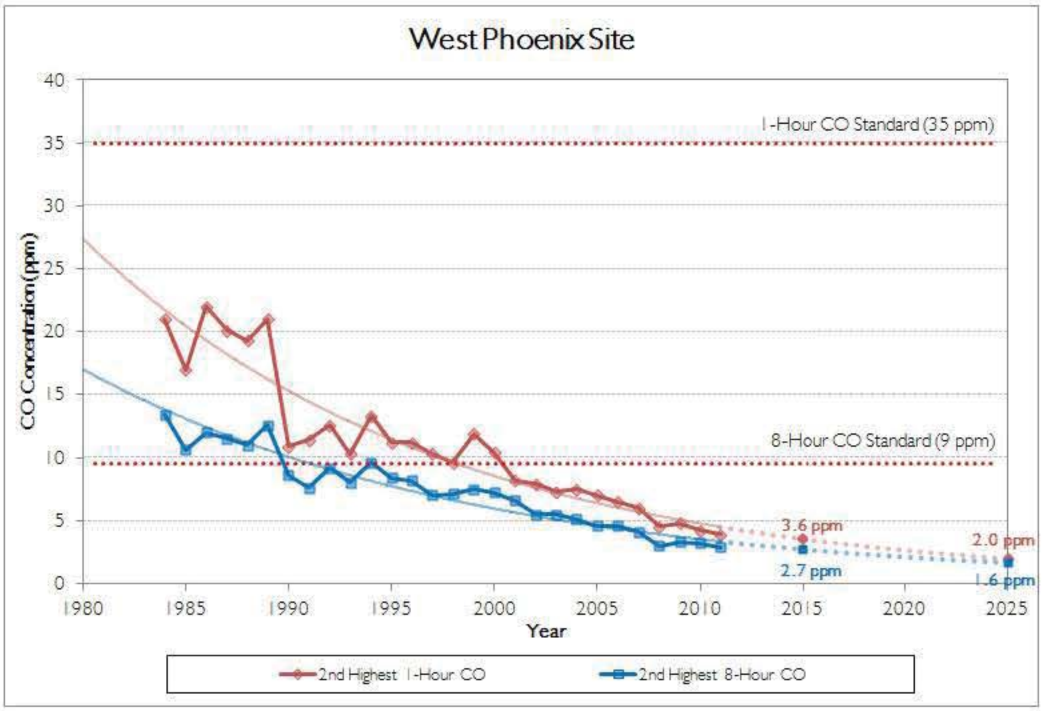
TABLE 3-7
SECOND HIGHEST EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS AT MONITORS IN MARICOPA COUNTY FOR 1996-2011

(units = ppm)

Site ID	Site Name	Abbr	2nd highest non-overlapping 8-hour CO concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0013	South Phoenix (old)*	SP	5.1	4.4	4.7	4.1												
04-013-0016	W Indian School Rd	WI	8.3	7.2	8.1	7.6	6.8	6.0	5.4	5.3	4.6	4.8	4.5	3.9	2.8	3.3	2.3	
04-013-0019	West Phoenix	WP	8.2	7.0	7.1	7.5	7.2	6.6	5.5	5.5	5.1	4.6	4.6	4.1	3.0	3.3	3.2	2.9
04-013-0022	Grand Ave	GA	10.0	7.8	6.8	8.1	6.0	6.2	5.5									
04-013-1003	Mesa	ME	3.8	4.5	3.7	4.0	3.2	2.7	3.5	2.2	1.7	2.4	2.0	2.0	1.3	1.3	1.4	1.3
04-013-1004	North Phoenix	NP	3.7	3.4	5.6	3.5	3.1	2.5	2.7	2.1	2.0	2.2	1.9	1.6	1.3	1.3	1.6	1.5
04-013-2001	Glendale	GL	3.7	3.0	3.4	3.5	3.2	2.8	2.7	2.3	2.1	2.3	1.8	1.6	1.5	1.2	1.5	1.2
04-013-3002	Central Phoenix	CP	7.5	7.2	6.3	6.0	5.2	4.1	4.1	3.8	3.3	3.8	3.2	2.9	2.2	2.1	2.2	2.1
04-013-3003	South Scottsdale	SS	4.9	4.2	3.5	4.1	3.1	3.1	2.8	2.2	2.4	2.4	1.9	1.6	1.4	1.4	1.6	1.3
04-013-3005	Gilbert	GI		2.2	2.7	2.4	2.0											
04-013-3006	Maryvale	MA		6.3	5.9	6.7	7.0	5.3	5.0	4.1	2.9							
04-013-3009	West Chandler (old)*	WC		2.7	2.7	2.8	2.3											
04-013-3010	Greenwood	GR		6.9	6.8	6.7	5.6	4.6	5.1	5.1	4.3	4.1	3.5	3.0	2.4	2.4	2.3	2.5
04-013-4003	South Phoenix (new)*	SP				4.4	4.8	3.4	3.7	3.3	3.3	3.2	2.7	2.3	2.0	2.2	3.1	2.0
04-013-4004	West Chandler (new)*	WC					2.2	2.1	2.2	2.6	2.1	2.0	2.0	1.5	1.4	1.5	1.6	1.3
04-013-4005	Tempe	TE					3.2	3.1	3.4	2.4	1.7	2.4	2.4	1.9	1.4	2.1	1.6	2.9
04-013-4007	Surprise	SU						1.1	1.1	0.8								
04-013-4010	Dysart	DY								1.1	1.1	1.2	0.8	1.3	1.0	0.8	0.6	0.5
04-013-4011	Buckeye	BE									0.4	0.9	0.6	0.8	0.5	0.5	0.6	0.8
04-013-9997	Super Site	SUPR				6.5	6.5	5.2	4.2	4.2	4.0	3.6	2.9	2.9	2.4	2.3	2.1	2.1
Maximum			**10.0**	**7.8**	**8.1**	**8.1**	**7.2**	**6.6**	**5.5**	**5.5**	**5.1**	**4.8**	**4.6**	**4.1**	**3.0**	**3.3**	**3.2**	**2.9**

* South Phoenix and West Chandler monitors (old) were relocated to the new South Phoenix and West Chandler sites in 1999 and 2000, respectively.

FIGURE 3-4
HISTORICAL ONE-HOUR AND EIGHT-HOUR CARBON MONOXIDE MONITORING DATA AND PROJECTIONS FOR THE WEST PHOENIX MONITORING SITE



trends in the second-highest one-hour and eight-hour CO concentrations at the West Phoenix monitor. The West Phoenix site has the highest projected eight-hour CO concentrations of 2.7 ppm in 2015 and 1.6 ppm in 2025. Similar graphs for the other thirteen monitors are provided in Section IV-3-1 of the TSD (Appendix A, Exhibit 2). The projected carbon monoxide concentrations based on historical data provide additional evidence that the Maricopa County area will continue to maintain the one-hour and eight-hour standards through 2025.

Meteorological Analysis

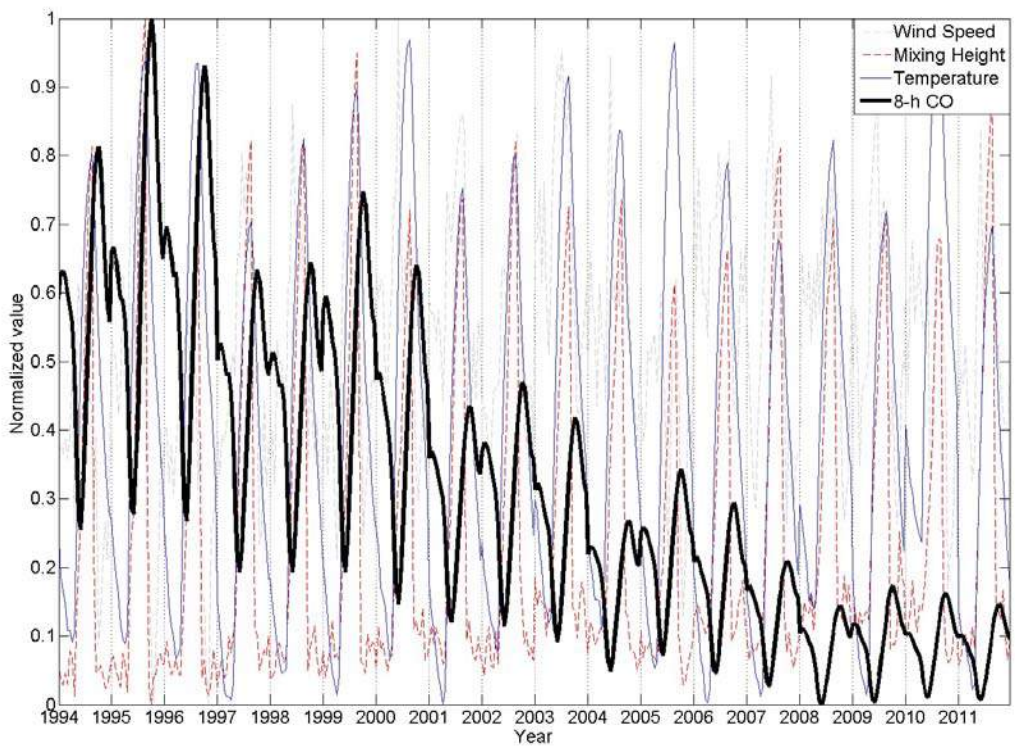
A meteorological analysis was performed to support the premise that the measured decreases in carbon monoxide concentrations are attributable to permanent and enforceable emission reductions, not unusually favorable meteorological conditions. The permanent and enforceable measures that have achieved continuing reductions in carbon monoxide concentrations, despite major increases in population, employment and vehicle travel in the region, are described in the Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG, 2001). For this purpose, long-term historical conditions for key meteorological parameters, including temperature, wind speed, wind direction, atmospheric stability, and mixing height, have been analyzed. The detailed results of this analysis are documented in Section IV-3-2 of the TSD (Appendix A, Exhibit 2).

Four different meteorological analyses were performed to demonstrate that the continuing trend in declining carbon monoxide concentrations in the Maricopa County area has not been due to favorable meteorological conditions. Figure 3-5 shows the results of one of these four analyses. This analysis was performed using meteorological data and eight-hour carbon monoxide concentrations for the winter seasons of 1994-2011. This graph shows clearly that maximum CO concentrations have declined, while daily wind speeds, temperatures, and mixing heights have not varied significantly over the same period.

The conclusions of the four meteorological analyses are summarized below:

- The maximum eight-hour CO concentrations have continued to decline, even though meteorological conditions during those years have not differed significantly from the 1994 episode meteorological conditions.
- The eight-hour CO concentrations have declined, while the daily variations in wind speeds, temperatures and mixing heights have not varied significantly over time.
- The one-hour CO concentrations have continued to decrease over time regardless of meteorological conditions.
- Daily maximum eight-hour CO concentrations below the CO standard were predominant during the period 1997 through 2011 under the same range of wind speeds and mixing heights.

FIGURE 3-5
NORMALIZED DIURNAL CYCLES OF WIND SPEED, TEMPERATURE, MIXING HEIGHT AND MAXIMUM EIGHT-HOUR CARBON MONOXIDE CONCENTRATIONS



Maintenance Demonstration Summary

Together, the three modeling and two weight of evidence analyses described above support a definitive conclusion that carbon monoxide concentrations will remain well below the one-hour and eight-hour standards through 2025. The following maximum eight-hour carbon monoxide concentrations were projected for 2025:

Emissions Inventory Comparison - 2.7 ppm (modeling domain); 2.2 ppm (maintenance area)

Scaled UAM/CAL3QHC Maximum Eight-Hour Concentrations - 4.0 ppm (modeling domain)

Intersection Hotspot Analysis - 1.7 ppm (near two high traffic/congested intersections)

Continued Monitored Attainment - 1.6 ppm (2nd-high at the West Phoenix monitor)

The maximum 2025 eight-hour carbon monoxide concentration projected by these four analyses was 4.0 ppm, which was based on scaled UAM/CAL3QHC modeling results from the 2003 CO Maintenance Plan. This maximum concentration in 2025 is less than half the eight-hour carbon monoxide standard of 9 ppm.

The Meteorological Analysis provides additional convincing evidence that the major reductions in carbon monoxide concentrations since 1994, despite increases in regional population, employment, and vehicle travel over this period, can be attributed to permanent and enforceable federal and local measures in the EPA-approved carbon monoxide plans for the region (MAG, 2001; MAG, 2003), rather than favorable meteorological conditions.

MONITORING NETWORK AND VERIFICATION OF CONTINUED ATTAINMENT

The ambient air quality monitoring network in Maricopa County is designed to assess the extent of air pollution, ensure compliance with national legislation, evaluate control options, and provide data for air quality modeling. In accordance with 40 CFR Part 58, the Maricopa County Air Quality Department (MCAQD) currently maintains twelve carbon monoxide monitoring sites in Maricopa County, while the Arizona Department of Environmental Quality (ADEQ) operates the Supersite in central Phoenix. Table 3-8 lists the carbon monoxide monitoring sites and their addresses.

MCAQD and ADEQ will continue to operate an appropriate air quality monitoring network to collect and provide air quality data for use in demonstrating ongoing attainment of the carbon monoxide standards. If the ambient levels of carbon monoxide concentrations rise and threaten to exceed the federal standards, the reasons for these occurrences will be investigated and appropriate actions will be taken. In compliance with 40 CRF Part 58 Subpart B, an annual air monitoring network review will be conducted to determine whether the network meets the monitoring objectives defined in Appendix D of 40 CFR Part 58, whether new sites are needed, and whether existing sites are no longer needed and can be terminated.

TABLE 3-8
CARBON MONOXIDE MONITORING SITES IN MARICOPA COUNTY

Site ID	Site Name	Abbr	Address	City
04-013-0016	West Indian School Rd*	WI	33rd Ave & W Indian School Rd	Phoenix
04-013-0019	West Phoenix	WP	39th Ave & Earll Dr	Phoenix
04-013-1003	Mesa	ME	Broadway Rd & Alma School Rd	Mesa
04-013-1004	North Phoenix	NP	7th St & Dunlap Ave	Phoenix
04-013-2001	Glendale	GL	59th Ave & W Olive	Glendale
04-013-3002	Central Phoenix	CP	16th St & Roosevelt St	Phoenix
04-013-3003	South Scottsdale	SS	Miller Rd & Thomas Rd	Scottsdale
04-013-3010	Greenwood	GR	27th Ave & Interstate 10	Phoenix
04-013-4003	South Phoenix	SP	Central Ave & Broadway Rd	Phoenix
04-013-4004	West Chandler	WC	Ellis St & Frye Rd	Chandler
04-013-4005	Tempe	TE	College Ave & Apache Blvd	Tempe
04-013-4010	Dysart	DY	Dysart Rd & Bell Rd	Surprise
04-013-4011	Buckeye	BE	Hwy 85 & MC 85	Buckeye
04-013-9997	Supersite	SUPR	4530 N 17th Ave	Phoenix

* Closed in 2010.

CONTINGENCY PROVISIONS

Section 175A(d) of the Clean Air Act requires that the maintenance plan contain contingency provisions to ensure prompt actions to correct any violation of the carbon monoxide standard which occurs after redesignation to attainment. A contingency plan is not required to contain fully adopted contingency measures. However, the plan should contain clearly identified contingency measures to be adopted, a schedule and procedure for adoption and implementation, and a specific time limit for action by the State. In addition, specific indicators should be identified which will be used to determine when the contingency measures need to be implemented (EPA, 1992). The 2013 Carbon Monoxide Maintenance Plan addresses each of these requirements below.

Two contingency measures in this plan were also contingency measures in the EPA-approved 2003 CO Maintenance Plan: Gross Polluter Option for I/M Program Waivers and Increased Waiver Repair Limit Options (MAG, 2003). A third contingency measure, Reinstatement of the VEI Program for Motorcycles, has been added to the 2013 CO Maintenance Plan.

Consistent with EPA guidance on early implementation of contingency measures, the two contingency measures that were approved in the 2003 CO Maintenance Plan have already been implemented in the CO maintenance area (EPA, 1993). No emission reduction credit for these two contingency measures was taken in this maintenance demonstration.

A description of the contingency measures in the 2003 CO Maintenance Plan is provided in Section VII-2-2 of the Technical Support Document in Appendix A, Exhibit 2 (MAG, 2003). The reasons for converting the Expansion of Area A Boundaries from a contingency measure in the 2003 CO Maintenance Plan to a maintenance measure in the 2013 Carbon Monoxide Maintenance Plan and the addition of a new contingency measure, Reinstatement of the VEI Program for Motorcycles, are discussed below.

In November 2012, EPA proposed to approve the 110(l) SIP revision submitted by the Arizona Department of Environmental Quality (ADEQ, 2009; ADEQ, 2011) that will eliminate the requirement for motorcycles to participate in the Arizona vehicle emissions inspection and maintenance (VEI) program (EPA, 2012a). EPA has indicated that the benefits of the contingency measure, Expansion of Area A Boundaries, in the 2003 CO Maintenance Plan may be used to offset the increase in emissions attributable to the exemption of motorcycles from the VEI program. Like other contingency measures in the 2003 CO Maintenance Plan, this measure was implemented early, in accordance with EPA guidance (EPA, 1993).

The motorcycle exemption is estimated to increase total carbon monoxide emissions in Area A by 0.264 metric tons per day or 0.027 percent, while the 2003 CO Maintenance Plan estimated that the expansion of Area A boundaries mandated by S.B. 1427 in 1998 reduced total CO emissions by 0.1 percent in 2000. Since the Expansion of Area A Boundaries will be used to offset the VEI exemption, it has been converted from a contingency measure in the 2003 Maintenance Plan to a committed maintenance measure in the 2013 Carbon Monoxide Maintenance Plan.

As indicated in the ADEQ SIP revision that will exempt motorcycles from VEI testing, CAA section 175A(d) requires that the State adopt as a contingency measure any control measure that was approved in the SIP prior to redesignation, but which the State subsequently repeals or relaxes (ADEQ, 2009; EPA, 2012a). In this instance, because the EPA-approved VEI program applied to motorcycles at the time the Maricopa County area was redesignated to attainment of the carbon monoxide standards in 2005, Reinstatement of the VEI Program for Motorcycles must also be adopted as a contingency measure in the 2013 Carbon Monoxide Maintenance Plan.

The ADEQ SIP revision proposes a contingency measure to reinstate VEI testing for motorcycles in Area A if a violation of the carbon monoxide standard occurs. If a violation of the eight-hour carbon monoxide standard occurs (i.e., the second-highest reading at the same monitor over two consecutive years is 9.5 ppm or higher), reinstatement of the motorcycle VEI program will be implemented according to the following schedule: ADEQ will request that the Arizona State Legislature reinstate emissions testing of motorcycles by October following the violation. In January 2013, ADEQ will request that the Legislature enact new legislation to reinstate emissions testing of motorcycles previously exempted by the revised SIP in the Phoenix vehicle emissions testing area, beginning January 1 of the following year (ADEQ, 2009).

In general, the success of an air quality program is measured by the concentrations recorded at the monitors. In order to ensure that violations of the carbon monoxide standards do not occur in the future, ambient air quality monitoring data will be examined to determine if additional contingency measures are needed. Two verified eight-hour carbon monoxide readings exceeding 9.0 ppm at one monitor during the same winter season (November - January) will trigger consideration of additional measures, which may include the strengthening of contingency measures that have already been implemented. When the trigger is activated, additional measures would be considered on the following schedule: (A) verification of the monitoring data to be completed three months after activation of the trigger; (B) applicable measures to be considered for adoption six months after the date established in (A); and (C) resultant committed measures to be implemented within twelve months after the adoption date in (B).

TRANSPORTATION CONFORMITY BUDGET

In accordance with the 1990 Clean Air Act Amendments (CAAA), transportation conformity requirements are intended to ensure that transportation activities do not result in air quality degradation. Section 176 of the Amendments requires that transportation plans, programs, and projects conform to applicable air quality plans before the transportation action is approved by a Metropolitan Planning Organization (MPO). The designated MPO for Maricopa County is the Maricopa Association of Governments.

Section 176(c) of the 1990 CAAA provides the framework for ensuring that Federal actions conform to air quality plans under section 110. Conformity to an implementation plan means that proposed activities must not: (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

EPA transportation conformity regulations establish criteria involving comparison of projected transportation plan emissions with the motor vehicle emissions assumed in applicable air quality plans. These regulations define the term “motor vehicle emissions budget” as meaning “the portion of the total allowable emissions defined in a revision of the applicable implementation plan (or in an implementation plan revision which was endorsed by the Governor or his or her designee) for a certain date for the purpose of meeting reasonable further progress milestones or attainment demonstrations, for any criteria pollutant or its precursors, allocated by the applicable implementation plan to highway and transit vehicles.”

The MAG 2003 CO Maintenance Plan, submitted to EPA in May 2003, established two transportation conformity budgets for the carbon monoxide modeling domain: a 2006 CO emissions budget of 699.7 metric tons per day and a 2015 CO budget of 662.9 metric tons per day. EPA found the 2006 and 2015 carbon monoxide budgets to be adequate for conformity purposes, effective October 14, 2003. In addition, these budgets were approved by EPA as part of the MAG 2003 CO Maintenance Plan, effective April 8, 2005. Currently, the approved 2006 budget applies to conformity horizon years from 2006 through 2014 and the 2015 budget applies to horizon years after 2014.

Table 3-3 indicates that the onroad mobile source emissions for the CO maintenance area will be 359.4 metric tons per day in 2025. EPA has indicated a new version of MOVES may be released in 2013 that “will incorporate multiple sources of new emissions data” and “it is too early in the development process for us to estimate the overall direction and magnitude of the emissions changes” (EPA, 2012b). To ensure that increases in carbon monoxide emission rates in future versions of the MOVES model do not cause exceedances of the 2025 conformity budget, it is proposed that a “safety margin” be applied to the 2025 onroad mobile source emissions produced by MOVES2010b.

Table 3-3 indicates that the 2008 carbon monoxide emissions estimated by MOVES2010b for the maintenance area are 581.6 metric tons per day. The maximum eight-hour carbon monoxide concentration in 2008 was 3.1 ppm (at the West Phoenix monitor), which is only one-third of the standard. Figure IV-1 in the TSD (Appendix A, Exhibit 2) indicates that carbon monoxide concentrations have declined since 2008 at all monitors and are projected to remain far below the 2008 concentrations at every monitoring site. The hotspot analysis also revealed that the traffic at high volume and heavily congested intersections will increase eight-hour carbon monoxide concentrations by a maximum of 0.4 ppm in 2025. Therefore, an increase in the 2025 conformity budget to a level below the 2008 emissions will not result in an exceedance of the carbon monoxide standard.

It is proposed that the safety margin represent 90 percent of the difference between the 2008 and 2025 carbon monoxide emissions, which is 200.0 metric tons per day. When added to the 2025 carbon monoxide emissions of 359.4 metric tons per day, this establishes a new 2025 conformity budget of 559.4 metric tons per day for the CO maintenance area. It is important to note that the 2025 budget for the CO maintenance area is less than the 2006 and 2015 conformity budgets for the CO modeling domain, even though the maintenance area is more than twice the size of the modeling domain.

Once EPA finds the new 2025 budget to be adequate (or approves the 2025 budget as part of the MAG 2013 CO Maintenance Plan), the 2025 budget for the CO maintenance area will be applied in regional conformity analyses conducted by MAG for horizon years 2025 and beyond. The 2006 and 2015 conformity budgets approved by EPA as part of the MAG 2003 CO Maintenance Plan, effective April 8, 2005, will continue to be applied in conformity analyses for horizon years prior to 2025. The approved 2006 carbon monoxide budget of 699.7 metric tons per day for the CO modeling domain will be applied in regional conformity analyses for horizon years 2006 through 2014 and the approved 2015 carbon monoxide budget of 662.9 metric tons per day for the CO modeling domain will be applied for horizon years 2015 through 2024.

SUBSEQUENT MAINTENANCE PLAN REVISIONS

Section 175A(b) of the Clean Air Act requires that a maintenance plan be submitted to EPA eight years after the original redesignation request and maintenance plan has been approved (i.e., by April 8, 2013). The purpose of this second maintenance plan is to demonstrate maintenance of the federal carbon monoxide standards for an additional ten years (2016-2025) following the first ten-year period (2006-2015).

No additional revisions of the carbon monoxide maintenance plan are anticipated at this time. If EPA reduces the carbon monoxide standards, the Maricopa Association of Governments, as the designated Regional Air Quality Planning Agency for the Maricopa County area, will work with ADEQ, MCAQD, ADOT and EPA to revise the State Implementation Plan, if necessary to demonstrate attainment and maintenance of the new carbon monoxide standards.

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MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

APPENDICES

MARCH 2013

MARICOPA
ASSOCIATION of
GOVERNMENTS

MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

APPENDICES

Prepared by:

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March 2013

Technical Assistance Provided By:

Arizona Department of Environmental Quality
Arizona Department of Transportation
Maricopa County Air Quality Department
U.S. Environmental Protection Agency

MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

APPENDICES

APPENDIX A

Exhibit I: 2008 Periodic Emissions Inventory for Carbon Monoxide for the Maricopa County, Arizona Maintenance Area. Maricopa County Air Quality Department. November 2012.

Exhibit 2: Technical Support Document in Support of the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. March 2013.

APPENDIX B

Exhibit 1: Public Hearing Process Documentation

Exhibit 2: Certification of Adoption

APPENDIX A

APPENDIX A

EXHIBIT 1

2008 Periodic Emissions Inventory for Carbon Monoxide for the Maricopa County, Arizona Maintenance Area. Maricopa County Air Quality Department. November 2012.

Maricopa County
Air Quality Department

2008 Periodic Emissions Inventory
for
Carbon Monoxide

for the
Maricopa County, Arizona, Maintenance Area

November 2012

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2008 Periodic Emission Inventory for Carbon Monoxide for the Maricopa County, Arizona Maintenance Area

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1. Introduction

1.1 Overview

This 2008 periodic carbon monoxide (CO) emissions inventory was developed to meet requirements set forth in Title I of the Clean Air Act Amendments of 1990 (CAAA). The CAAA require development of a baseline emission inventory and periodic revisions for areas that fail to meet the National Ambient Air Quality Standards (NAAQS) and for maintenance areas. In 2005, the Phoenix metropolitan area was redesignated to attainment for CO and the area became a maintenance area.

This inventory includes emission estimates for carbon monoxide (CO) from point, area, nonroad mobile, and onroad mobile sources. Note that totals shown in all tables may not equal the sum of individual values due to independent rounding.

1.2 Agencies responsible for the emissions inventory

Maricopa County Air Quality Department (MCAQD) has primary responsibility for preparing and submitting the 2008 Periodic Carbon Monoxide Emissions Inventory for Maricopa County. Point, area, and nonroad mobile source emission estimates were prepared by MCAQD. The Maricopa Association of Governments (MAG) prepared the emission estimates for onroad mobile and biogenic source categories. Table 1.2–1 lists those responsible for inventory preparation and quality assurance/quality control activities, which are described in the respective chapters.

Table 1.2–1. Contact information for chapter authors and QA/QC personnel.

Chapter	Author(s)	QA/QC contact persons
2. Point Sources	Matt Poppen, MCAQD (602) 506-6790	Bob Downing and Eric Raisanen MCAQD (602) 506-6790
3. Area Sources	Matt Poppen, Eric Raisanen and Dena Konopka, MCAQD (602) 506-6790	Bob Downing, MCAQD (602) 506-6790
4. Nonroad Mobile Sources	Matt Poppen and Bob Downing MCAQD (602) 506-6790	Bob Downing and Eric Raisanen MCAQD (602) 506-6790
5. Onroad Mobile Sources	Ieesuck Jung and Cathy Arthur MAG (602) 254-6300	Bob Downing and Eric Raisanen MCAQD (602) 506-6790
6. Biogenic Sources	Feng Liu MAG (602) 254-6300	Bob Downing and Eric Raisanen MCAQD (602) 506-6790

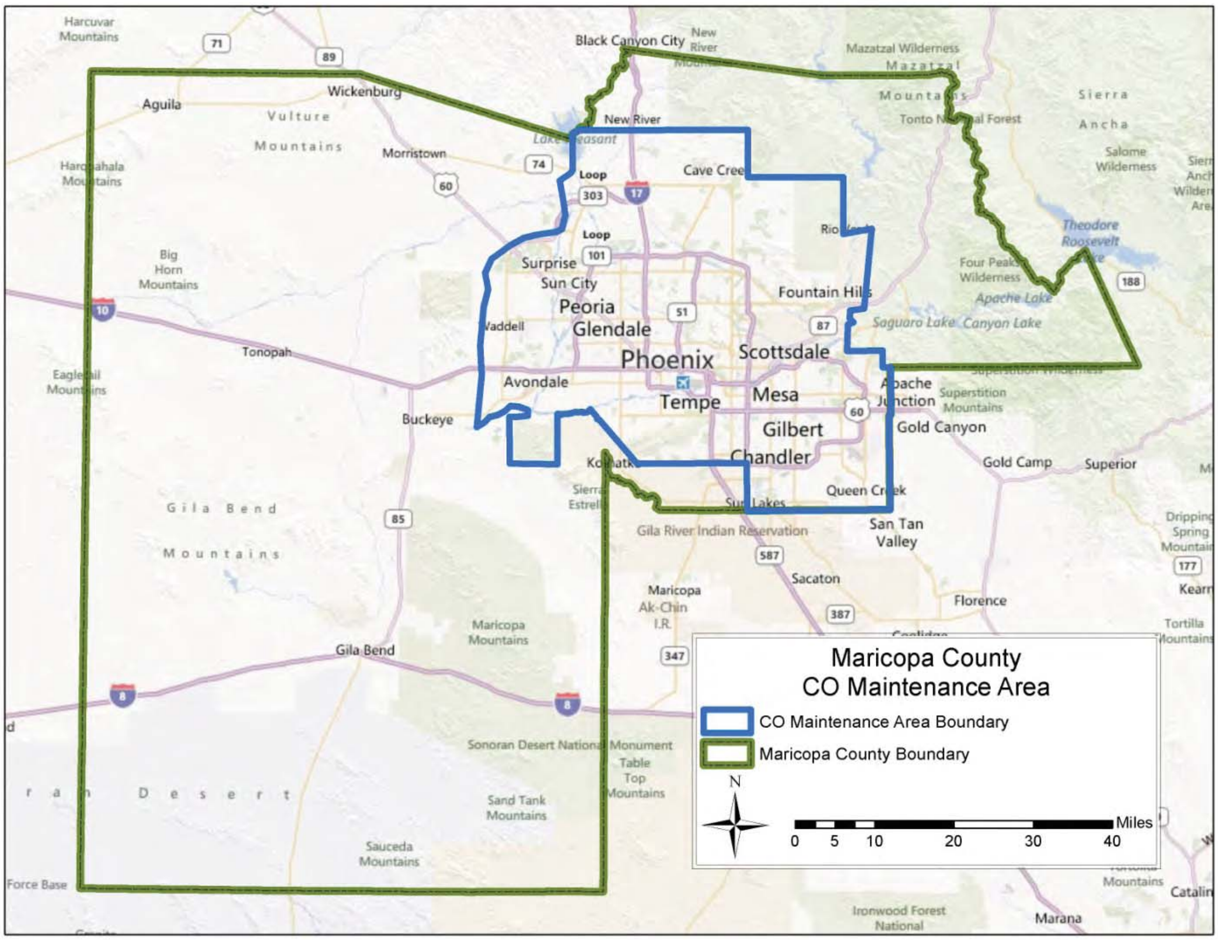
1.3 Temporal scope

Annual and CO season-day emissions were estimated for the year 2008, for Maricopa County and the Maricopa County CO maintenance area. The three-month peak CO season for Maricopa County is defined as November through January. The CO season is based on CO exceedances from 1988 through 1991 and is consistent with the CO season in the 1990 base year inventory.

1.4 Geographic scope

This inventory includes emission estimates for Maricopa County and for the Maricopa County CO maintenance area. Maricopa County encompasses approximately 9,223 square miles of land area, while the Maricopa County CO maintenance area is approximately 1,946 square miles or approximately 21 percent of the Maricopa County land area. A map of Maricopa County and the CO maintenance area is provided in Figure 1.4–1.

Figure 1.4–1. Map of Maricopa County and the CO maintenance area.



1.5 Overview of local demographic and land-use data

Many of the emissions estimates generated in this report were calculated using demographic and land-use data provided by the Maricopa Association of Governments (MAG). These data were used to apportion and/or scale Maricopa County emissions estimates to the maintenance area and vice versa. (For example, county-level emissions from residential natural gas usage in Maricopa County were apportioned to the maintenance area using the ratio of occupied households in each area). Detailed explanations of how emission estimates were apportioned or scaled are presented in each of the following chapters, along with the data sources used.

1.5.1 Demographic data

The demographic data provided by MAG included population, housing and employment data for calendar year 2008, for Maricopa County and the maintenance area. Table 1.5-1 provides an overview of the demographic data used in this report.

Table 1.5–1. Demographic profile of Maricopa County and the CO maintenance area.

Demographic variable	Maricopa County totals	Within CO Maintenance Area	Percent within CO Maintenance Area
Total resident population	4,026,000	3,899,350	96.85%
Total non-resident population	253,760	248,420	97.90%
Total population:	**4,279,760**	**4,147,770**	**96.92%**
Retail employment	537,430	526,840	98.03%
Office employment	444,170	442,770	99.68%
Industrial employment	412,580	406,050	98.42%
Public employment	278,610	267,370	95.97%
Other employment	191,770	184,210	96.06%
Construction	79,680	73,420	92.14%
Work at home	65,620	63,370	96.57%
Total employment:	**2,009,860**	**1,964,030**	**97.72%**
Single-family/multi-family household split:			
Single-family	75%	75%	
Multi-family	25%	25%	

1.5.2 Land-use data

MAG provided draft 2009 land use data (as of March 2010). The draft 2009 land-use data was assumed to be representative of 2008. Table 1.5–2 presents a summary of the land-use categories and acreage used to develop emission estimates for this inventory.

Table 1.5–2. Land-use categories used to apportion emissions.

Land use category	Area within Maricopa County (acres)	Area Within CO Maintenance Area (acres)	Percent within CO Maintenance Area
General/active open space/golf course (e.g., parks)	228,295	187,787	82.26%
Passive/restricted open space (e.g., mountain preserves)	2,373,545	89,051	3.75%
Lakes	12,525	12,525	100.00%
Agriculture	295,509	84,979	28.76%
Vacant (e.g., developable land)	2,227,981	171,785	7.71%

1.6 Emissions overview by source category

1.6.1 Point sources

The point source category includes those stationary sources that emit a significant amount of pollution into the air such as power plants, petroleum product storage and transfer facilities, and large industrial facilities. MCAQD utilizes the US EPA's Annual Emissions Reporting Requirements (AERR) Rule to define which stationary sources are listed as point sources. A detailed definition of a point source can be found in Section 2.1 of Chapter 2.

Table 1.6–1 summarizes annual and season-day emissions from point sources (including emission reduction credits) in Maricopa County and the CO maintenance area, respectively. A detailed breakdown of emissions calculations for all point sources is contained in Chapter 2.

Table 1.6–1. Summary of annual and season-day point source emissions.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	738.04	3,235.7
CO Maintenance Area	371.77	1,575.4

1.6.2 Area sources

Area sources are facilities or activities whose individual emissions do not qualify them as point sources. Area sources represent numerous facilities or activities that individually release small amounts of a given pollutant, but collectively they can release significant amounts of a pollutant. Stationary sources with annual emissions lower than the point source thresholds described in Section 2.1 were included in the area source inventory. Examples of area source categories include residential wood burning, commercial cooking, waste incineration, and wildfires.

Table 1.6–2 summarizes annual and season-day emissions of the chief area source categories, for both Maricopa County and the CO maintenance area. A detailed breakdown of emissions calculations for each area source category is contained in Chapter 3.

Table 1.6–2. Summary of annual and season-day area source emissions, by source category.

	Maricopa County		CO maintenance area	
Source category	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Fuel combustion	6,900.04	79,250.4	6,725.01	77,055.5
Industrial processes	655.87	4,134.3	629.03	3,985.3
Waste treatment/disposal	730.70	17,039.4	257.60	1,657.3
Miscellaneous area sources	4,968.33	2,486.9	140.40	712.9
All area sources:	**13,254.94**	**102,911.0**	**7,752.04**	**83,411.1**

1.6.3 Nonroad mobile sources

Nonroad mobile sources include off-highway vehicles and engines that move or are moved within a 12-month period. Table 1.6–3 summarizes annual and season-day emissions from nonroad mobile sources, for both Maricopa County and the CO maintenance area. A detailed breakdown of emissions calculations for each source category is contained in Chapter 4.

Table 1.6–3. Summary of annual and season-day emissions from nonroad mobile sources.

	Maricopa County		CO maintenance area	
Equipment category	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**
Agricultural	367.01	513.7	105.55	147.7
Airport ground support equipment	4,842.26	26,460.4	21,327.08	116,541.4
Commercial	37,407.59	204,928.7	36,816.55	201,690.8
Construction & mining equipment	17,097.10	90,379.7	15,753.27	83,275.9
Industrial equipment	10,294.56	64,617.8	10,131.90	63,596.8
Lawn & garden	66,712.36	100,753.6	64,657.62	97,650.4
Pleasure craft	1,627.41	5,008.5	431.81	1,328.9
Railway maintenance	19.33	120.8	18.73	117.1
Recreational equipment	7,270.41	24,593.7	412.23	1,394.5
Aircraft	17,105.50	93,472.7	16,683.40	91,166.1
Locomotives	276.93	1,513.3	119.23	651.6
All nonroad mobile sources:	**163,020.46**	**612,362.8**	**166,457.38**	**657,561.2**

1.6.4 Onroad mobile sources

Emissions from onroad mobile sources were calculated for the CO maintenance area located primarily within Maricopa County as well as for Maricopa County as a whole. A detailed break-down of emissions calculations by vehicle class and roadway type is contained in Chapter 5.

Table 1.6–4 summarizes annual and season-day emissions from onroad mobile sources for both Maricopa County and the CO maintenance area.

Table 1.6–4. Annual and season-day emissions from onroad mobile sources in Maricopa County.

Geographic area	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**
Maricopa County	255,355.67	1,293,502.6
CO Maintenance Area	237,324.41	1,201,621.5

1.6.5 Biogenic sources

The biogenic source category includes emissions from all vegetation (e.g., crops, indigenous vegetation, landscaping, etc.) in Maricopa County and the CO maintenance area. Emissions were estimated using the Model of Emissions of Gases and Aerosols from Nature (MEGAN). MEGAN is a state-of-the-art biogenic emissions model developed by the National Center for Atmospheric Research (NCAR). Some corrections and improvements were made in the latest version of MEGAN2.04. MEGAN2.04 was used to compute biogenic emissions in Maricopa County and the CO maintenance area. Annual and daily CO emissions from biogenic sources are shown in Table 1.6–5 for Maricopa County and the CO maintenance area.

Table 1.6–5. Annual and season-day emissions from biogenic sources.

Geographic area	**Annual CO emissions (tons/yr)**	**Typical daily CO emissions (lbs/day)**
Maricopa County	14,452.68	21,144.7
CO Maintenance Area	3,130.39	4,646.0

2. Point Sources

2.1 Introduction and scope

This carbon monoxide (CO) inventory is one of a number of emission inventory reports being prepared to meet US EPA reporting requirements. In addition to preparing periodic emissions inventories for the CO maintenance area as a commitment under the current CO State Implementation Plan (SIP), the federal Air Emission Reporting Requirements (AERR) requires that state and local agencies prepare emissions estimates on a county basis, and submit data electronically to the US EPA for inclusion in the National Emission Inventory (NEI) for 2008. This CO inventory was developed concurrently with similar inventories for ozone precursors (VOC, NO_x and CO), and PM (including PM_{10}, $PM_{2.5}$, NO_x, SO_x, and NH_3), as part of Maricopa County's requirements under the respective SIPs.

In order to provide consistency among all these inventories, it was decided to standardize the definition of a "point source" by adopting the designation of point sources as outlined in the AERR:

> *We are basing the requirement for point source format reporting on whether the source is major under 40 CFR part 70 for the pollutants for which reporting is required, i.e., CO, VOC, NO_x, SO_2, $PM_{2.5}$, PM_{10}, lead and NH_3 but without regard to emissions of HAPs…this approach will result in a more stable universe of reporting point sources, which in turn will facilitate elimination of overlaps and gaps in estimating point source emissions, as compared to nonpoint source emissions. Under this requirement, states will know well in advance of the start of the inventory year which sources will need to be reported. (US EPA, 2008)*

Additionally, EPA guidance requires emission inventories prepared for SIP development purposes to consider point sources within 25 miles of the CO maintenance area. No additional point sources met this reporting threshold.

This point source inventory includes actual CO emissions for the year 2008 and a typical day during the CO season (defined as November through January). A description and map of the maintenance area are provided in Chapter 1.

Several tables have been constructed to provide the point source emissions and category totals. Table 2.2–1 provides an alphabetical list of all point sources and their location, while Table 2.4–1 shows the 2008 annual and average CO season-day emissions broken out by facility. Note that totals shown in all tables may not equal the sum of individual values due to independent rounding.

2.2 Identification of CO point sources

The Maricopa County Air Quality Department (MCAQD) identified point sources within Maricopa County through its electronic permit system database, Environmental Management System (EMS), and the 2008 annual emissions reports submitted to the department. A total of 21 stationary sources were identified as point sources using the definition described in Section 2.1.

There are no additional point sources within the 25-mile boundary around the CO maintenance area with permits issued by the Pinal County Air Quality Control District (PCAQCD). While the Arizona Department of Environmental Quality (ADEQ) retains permitting authority for a limited number of industrial source categories in Maricopa County, no ADEQ-permitted facilities are considered point sources, and are addressed instead as area sources.

Table 2.2–1 contains an alphabetical listing of all point sources, including a unique business identification number, NAICS industry classification code, business name, and physical address.

Table 2.2–1. Name and location of all point sources in Maricopa County.

ID #	NAICS	Business name	Address	City	ZIP	
245	337122	AF Lorts Manufacturing Company	8120 W Harrison St	Tolleson	85353	
3313	221112	APS West Phx Power Plant	4606 W Hadley St	Phoenix	85043	
43063	221112	Dynegy Arlington Valley LLC	39027 W Elliot Rd	Arlington	85322	*
44439	221112	Gila River Power Station	1250 E Watermelon Rd	Gila Bend	85337	*
1418	326299	Goodrich Corporation	3414 S 5th St	Phoenix	85040	
355	336412	Honeywell-Engines Systems & Services	111 S 34th St	Phoenix	85034	
3300	92811	Luke AFB - 56th Fighter Wing	14002 W Marauder St	Glendale	85309	
62	33711	Mastercraft Cabinets Inc.	305 S Brooks	Mesa	85202	
44186	221112	Mesquite Generating Station	37625 W Elliot Rd	Arlington	85322	*
43530	221112	New Harquahala Generating Co	2530 N 491st Ave	Tonopah	85354	*
20706	32614	New Wincup Holdings, Inc.	7980 W Buckeye Rd	Phoenix	85043	
52382	221112	Ocotillo Power Plant	1500 E University Dr	Tempe	85281	
1341	33992	Penn Racquet Sports Inc.	306 S 45th Ave	Phoenix	85043	
42956	221112	Redhawk Generating Facility	11600 S 363rd Ave	Arlington	85322	*
303	332431	Rexam Beverage Can Company	211 N 51st Ave	Phoenix	85043	
3315	221112	Santan Generating Station	1005 S Val Vista Rd	Gilbert	85296	
4175	424710	SFPP LP Phoenix Terminal	49 N 53rd Ave	Phoenix	85043	
3316	221112	SRP Agua Fria Generating Station	7302 W Northern Ave	Glendale	85303	
3317	221112	SRP Kyrene Generating Station	7005 S Kyrene Rd	Tempe	85283	
552	337122	Thornwood Furniture Mfg	5125 E Madison St	Phoenix	85034	
174	325998	W. R. Meadows Of Arizona, Inc.	4220 S Sarival Ave	Goodyear	85338	

* = Facility is outside the CO maintenance area.

2.3 Procedures for estimating emissions from point sources

Both annual and average season-day CO emissions were estimated from annual source emission reports, MCAQD investigation reports, permit files and logs, or telephone contacts with sources. For most of the sources, material balance methods were used for determining emissions. Emissions were estimated using the emission factors from AP–42, source tests, engineering calculations, or manufacturers' specifications.

MCAQD distributes annual emissions survey forms to nearly all facilities for which MCAQD has issued an operating permit. Facilities are required to report detailed information on stacks, control devices, operating schedules, and process-level information concerning their annual activities. (See Appendix 1 for a copy of the instructions to complete the emissions inventory.) These instructions include examples and explanations on how to complete the annual emissions reporting forms that facilities must submit to MCAQD. Activity data reported for the December–February winter season is presumed to be representative of the November–January CO season.

After a facility has submitted an annual emissions report to MCAQD, emissions inventory staff check all reports for missing and questionable data, and check the accuracy and reasonableness of all emissions calculations with AP–42, the Factor Information and REtrieval (*webFIRE*) software, and other EPA documentation. Control efficiencies are determined by source tests when available, or by AP–42 factors, engineering calculations, or manufacturers' specifications. MCAQD has conducted annual emissions surveys for permitted facilities since 1988, and the department's database system, EMS, contains numerous automated quality assurance/quality control checks for data input and processing.

2.3.1 Application of rule effectiveness

Rule effectiveness reflects the actual ability of a regulatory program to achieve the emission reductions required by regulation. The concept of applying rule effectiveness in a SIP emission inventory has evolved from the observation that regulatory programs may be less than 100 percent effective for some source categories. Rule effectiveness (RE) is applied to those sources affected by a regulation and for which emissions are determined by means of emission factors and control efficiency estimates.

MCAQD has estimated RE for industrial processes that claimed emissions reductions through the use of a control device, RE calculations were performed separately for Title V and non-Title V sources. Overall RE values of 90.94% (for Title V processes) and 84.27% (for non-Title V) were calculated. (See Appendix 2 for details on the methods and data used in computing RE rates.)

2.4 Detailed overview of point source emissions

Table 2.4–1 provides a summary of annual and CO season-day emissions from all point sources, within and outside the CO maintenance area. Sources for which rule effectiveness has been applied (for CO emissions) are noted. Values of "0.00" and "0.0" for annual and season-day emissions denote a value below the level of significance (0.005 tons/yr and 0.05 lbs/day, respectively).

Table 2.4–1. Annual and CO season-day point source emissions, by facility.

ID #	Business name	City		Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
245	AF Lorts Manufacturing Company	Tolleson		0.0	0.06
3313	APS West Phx Power Plant	Phoenix		72.2	372.60
43063	Dynegy Arlington Valley LLC	Arlington	*	41.5	97.98
44439	Gila River Power Station	Gila Bend	* †	84.8	415.40
1418	Goodrich Corporation	Phoenix	†	0.2	2.96
355	Honeywell-Engines Systems & Services	Phoenix		18.8	103.35
3300	Luke AFB - 56th Fighter Wing	Glendale		4.9	40.73
62	Mastercraft Cabinets Inc.	Mesa		0.0	0.68
44186	Mesquite Generating Station	Arlington	* †	21.2	126.08
43530	New Harquahala Generating Co	Tonopah	*	55.4	304.15
20706	New Wincup Holdings, Inc.	Phoenix		10.4	61.93
52382	Ocotillo Power Plant	Tempe		12.9	25.04
1341	Penn Racquet Sports Inc.	Phoenix		2.9	23.49
42956	Redhawk Generating Facility	Arlington	*	163.4	716.74
303	Rexam Beverage Can Company	Phoenix		3.7	20.24
3315	Santan Generating Station	Gilbert		130.7	637.81
4175	SFPP LP Phoenix Terminal	Phoenix		9.6	52.73
3316	SRP Agua Fria Generating Station	Glendale		80.6	92.31
3317	SRP Kyrene Generating Station	Tempe		11.7	67.83
552	Thornwood Furniture Mfg	Phoenix		0.5	4.06
174	W. R. Meadows Of Arizona, Inc.	Goodyear		0.1	1.24

† = Facility is outside the CO maintenance area.
* = Facility for which rule effectiveness has been applied.

2.5 Emission reduction credits

A major source or major modification planned in a maintenance area must obtain emissions reductions as a condition for approval. These emissions reductions, generally obtained from existing sources located in the vicinity of a proposed source must offset the emissions increase from the new source or modification. The obvious purpose of acquiring offsetting emissions decreases is to allow an area to move towards attainment of the national ambient air quality standards while still allowing some industrial growth.

Table 2.5–1 provides a list of emission reduction credits for carbon monoxide. One previously operational facility maintains emission reduction credits in the Arizona Emissions Bank (http://www.azdeq.gov/environ/air/permits/eb.html) that is still valid for inclusion in this report.

Table 2.5–1. CO emission reduction credits.

ID	Facility Name	Emission Reduction Credits (tons)
1151	Freescale Semiconductor, Inc. (formerly Motorola Mesa)	12.5

2.6 Summary of point source emissions

Table 2.6–1 provides an overview of point source emissions for Maricopa County and the CO maintenance area.

Table 2.6–1. Annual and season-day point source CO emissions (including emission reduction credits).

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	738.04	3,235.7
CO Maintenance Area	371.77	1,575.4

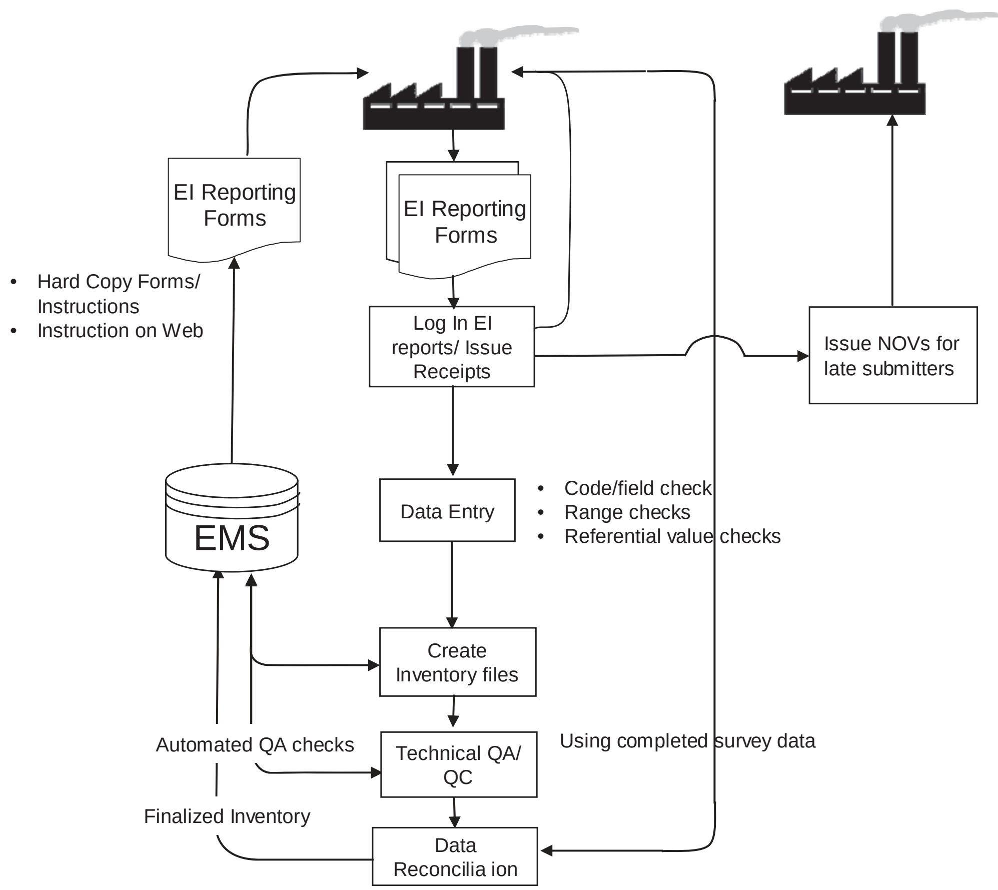
2.7 Quality assurance / quality control procedures

2.7.1 Emission survey preparation and data collection

The MCAQD's Emissions Inventory (EI) Unit annually collects point source criteria pollutant emission data from sources in the county. MCAQD annually reviews EPA guidance, documents from the Emission Inventory Improvement Program (EIIP), and other source materials to ensure that the most current emission factors and emission calculation methods are used for each year's survey. Each January, the EI Unit prepares a pre-populated hard copy of the preceding year's submissions and mails reporting forms to permitted sources, along with detailed instructions for completing the forms. (A copy of these instructions is included as Appendix 1). The EI Unit asks sources to verify and update the data. The EI Unit also holds periodic workshops from January through April to assist businesses in completing EI forms.

The general data flow for data collection and inventory preparation is shown in Figure 2.7–1.

Figure 2.7–1. Data flow for annual point source emission inventory reporting.



2.7.2 Submission processing

Submitted EI reports are logged in as they are received, and receipts are issued for emissions fees paid. The data are input "as received" into the department's data base. During data entry, numerous automated quality control (QC) checks are performed, including:

- pull-down menus to minimize data entry errors (e.g., city, pollutant, emission factor unit, etc.)
- mandatory data field requirement checks (e.g., a warning screen appears if a user tries to save an emission record with a missing emission factor).
- range checks (e.g., were valid SCC, Tier, SIC, and NAICS codes entered?)
- referential value checks (e.g., emission factor units, annual throughput units)
- automatic formatting of date, time, telephone number fields, etc.

Automated quality assurance (QA) checks on the report that has been entered include the following:

- Comparing reported emission factors to SCC reference lists
- Comparing reported emission factors to material name reference list
- Checking the report for calculation errors. This includes annual throughput, emission factors, unit conversion factors (e.g., BTU to therms), capture efficiency, primary / secondary control device efficiency, and any offsite recycling credits claimed.
- Checking the report for completeness of required data.

When data entry is complete, an electronic version of the original data is preserved separately to document changes made during the technical review and QA/QC process.

When errors are flagged, the businesses are contacted and correct information is obtained and input to the EMS. Outstanding reporting issues are documented. Confidential business information (CBI) is identified by a checkbox on the form, and these data elements are flagged during data entry and are not transmitted to the EPA. To prepare the inventory for submittal to the National Emissions Inventory (NEI), the EI Unit runs Microsoft Access queries on the data in the EMS to pull fields for the NEI Input format (NIF) tables.

2.7.3 Analysis of annual point source emissions data for this inventory

Two environmental planners checked inventory accuracy and reasonableness, and assured that all point sources had been identified and that the methodology applied to calculate emissions was appropriate and that the calculations were correct. Other reasonableness checks were conducted by recalculating emissions using methods other than those used to make the initial emissions calculations and then comparing results. QA was conducted by checking all emissions reports submitted to MCAQD for the year 2008 for missing and questionable data and by checking the accuracy and reasonableness of all emissions calculations made for such reports. Notes concerning follow-up calls and corrections to calculations were documented on each 2008 annual emissions report.

The QA point source coordinator reviewed checked calculations, identified errors, and performed completeness, reasonableness and accuracy checks.

2.8 References

US EPA, 2008. Air Emissions Reporting Requirements. 73 Fed. Reg. 76539. Available at: http://www.epa.gov/ttn/chief/aerr/final_published_aerr.pdf.

3. Area Sources

3.1 Scope and methodology

This chapter considers all stationary sources which are too small or too numerous to be treated as point sources. EPA guidance documents, including "Introduction to Area Source Inventory Development" as well as permit and emissions data in the MCAQD's Environmental Management System (EMS) database, and previous SIP inventories, were evaluated to develop the list of area source categories for inclusion. Some source categories were deemed "insignificant" because there are no large production facilities and/or very few small sources, and therefore emissions were not quantified. MCAQD prepared the area source emission estimates for all area sources and provided quality assurance checks on all data. Table 3.1–1 contains a list of all area source categories addressed in this chapter.

Table 3.1–1. List of area source categories.

Area source description	Section
Fuel combustion:	
Industrial natural gas	3.2.1
Industrial fuel oil	3.2.2
Commercial/institutional natural gas	3.2.3
Commercial/institutional fuel oil	3.2.4
Residential natural gas	3.2.5
Residential wood	3.2.6
Residential fuel oil	3.2.7
Industrial processes:	
Secondary metal production	3.3.1
Commercial cooking	3.3.2
State-permitted portable sources	3.3.3
Industrial processes not elsewhere classified	3.3.4
Electrical equipment manufacturing	3.3.5
Waste treatment and disposal:	
On-site incineration	3.4.1
Open burning	3.4.2
Landfills	3.4.3
Other industrial waste disposal	3.4.4
Miscellaneous area sources:	
Wildfires	3.5.1.1
Prescribed Fires	3.5.1.2
Structure fires	3.5.1.3
Vehicle fires	3.5.1.4
Engine testing	3.5.1.5
Health services (crematories)	3.5.2

For nearly all categories, emissions were calculated in one of the following ways:

- emissions estimates for some categories were developed by conducting surveys on local usage (e.g., natural gas consumption) or derived from state-wide data (e.g., fuel oil use).
- for some widespread or diverse categories (e.g., consumer solvent use), emissions were calculated using published per-capita or per-employee emission factors.
- for source categories with some information available from annual emissions reports (e.g., bakeries), these data were combined with employment data to “scale up” reported emissions to reflect the entire source category.
- for those source categories with detailed emissions data available from most or all significant sources in the category, emissions were calculated based on detailed process and operational data provided by these sources.

The specific emissions estimation methodologies used for each source category (including any application of rule effectiveness) are described in greater detail in the respective sections.

3.2 Fuel combustion

Area source emissions for the following seven categories of fuel consumption were calculated: Industrial natural gas, industrial fuel oil, commercial/institutional natural gas, commercial institutional fuel oil, residential natural gas, residential wood, and residential fuel oil. Data for emissions calculations from natural gas combustion came from a survey of the three natural gas suppliers in Maricopa County. The following table summarizes the natural gas sales data received from Maricopa County natural gas suppliers.

Table 3.2–1. Annual natural gas sales in Maricopa County, by supply company and end-user category.

	Sales by end user category (in MMCF/yr)					
Natural gas supplier	**Electric Utilities**	**Industrial**	**Commercial/ Institutional**	**Residential**	**Transport***	**Other***
Southwest Gas	17.07	1,543.27	15,643.15	14,911.67	6,487.35	n/a
City of Mesa	6.52	93.02	1,609.12	1,339.62	n/a	244.97
El Paso	227,608.92	201.90	n/a	n/a	n/a	6.07

* For emissions calculations, sales from these two categories were grouped with industrial sales.

Area source emissions for wood and fuel oil combustion were calculated from Arizona state-level sales and consumption data as described in the following subsections. Area source emissions from coal and liquid petroleum gas were not calculated as emissions from these categories were determined to be insignificant.

3.2.1 Industrial natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas distributed, by user category, within the county in 2008. Area source industrial natural gas usage for the county is based on the reported total volume of natural gas sold to industrial sources, minus natural gas used by industrial point sources.

Natural gas is used for both external combustion (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source natural gas usage derived must be apportioned between these two categories. This apportionment was based on the percentages of external and internal natural gas combustion reported by all industrial area sources in 2008.

Annual emissions for the county are calculated by multiplying natural gas usage by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–2. Emission factors and annual CO emissions from area-source industrial natural gas combustion, by combustion type.

Combustion type	% of total	Annual natural gas usage (MMCF)	CO emission factor (lbs/MMCF)	Annual CO emissions (tons/yr)
External	98.44	7,934.68	84	333.26
Internal	1.56	125.74	399	25.09
Totals:	**100.00**	**8,060.43**		**358.34**

Season-day emissions for the county are calculated by first multiplying annual emissions by the percentage of industrial natural gas sold used during the CO season. (Figures reported by natural gas suppliers for the December–February time period are assumed to be representative for the November–January CO season.) CO season emission totals are then divided by the number of days that activity occurs during the CO season. Annual and season-day emissions within the CO maintenance area are calculated by applying the ratio of industrial employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–3. Annual and season-day CO emissions from area-source industrial natural gas combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	358.34	2,513.9
CO Maintenance Area	352.68	2,474.1

3.2.2 Industrial fuel oil

Area source emissions from industrial fuel oil combustion are calculated by a multi-step process which allocates Arizona state-level industrial fuel oil sales data from the US Department of Energy, Energy Information Administration (US DOE, 2010a) to Maricopa County.

To derive industrial fuel oil usage in Maricopa County, reported Arizona sales of high-sulfur diesel for 2008 are first subtracted from Arizona state-level total industrial fuel oil sales, as it is presumed that no high-sulfur diesel fuel is used in Maricopa County due to local air quality regulations and market conditions.

Arizona state industrial fuel oil sales (less high-sulfur diesel fuel) are then multiplied by the ratio of industrial employment in Maricopa County to Arizona State (0.70), as determined by data from the US Census Bureau (2010) to estimate annual Maricopa County industrial fuel oil sales. To avoid double-counting, industrial fuel oil use attributable to stationary point sources (addressed in Chapter 2) and nonroad mobile sources (addressed in Chapter 4) are subtracted from County industrial fuel oil sales to estimate county fuel oil usage by area sources.

Industrial fuel oil is used for both external combustions (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area-source industrial fuel oil sales derived above must be apportioned between these two categories. This apportionment was based on the percentages of external and internal fuel oil combustion reported by all industrial area sources surveyed in 2008 shown in Table 3.2–4.

County-level annual emissions from this area source category were calculated by multiplying industrial fuel oil sales by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–4. Emission factors and annual CO emissions from area-source industrial fuel oil combustion, by combustion type.

Combustion type	% of total	Annual fuel oil sales (Mgals)	CO emission factor (lbs/Mgals)	Annual CO emissions (tons/yr)
External	78.01	65,634.56	5	164.09
Internal	21.99	18,501.53	130	1,202.60
Totals:	**100.00**	**84,136.09**		**1,366.69**

Season-day emissions for the county are calculated by first multiplying annual emissions by 25.07% to estimate CO season emission totals. CO season emission totals are then divided by the number of days that activity occurs during the CO season (78), as recommended by EIIP guidance (US EPA, 2001a).

Annual and season-day emissions in the CO maintenance area are calculated by applying the ratio of industrial employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–5. Annual and season-day CO emissions from area-source industrial fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	1,366.69	8,784.8
CO Maintenance Area	1,345.09	8,646.0

3.2.3 Commercial/institutional natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas distributed, by user category, within the county in 2008. Area source commercial and institutional (C&I) natural gas usage for the county is based on the reported total volume of natural gas sold to C&I sources, minus natural gas used by C&I point sources.

Natural gas is used for both external combustions (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source natural gas usage derived above must be apportioned between these two categories. This apportionment was based on the percentages of external and internal natural gas combustion reported by all C&I area sources in 2008.

Annual emissions for the county and the CO maintenance area are calculated by multiplying natural gas usage by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–6. Emission factors and annual CO emissions from area-source commercial/institutional natural gas combustion, by combustion type.

Combustion type	% of total	Annual natural gas usage (MMCF)	CO emission factor (lbs/MMCF)	Annual CO emissions (tons/yr)
External	98.34	17,130.07	84	719.46
Internal	1.66	289.16	399	57.69
Totals:	**100.00**	**17,419.23**		**777.15**

Season-day emissions for the county are calculated by first multiplying annual emissions by the percentage of C&I natural gas sold used during the CO season. (Figures reported by natural gas suppliers for the December–February time period are assumed to be representative for the November–January CO season.) CO season emission totals are then divided by the number of days that activity occurs during the CO season.

Annual and season-day emissions in the CO maintenance area are calculated by applying the combined ratio of retail, office, public and other employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–7. Annual and season-day CO emissions from area-source commercial/institutional natural gas combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	777.15	7,248.7
CO Maintenance Area	760.67	7,095.1

3.2.4 Commercial/institutional fuel oil

Area source emissions from commercial and institutional (C&I) fuel oil combustion are calculated by a multi-step process of allocating Arizona state-level C&I fuel oil sales as reported by the US Department of Energy, Energy Information Administration (US DOE, 2010b) to Maricopa County.

To derive commercial/institutional fuel oil usage in Maricopa County, reported Arizona state-level sales of high-sulfur diesel for 2008 are first subtracted from Arizona state-level total commercial/institutional fuel oil sales, as it is presumed that no high-sulfur diesel fuel is used in Maricopa County due to local clean air act requirements and market conditions. Arizona state commercial/institutional fuel oil sales (less high-sulfur diesel fuel) are then multiplied by the ratio of C&I employment in Maricopa County to Arizona state (0.80), as determined by data from the US Census Bureau (2010) to estimate Maricopa County-level C&I fuel oil sales.

To avoid double-counting, commercial/institutional fuel oil use attributable to stationary point sources (addressed in Chapter 2) and nonroad mobile sources (addressed in Chapter 4) are subtracted from County C&I fuel oil sales to estimate county fuel oil usage used by C&I area sources.

Fuel oil is used for both external combustion (boilers, heaters) and internal combustion (generators), each of which have different emission factors. Thus the area source C&I fuel oil sales derived above must be apportioned between these two categories. This apportionment was based on the percentages of external and internal fuel oil combustion reported by all commercial/institutional area sources surveyed by MCAQD in 2008 (shown in Table 3.2–8 below).

Annual emissions for the county are calculated by multiplying C&I fuel oil sales by the respective AP-42 emission factors for external and internal combustion.

Table 3.2–8. Emission factors and annual CO emissions from area-source commercial/institutional fuel oil combustion, by combustion type.

Combustion type	% of total	Annual fuel oil sales (Mgals)	CO emission factor (lbs/Mgals)	Annual CO emissions (tons/yr)
External	66.95	20,321.18	5	50.80
Internal	33.05	10,031.59	130	652.05
Totals:	**100.00**	**30,352.78**		**702.86**

Season-day emissions for the county are calculated by first multiplying annual emissions by 26.66% to estimate CO season emission totals. CO season emission totals are then divided by the number of days that activity occurs during the CO season (78) as recommended by EIIP guidance (US EPA, 2001a).

Annual and season-day emissions within the CO maintenance area are calculated by applying the combined ratio of retail, office, public and other employment in the maintenance area to county-level emission calculations. (See Section 1.5.1 for a discussion of the employment data used).

Table 3.2–9. Annual and season-day CO emissions from area-source commercial/institutional fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	702.86	4,804.7
CO Maintenance Area	687.96	4,702.8

3.2.5 Residential natural gas

All natural gas suppliers in Maricopa County were surveyed to gather information on the volume of natural gas sold, by user category, within the county. Annual emissions from residential natural gas combustion emissions were calculated by multiplying residential natural gas sales by emission factors for residential natural gas combustion listed in AP-42 Tables 1.4-1 and 1.4-2 (US EPA, 1998).

CO season-day emissions are calculated by first multiplying reported natural gas usage during the CO season (8,172.3 MMCF) by the emission factor for CO for residential natural gas combustion (40 lbs CO/MMCF) to produce CO season emissions (natural gas usage reported for the months of December-February are assumed to represent CO season usage). CO season emissions are then divided by the number of days during the CO season that residential natural gas combustion occurs (91) (US EPA, 2001a).

Annual and season-day residential natural gas emissions in the CO maintenance area are calculated by multiplying county-level emissions by the percentage of total resident population (96.85%) in the CO maintenance area.

Table 3.2–10. **Annual and season-day CO emissions from residential natural gas combustion.**

Geographic area	Annual CO emissions (tons/year)	Season-day CO emissions (lbs/day)
Maricopa County	325.03	3,592.2
CO Maintenance Area	314.79	3,479.1

3.2.6 Residential wood combustion

Area-source emissions from residential wood combustion are calculated based on the amount of wood burned in fireplaces and woodstoves in Maricopa County, as recommended by EIIP guidance (US EPA, 2001b). Residential wood combustion in the county is estimated by multiplying data on statewide residential wood combustion usage (651,000 cords/yr) from the US Department of Energy (US DOE, 2010) by the ratio of county to state households that report use of wood for heating (3.2867%) from the US Census Bureau (2010a). The latest available data on residential wood use for household heating from the US Department of Energy is for the calendar year 2007. Since all fireplaces in homes constructed since 1999 are required by Arizona statute to be clean-burning, it is assumed that these new homes have negligible emissions. Thus, year 2007 data is assumed to be representative of 2008 emissions.

To calculate emissions, the amount of wood used is converted to tons by multiplying cords by the number of cubic feet of wood in a cord (79 avg. ft^3 wood/cord) and by the density of the wood used (US EPA, 2001b). Wood density is determined by weighted average of types of wood used for residential combustion in Maricopa County (31.57 lbs/ft^3), provided by the US Forest Service (USFS, 1993).

Annual emissions from residential wood combustion are calculated by multiplying the tons of wood used by the CO emission factor for residential total woodstoves and fireplaces (252.6 lbs/ton) from EIIP Volume III, Chapter 2, Table 2.4-1 (US EPA, 2001b).

Season-day CO emissions are calculated by apportioning wood burning activity based on heating degree days (i.e., the number of degrees per day that the daily average temperature is below 65°F). Data provided by Arizona Department of Commerce (ADOC, 2010) indicated that there were a total of 885 heating degree days in Phoenix during 2008, with 625 heating degrees days reported during the CO season. Co season-day emissions were derived by applying the ratio of CO season heating degree days to annual heating degree days and are shown in Table 3.2-11.

Annual and season-day emissions within the CO maintenance area are calculated by multiplying county totals by the percentage of residential population within the CO maintenance area of 96.85%. See Section 1.5.1 for a further discussion of the housing data used.

Table 3.2–11. **Annual and season-day CO emissions from residential wood combustion.**

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	3,369.91	52,305.0
CO Maintenance Area	3,263.75	50,657.4

3.2.7 Residential fuel oil

Emissions from residential fuel oil use were calculated using an approach similar to that used for residential wood combustion described in Section 3.2.6. County-level residential fuel oil use was derived from statewide totals (US EIA, 2010) using the ratio of county to state households that report fuel oil use from the US Census Bureau (2010b).

Annual and daily emissions were calculated using AP-42 emission factors and data on heating degree days and residential housing units described in Section 3.2.6. Annual and season-day emissions are shown in Table 3.2–12.

Table 3.2–12. Annual and season-day CO emissions from residential fuel oil combustion.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.07	1.1
CO Maintenance Area	0.07	1.0

3.3 Industrial processes

3.3.1 Secondary metal production

Annual emissions from secondary metal production facilities were derived from annual emission reports from permitted sources. As this category consists primarily of foundries, it was assumed that there were no significant unpermitted sources within Maricopa County. CO season-day emissions were calculated based on operating schedule information provided in the facilities' annual emission reports. Since all facilities considered in this section are located within the CO maintenance area, total emission values for the county and the CO maintenance area from secondary metal production are equal.

Table 3.3–1. Annual and season-day CO emissions from area-source secondary metal production.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	107.72	703.5
CO Maintenance Area	107.72	703.5

3.3.2 Commercial cooking

Emissions from commercial cooking were estimated for five types of commercial cooking equipment using EPA methodology (US EPA, 2006). The equipment types include: chain-driven charbroilers, underfired charbroilers, deep-fat fryers, flat griddles, and clamshell griddles. EPA's methodology estimates commercial cooking activity for restaurants with each type of cooking equipment (ethnic, family, fast food, seafood, and steak & barbeque) based on an average number of equipment pieces by restaurant type and average pounds of meat cooked on each type of equipment per week (steak, hamburger, poultry, pork, and seafood). The estimated number of restaurants in Maricopa County for the five restaurant types was obtained from a commercial database (www.selectoryonline.com) and is shown in Table 3.3–2.

Table 3.3–2. Number of Maricopa County restaurants, by restaurant type.

Restaurant category	No. of restaurants
Ethnic food	907
Fast food	1,068
Family	253
Seafood	37
Steak & barbecue	75
All restaurants:	**2,340**

Using the number of restaurants for each restaurant type, along with the default emission factors and equations from US EPA (2006), emissions for each combination of equipment type, restaurant type, and meat type were calculated, and the results were summed to estimate annual emissions for each type of cooking equipment, as shown in Table 3.3–3.

Commercial cooking is assumed to occur uniformly throughout the year, therefore, it was assumed that 25% of annual activity occurs during the CO season, and activity occurs 7 days/week.

Annual and season-day emissions for the CO maintenance area were calculated by multiplying the Maricopa County emission totals by the percentage population within the maintenance area (96.92%). (See Section 1.5.1 for a discussion of the population data used.) Table 3.3–3 summarizes the annual and season-day emissions from commercial cooking for Maricopa County and the CO maintenance area.

Table 3.3–3. Annual and season-day CO emissions from commercial cooking.

	Maricopa County		CO Maintenance Area	
Equipment type	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**
Chain-driven charbroilers	86.79	476.9	84.12	462.2
Underfired charbroilers	270.94	1,488.7	262.60	1,442.8
Deep fat fryers	–	0.0	0.00	0.0
Flat griddles	22.55	123.9	21.86	120.1
Clamshell griddles	–	0.0	0.00	0.0
Totals:	**380.29**	**2,089.5**	**368.58**	**2,025.1**

3.3.3 State-permitted portable sources

The Arizona Department of Environmental Quality (ADEQ) retains the authority to permit certain categories of sources within Maricopa County, including portable sources. MCAQD requested information from ADEQ for all ADEQ-permitted sources that reported any activity in Maricopa County during 2008. Annual total emissions for most pollutants were provided, along with information on the facility type, and information on the location of the site(s) during the year. Permits were classified into four major types: asphalt batch, concrete batch, crushing/screening, and other (including soil remediation, generators, etc.). From this information, emissions that occurred within Maricopa County were estimated as in the following example.

Data provided:

Source information:	McNeil Brothers - Erie Strayer Portable Plant
Permit type:	Concrete batch plant
Operating schedule:	Operated from 1/1-5/15 in Mesa at SR202 and McKellips (SE Corner); operated from 10/16-12/31 in Goodyear at Northside I-10 east of Estrella.

Total annual emissions: (tons/yr)	**CO**
	6.19

Using this information, calculations were made to determine:

Total operating days in 2008: 136 = 31 (Jan.) + 29 (Feb.) + …16 (Oct.) + 30 (Nov.) + 31 (Dec.)
Total operating days in Maricopa County: 136 = 31 (Jan.) + 29 (Feb.) + …16 (Oct.) + 30 (Nov.) + 31 (Dec.)

All emissions were assumed to be equally distributed among all reported days of operation. First, the total emissions attributable to activity in Maricopa County were calculated as follows:

$$\text{Annual CO emissions in Maricopa County} = \text{Total annual emissions (tons/yr)} \times \frac{\text{operating days in Maricopa County}}{\text{total operating days in 2008}}$$

$$= 6.19 \times \frac{136}{136}$$

$$= 6.19 \text{ tons CO/yr}$$

Since activity was presumed to be spread equally among all "in-county" days, season-day emissions were thus calculated as follows:

$$\text{Season-day CO emissions in Maricopa County (lbs/day)} = \frac{\text{total emissions attributable to activity in Maricopa County}}{\text{number of operating days in Maricopa County}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}}$$

$$= \frac{6.19 \text{ tons}}{136 \text{ days}} \times \frac{2{,}000 \text{ lbs}}{\text{ton}}$$

$$= 91.03 \text{ lbs CO /day}$$

Table 3.3–4 summarizes the annual and season-day emissions for all ADEQ-permitted portable sources that operated within Maricopa County at some point during 2008. Since precise location data was not available for all permits, all emissions are conservatively assumed to have originated within the CO maintenance area; thus emission estimates for Maricopa County and the maintenance area are equal.

Table 3.3–4. CO emissions from ADEQ-permitted portable sources.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	145.42	1,212.6
CO Maintenance Area	145.42	1,212.6

3.3.4 Industrial processes, not elsewhere classified (NEC)

Annual area-source emissions from other industrial processes not elsewhere classified (NEC) were derived from annual emissions reports from permitted facilities. Other industrial processes include a wide array of industrial activities that are often specific to the permitted facility that reported the process. For this reason, it is assumed there are no significant emissions from other industrial processes, other than those reported by permitted facilities on their annual emissions reports. CO season-day emissions are calculated based on operating schedule information provided by the facilities in their annual emissions report.

Table 3.3–5. Annual and season-day CO emissions from other industrial processes.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	18.59	107.3
CO Maintenance Area	3.47	22.7

3.3.5 Electrical equipment manufacturing

Annual and season-day emissions from electric equipment manufacturing were derived from annual emission reports submitted by permitted sources. It was assumed that there were no significant unpermitted sources within Maricopa County and all electrical equipment manufacturing permitted sources are reported here as area-sources.

All facilities addressed in this source category are located within the CO maintenance area; thus, emissions for the county and maintenance area are equal. Annual and season-day emissions are shown in Table 3.3–6.

Table 3.3–6. Annual and season-day CO emissions from area-source electric equipment manufacturing.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	3.85	21.3
CO Maintenance Area	3.85	21.3

3.4 Waste treatment and disposal

3.4.1 On-site incineration

This section includes emissions from on-site industrial incinerators, primarily burn-off ovens used to reclaim electric wire or other materials. Emissions from human and animal crematories are addressed in Section 3.5.2. There were no incinerators at residential (e.g., apartment complexes) or commercial/institutional facilities (e.g., hospitals, service establishments) in operation during 2008.

Emissions from on-site incineration were determined from annual emissions reports. It is assumed that all incinerator emissions are accounted for, since all permitted incinerators received reports in 2008. Season-day emissions are based on operating schedules as supplied in the annual emissions reports. All surveyed facilities are located within the CO maintenance area; thus, emissions for the county and maintenance area are equal.

Table 3.4–1. Annual and season-day CO emissions from on-site incineration.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.69	5.7
CO Maintenance Area	0.69	5.7

3.4.2 Open burning

Emissions from controlled open burning are regulated by MCAQD Rule 314, which requires a burn permit for open burning in Maricopa County. Burn permits are issued primarily for purposes of agricultural ditch bank and fencerow burning, tumbleweed burning, land clearance, air curtain destructor burning of trees, and fire fighting training. Maricopa County's burn permit database was used to identify all burn permits issued during 2008. A total of 55 permits were issued during the year; however, not all permit applications contained the information needed to calculate emissions. Where data were missing, activity data for each permit category was grown from those permits that contained information.

Reported and estimated activity data for each open burning category are summarized in Table 3.4–2. Permits issued for firefighting training are addressed in Section 3.5.1.3, Structure fires.

Table 3.4–2. Summary of 2008 Maricopa County burn permit activity.

Category	Unit of measure	Total reported activity	Number of permits with activity data	Total permits issued	Activity grown to total number of permits issued
Ditchbank/fencerow	Linear ft	541,336	22	32	787,398
Land clearance	Acres	564	5	12	1,354
Air curtain	Material Burned	70*	0	7	70
Tumbleweeds	Piles	14	2	4	28

*Assumed that air curtain destructors burn 10 tons/day of brush/trees/vegetation.

The above activity data were converted to tons material burned using fuel loading factors from AP-42, Table 2.5-5 (US EPA, 1992). The emission and loading factors used are shown in Table 3.4–3.

Table 3.4–3. Emission and fuel loading factors for open burning.

Category	CO emission factors (lbs/ton burned)	Fuel loading factors (tons/acre)
Weeds, unspecified	85	3.2
Russian Thistle (tumbleweeds)	309	0.1
Orchard Crops: Citrus	81	1.0

The following assumptions were made based on previous Maricopa County emission inventory work:

- Ditch banks and fence rows in Maricopa County average 7 feet in width and are burned twice per year (MCESD, 1999).
- A pile of tumbleweeds 15 feet in diameter and 5 feet high weighs 200 lbs (MCESD, 1993). This is equivalent to 0.1 tons/acre, the AP-42 fuel loading factor for tumbleweeds.
- Air curtain destructors burn between 7-10 tons of material per day (MCAQD, 2006).

To calculate the annual amount of material burned on ditch banks and fence rows in Maricopa County, MCAQD estimated the area burned and then applied AP-42 fuel loading factor. Activity data for the other categories were similarly converted to material burned using AP-42 fuel loading factors.

Annual emissions were then calculated by multiplying the amount of material burned by emission factors listed in AP-42 (Table 3.4–3). To account for unpermitted illegal outdoor burning, all calculated emissions estimates were increased 2.87 times based on complaints received in 2008 for open or illegal outside burning (158 complaints received; 158 complaints/55 open burn permits = 2.87). Table 3.4–4 summarizes the annual emissions for Maricopa County from each open burning category.

Table 3.4–4. Annual CO emissions from open burning in Maricopa County (tons/yr).

Category	Ton-equivalents	CO emissions (tons/yr)
Ditchbank/fencerow	809.8	98.87
Land clearance	4,331.5	528.94
Air curtain	70.0	8.14
Tumbleweeds	2.80	1.24
Total:		**637.10**

Annual emissions for the maintenance area are calculated by multiplying the percentage of agricultural and/or vacant land use located in the CO maintenance area by the Maricopa County emission totals. (See Section 1.5.2 for a discussion of the land-use data used.) Table 3.4–5 summarizes the annual emissions for the CO maintenance area.

Table 3.4–5. Maintenance area:county ratios and annual CO emissions from open burning in the CO maintenance area.

Category	Surrogate land-use category	2009 Maint. area:county land-use ratio	CO emissions (tons/yr)
Ditchbank/fencerow	Agriculture	28.76%	28.43
Land clearance	Vacant	7.71%	152.08
Air curtain	agriculture and vacant	10.17%	2.34
Tumbleweeds	agriculture and vacant	10.17%	0.36
Total:			**183.21**

Ditch bank/fence row burning is not allowed from November to February, therefore daily emissions during the CO season are zero. For the other burning categories, it was assumed that open burning occurs 5 days per week (most burn permits are issued for weekdays but permits may be issued on weekends depending on circumstances) and open burning occurs evenly during the CO season months (November – January).

Season-day emissions for the maintenance area are calculated by multiplying the percentage of agricultural and/or vacant land use located in the maintenance area (listed in Table 3.4–5) by the County season-day emissions. Table 3.4–6 summarizes the CO season-day emissions from open burning for both Maricopa County and the CO maintenance area.

Table 3.4–6. Season-day CO emissions from open burning (lbs/day).

Category	Maricopa County (lbs/day)	CO maintenance area (lbs/day)
Ditchbank/fencerow	0.0	0.0
Land clearance	16,272.0	1,254.6
Air curtain	250.6	25.5
Tumbleweeds	38.2	3.9
Totals:	**16,560.8**	**1,284.0**

3.4.3 Landfills

Emissions from municipal solid waste (MSW) landfills come from uncontrolled landfill gas emissions as well as from cover operations and combustion from control measures, such as a flare. Total emissions were calculated from annual emissions inventory reports from all landfills located within the county; results are shown in Table 3.4–7 below. No landfills were considered point sources; thus all MSW landfills are reported here as an area-source activity.

Table 3.4–7. Annual and season-day CO emissions from landfills.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	40.05	219.9
CO Maintenance Area	20.84	114.7

3.4.4 Other industrial waste disposal

Annual area-source emissions from other industrial waste disposal were derived from annual emissions reports from permitted facilities. Other industrial waste disposal processes include a wide array of industrial activities that are often specific to the permitted facility that reported the process. For this reason, it is assumed there are no significant emissions from this category, other than those reported by permitted facilities on their annual emissions reports. Typical daily emissions were calculated based on operating schedule information provided by the facilities in their annual emissions report. Emission estimates are shown in Table 3.4–8 below.

All facilities that reported area-source emissions from other industrial waste disposal are located inside the CO maintenance area, therefore emissions for Maricopa County and the CO maintenance area are equal.

Table 3.4–8. Annual and typical daily CO emissions from other industrial waste disposal.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	52.86	252.9
CO Maintenance Area	52.86	252.9

3.5 Miscellaneous area sources

3.5.1 Other combustion

3.5.1.1 Wildfires

Data on wildfires in 2008 within Maricopa County were obtained from the Arizona State Land Department (ASLD) Forestry Division (ASLD, 2009), the Arizona Department of Fire, Building, and Life Safety (DFBLS, 2009), and the Federal Fire Occurrence website (FFOW, 2009).

The ASLD Forestry Division provides for the prevention and suppression of wildfires on state and private lands located outside of incorporated municipalities. The wildfire data provided by ASLD includes wildfires that occur outside of local fire districts and municipalities on State, private, and U.S. Bureau of Land Management (BLM) land in 2008. The ASLD reported 25 wildfires in 2008 in Maricopa County which encompassed nearly 750 acres. Wildfire data provided by ASLD were compared to wildfires reported in the Geospatial Multi-Agency

Coordination Group (GeoMAC) Wildland Fire Support database and 2008 Incident Status Summary reports (ICS-209) to identify wildfires that may have occurred outside of ASLD jurisdiction. GeoMAC and ICS-209 reports only include large wildfires, generally fires greater than 100 acres. Three Maricopa County wildfires were reported in GeoMAC and on ICS-209 reports in 2008 (USDA, 2008 and USGS, 2008). Two of these fires were included in the ASLD data. One fire, the Ethan fire, was not captured in the ASLD data because it occurred on tribal lands. The Ethan fire encompassed more than 6,600 acres.

The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire departments. NFIRS is a national reporting system used by fire departments to report fires and other incidents to which they respond and to maintain records of these incidents in a uniform manner. Twenty-one of thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included ten "forest, woods or wildland fires". The ten "forest, woods or wildland fires" were analyzed for inclusion in the wildfire emission estimates. First, the DFBLS fires were culled for duplicates by comparing the incident dates and locations with wildfires reported by ASLD. One DFBLS fire was excluded from the combined dataset because it may have been a duplicate already captured in the ASLD data. Because only four of the ten DFBLS fires included acreage, an average number of acres burned (1.05 acres) were determined from the fires with reported acreage. This average number of acres burned was then applied to the fires with no reported acreage.

The Federal Fire Occurrence Website is an official government website that provides users with the ability to query, research and download wildland fire occurrence data. The data available through this website contains over 548,000 fire records collected by Federal land management agencies for fires that occurred from 1980 through 2008 in the United States. The 2008 data for Maricopa County included eighty-one fires. The federal wildland fire occurrence data were culled for duplicates by comparing the incident names, dates and locations with wildfires reported by ASLD and DFBLS. Thirteen fires were excluded from the combined dataset because they appeared to be duplicates already captured in either the ASLD or DFBLS data and seven fires were excluded because they contained no acreage data. The final 2008 dataset listed 96 fires encompassing over 7,400 acres. Table 3.5-1 summarizes fire data obtained from each data sources.

Table 3.5–1. Fire data sources.

Data Source	Number of Fires	Acreage
Arizona State Land Department (ASLD)	25	747.25
Arizona Department of Fire, Building, and Life Safety (DFBLS)	9	9.45
Federal Fire Occurrence website (FFOW)	61	16.79
ICS-209	1	6,660.00
Totals	**96**	**7,433.49**

Fuel loading was assigned using the National Fire Danger Rating System (NFDRS) fuel model codes and a table of fuel loading values for NFDRS fuel model categories (WGA/WRAP, 2005). The department used the NFDRS Fuel Model map in ArcGIS to identify NFDRS fuel types for fires with latitude and longitude data.

Table 3.5–2. NFDRS fuel model categories and fuel loading factors for 2008 Maricopa County wildfires.

Land use type (by NFDRS Model Category)	No. of Fires	Total area (acres)	Fuel loading factor (tons/acre)
Agriculture*	33	744.05	4.5
California chaparral	1	0.01	19.5
Barren*	2	0.4	0.5
Pine-grass savanna	1	0.01	4.7
Intermediate brush	17	2.87	15.0
Sagebrush grass	42	6,686.15	4.5
Totals	**96**	**7,433.49**	

***** "Agriculture" and "Barren" NFDRS model categories were not included in WGA/WRAP 2002 fuel loading values for NFDRS fuel model categories. Therefore, it was assumed that "Agriculture" is similar to "sagebrush grass" and "Barren" is similar to "western grasses (annual)", and fuel loadings were assigned accordingly.

Estimates of the material burned were derived by multiplying the number of acres burned by the fuel loading factor. Table 3.5–3 shows the number of wildfires and acres burned for Maricopa County and the CO maintenance area in 2008 and an estimate of material burned. No wildfires occurred during the CO season; therefore season-day emissions from wildfires were zero.

Table 3.5–3. Summary of fires, acres burned and estimate of material burned

Geographic Area	No. of Fires	Acres Burned	Material Burned Annually (tons/yr)	Material Burned in CO Season (tons/season)
Maricopa County	96	7,433	33,479	12.8
CO Maintenance Area	19	28	127	0

The CO emission factor was obtained from the Western Regional Air Partnership's (WRAP) 2002 Fire Emission Inventory (WGA/WRAP, 2005). The CO emission factor for wildfires and prescribed broadast burning (289 lbs CO/ton) was used.

The majority of fire data included fire locations in latitude and longitude. For those fires without longitude and latitude, the fire location address was used to determine latitude and longitude. This latitude and longitude data was used to determine the number of acres burned inside of the CO maintenance area. Nineteen wildfires occurred within the CO maintenance area, resulting in nearly 28 acres burned.

Annual emissions from wildfires within the CO maintenance area were calculated in the same manner as Maricopa County annual emissions, except that material burned in the CO maintenance area were used rather than material burned in Maricopa County.

Annual and season-day emissions from wildfires for Maricopa County and the maintenance area are shown in Table 3.5−4.

Table 3.5–4. Annual and season-day CO emissions from wildfires

Geographic area	CO-season burn days	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	7	4,837.77	526.4
CO Maintenance Area	0	18.29	0.0

3.5.1.2 *Prescribed fires*

Prescribed fire data were obtained from the U. S. Forest Service (USFS, 2009). The USFS reported that six prescribed fires occurred in Maricopa County in 2008. Twenty-nine acres of piled fuels were burned. All six prescribed fires occurred outside the maintenance area. Because all 2008 prescribed fires were piled fuels, the total mass of material burned was derived by multiplying the number of acres burned by tons of piles per acre for each fire. Data provided by the USFS and the resulting material burned for each fire are shown below in Table 3.5–5.

Table 3.5−5. Prescribed fire activity in Maricopa County in 2008.

Date of burn	Burn number	Burn location	Acres Burned	Tons of piles/acre	Material Burned (tons)
01/13/2008	TNF0106	T6N,R7E,S28	3	1	3
03/13/2008	TNF0106P	T6N,R7E,S28	3	3	9
04/04/2008	TNF0302	T3N,R7E,S34	2	5	10
04/09/2008	TNF0302	T3N,R8E,S28	5	5	25
09/25/2008	TNF0302	T3N,R8E,S31	10	5	50
11/06/2008	TNF0302	T2N,R7E,S18	6	5	30
Totals:			**29**	**24**	**127**

The prescribed fire CO emission factor (74.3 lbs CO per ton burned) was obtained from the Western Regional Air Partnership's (WRAP) 2002 Fire Emission Inventory (WGA/WRAP, 2005).

Annual emissions from prescribed fires in Maricopa County were calculated by multiplying the material burned (tons/acre) by the emission factor (lbs CO/ton) and dividing the result by 2,000 lbs/ton.

Two prescribed fires occurred during the CO season. The fires occurred on January 13, 2008 and November 6, 2008, and resulted in 33 tons of material burned. It was assumed the prescribed fires lasted one day each. CO-season day emissions are determined by multiplying the tons material burned by the emission factor (lbs CO/ton) and then dividing the resulting emissions by the number of burn days. In this case, there were only two burn days.

Because all the 2008 prescribed fires burned outside of the maintenance area, the annual and season-day emissions for the maintenance area are zero.

Table 3.5−6. Annual and season-day CO emissions from prescribed fires.

Geographic Area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	4.72	1,226.0
CO Maintenance area	0.00	0.0

3.5.1.3 *Structure fires*

2008 structure fire data were from the Arizona Department of Fire, Building, and Life Safety (DFBLS). The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire department. NFIRS is a national reporting system used by fire departments to report fires and other incidents to which they respond and to maintain records of these incidents in a uniform manner. Twenty-one of thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included nearly 2,150 reported structure fires.

Because the DFBLS data only included data reported by twenty-one of thirty-six fire departments in Maricopa County, the number of structure fires reported were scaled up to the entire inventory area based on population. The most recent population estimates for Maricopa County were used to scale up the number of structure fires (ADOC, 2008). Seven open burn permits were issued in 2008 for fire training; these were included in the total number of estimated structure fires for 2008. It was estimated that 2,422 structure fires occurred in the county during 2008.

Estimates of the material burned in a structure fire were determined by multiplying the number of structure fires by a fuel loading factor of 1.15 tons of material per fire, which factors in percentage structural loss and content loss (US EPA, 2001c). Annual emissions were then calculated by multiplying the amount of material burned by a 60 lbs of CO per ton of material burned emission factor (from US EPA, 2001c) and dividing the resultant amount by 2,000 lbs/ton.

Annual emissions for the CO maintenance were derived by multiplying Maricopa County annual emissions by the percentage of total population within the maintenance area (96.92%). See Section 1.5.1 for a discussion of the population data used.

It was assumed that structure fires occur 7 days a week; however, structure fires vary seasonally and may increase during cold weather. Because local season-specific data were not available from the NFIRS data, seasonal occurrences of residential and non-residential structure fires reported by the Federal Emergency Management Agency (FEMA) were used to derive a seasonal adjustment factor for the CO season (US EPA, 2001c). FEMA reported that 29.6% of residential structure fires and 24.5% of non-residential structural fires occurred during November, December, and January 1994. Thus, an average occurrence of 27.05% [(29.6% + 24.5%) ÷ 2] was used as a seasonal adjustment factor to estimate CO season-day emissions.

CO season-day emissions for Maricopa County were derived by multiplying the annual emissions by the 27.5% seasonal adjustment factor and then dividing the result by 91 (7 days/wk × 13 weeks/season).

Table 3.5‒7. Annual and season-day CO emissions from structure fires.

Geographic area	Annual CO emissions (tons/yr)	Season day CO emissions (lbs/day)
Maricopa County	83.56	496.8
CO Maintenance area	80.98	481.4

3.5.1.4 Vehicle fires

2008 vehicle fire data were from the Arizona Department of Fire, Building, and Life Safety (DFBLS). The DFBLS coordinates reporting to the National Fire Incident Reporting System (NFIRS) for Arizona fire department. NFIRS is a national reporting system used by fire departments to report fires and other incidents to which they respond and to maintain records of these incidents in a uniform manner. Twenty-one of thirty-six fire departments in Maricopa County reported over 10,000 fires to NFIRS in 2008. This included over 2,100 reported vehicle fires. Because the DFBLS data only included data reported by twenty-one of thirty-six fire departments in Maricopa County, the number of vehicle fires reported were scaled up to the entire inventory area based on population. The most recent population estimates for Maricopa County were used to scale up the number of vehicle fires (ADOC, 2008). It was estimated that 2,403 vehicle fires occurred in Maricopa County in 2008.

Annual emissions from vehicle fires were calculated by first multiplying the number of vehicle fires by a fuel loading factor of 0.25 tons per vehicle fire to estimate the annual amount of material burned in vehicle fires (US EPA, 2000). The amount of annual material burned in vehicle fires was then multiplied by the emission factor for open burning of automobile components (125 lbs of CO/ton of material burned) from AP-42 as listed in table 3.7–12 (US EPA, 1992). The resultant amount was divided by 2,000 lbs/ton to obtain annual emissions in tons per year.

Annual emissions for the CO maintenance area were derived by multiplying Maricopa County annual emissions by the percentage of total population within the CO maintenance area (96.92%). See Section 1.5.1 for a discussion of the population data used. It is assumed that vehicle fires occur evenly throughout the year. Thus, CO season day emissions were derived by dividing the Maricopa County and maintenance area annual emissions by 366 days/year. The results are shown in Table 3.5−8 below.

Table 3.5−8. Annual and season-day CO emissions from vehicle fires.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	37.55	205.2
CO Maintenance area	36.39	198.8

3.5.1.5 Engine testing

Annual emissions from engine testing facilities were derived from annual emission reports from permitted sources that were not considered point sources in this inventory. It was assumed that there were no significant unpermitted sources within Maricopa County. Season-day emissions were calculated based on operating schedule information provided in the facilities' annual emission reports. Since all facilities considered in this section are located within the CO maintenance area, total emission values for the county and the CO maintenance are equal. Results are shown in Table 3.5–9.

Table 3.5–9. Annual and season-day CO emissions from engine testing.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	4.06	27.5
CO Maintenance Area	4.06	27.5

3.5.2 Health services: crematories

Emissions from human and animal crematories were calculated from annual emissions inventory reports from all crematories located within the county. It is assumed that there are no unpermitted crematories in Maricopa County. CO season-day emissions were calculated based on operating schedule information provided in the facilities annual emission reports. Location information provided in those annual emission reports indicated whether the facility was inside or outside the CO maintenance area.

Table 3.5–10. Annual and season-day CO emissions from crematories.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	0.68	5.2
CO Maintenance Area	0.68	5.1

3.6 Summary of area source emissions

Table 3.6–1 summarizes the total annual and CO season-day emissions from all area sources addressed in this chapter for both Maricopa County and the CO maintenance area.

Table 3.6–1. Summary of annual and season-day area source CO emissions, by source category.

	Maricopa County		CO maintenance area	
Source category	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**	**Annual CO emissions (tons/yr)**	**Season-day CO emissions (lbs/day)**
Fuel combustion:				
Industrial natural gas	358.34	2,513.9	352.68	2,474.1
Industrial fuel oil	1,366.69	8,784.8	1,345.09	8,646.0
Commercial/institutional natural gas	777.15	7,248.7	760.67	7,095.1
Commercial/institutional fuel oil	702.86	4,804.7	687.96	4,702.8
Residential natural gas	325.03	3,592.2	314.79	3,479.1
Residential wood	3,369.91	52,305.0	3,263.75	50,657.4
Residential fuel oil	0.07	1.1	0.07	1.0
Total, all fuel combustion:	**6,900.04**	**79,250.4**	**6,725.01**	**77,055.5**
Industrial processes:				
Commercial cooking	380.29	2,089.5	368.58	2,025.1
Secondary metal production	107.72	703.5	107.72	703.5
State-permitted portable sources	145.42	1,212.6	145.42	1,212.6
Industrial process NEC	18.59	107.3	3.47	22.7
Electric equipment mfg	3.85	21.3	3.85	21.3
Total, all industrial processes:	**655.87**	**4,134.3**	**629.03**	**3,985.3**
Waste treatment/disposal:				
On-site incineration	0.69	5.7	0.69	5.7
Open burning	637.10	16,560.8	183.21	1,284.0
Landfills	40.05	219.9	20.84	114.7
Other industrial waste disposal	52.86	252.9	52.86	252.9
Total, all waste treatment	730.70	17,039.4	257.60	1,657.3
Miscellaneous Area Sources:				
Wildfires	4,837.77	526.4	18.29	0.0
Prescribed fires	4.72	1,226.0	0.00	0.0
Structure fires	83.56	496.8	80.98	481.4
Vehicle fires	37.55	205.2	36.39	198.8
Engine testing	4.06	27.5	4.06	27.5
Crematories	0.68	5.2	0.68	5.1
Total, all miscellaneous sources:	**4,968.33**	**2,486.9**	**140.40**	**712.9**
Total, all area sources:	**13,254.94**	**102,911.0**	**7,752.04**	**83,411.1**

3.7 Quality assurance / quality control procedures

Quality assurance and quality control (QA/QC) activities for the area source emissions inventory were driven by the goal of creating a comprehensive, accurate, representative and comparable inventory of area source emissions for Maricopa County and the CO maintenance area. During each step of creating, building and reviewing the area source emissions inventory, quality checks and assurances were performed to establish confidence in the inventory structure and data.

Area source categories were selected for inclusion in the inventory based on the latest Emission Inventory Improvement Program (EIIP) guidance available. EPA's guidance for area source categories included in prior National Emission Inventories (NEIs) was also evaluated. The list of area source categories developed based on these guidance documents was modified to fit the characteristics of Maricopa County, with some area source categories determined to be insignificant (e.g., emissions from industrial coal combustion, or oil and natural gas production facilities). Prior Maricopa County periodic inventories for ozone and carbon monoxide, as well as and other similar emission inventories from other locales were also consulted, to cross-check the completeness of the list of area source categories identified for inclusion in the present inventory.

Data for area source emission calculations were gathered from a wide universe of resources. Whenever applicable, local surveyed data (such as annual emissions report) was used as this data best reflects activity in the county and the CO maintenance area. When local data was not available, state data from Arizona State agencies (such as the Arizona Department of Transportation) and regional bodies (such as the Western Regional Air Partnership [WRAP]) were used. National level data (such as the US Census Bureau) was used when no local, state or regional data was available. In addition, the most recent EIIP guidance for area sources was consulted for direction in determining the most relevant data source for use in emissions calculations.

Emissions calculations for area sources were performed by three air quality planners and one unit manager. All area source emission estimates were calculated in spreadsheets to ensure the calculations could be verified and reproduced. Whenever possible or available, the "preferred method" described in the most recent EIIP guidance documents for area sources was used to calculate emissions. Emissions were estimated using emission factors from EIIP guidance, AP-42, and local source testing. Local seasonal and activity data were used when available, with EPA and EIIP guidance used when no local seasonal or activity data existed. All calculations were evaluated to ensure that emissions from point sources were not being double-counted and to determine if rule effectiveness applied.

Once area source emission estimates had been produced, several quality control checks were performed to substantiate the calculations. Most area source calculations were peer-reviewed by two other planners, with all area sources being reviewed by at least one other planner. Peer review ensured that all emission calculations were reasonable and could be reproduced. Sensitivity analyses and computational method checks were performed on area sources when emissions seemed to be outside the expected ranges. When errors were found, the appropriate changes were made by the author of the calculations to ensure consistency of the emissions calculations. The peer-reviewed emissions estimates were combined into a draft area source chapter. This draft chapter was read through in its entirety by the unit manager and the three air quality planners for final review, with any identified errors corrected by the author of the section.

The draft version of the area source chapter was sent to the Arizona Department of Environmental Quality, the Arizona Department of Transportation, and the Maricopa Association of Governments for a quality assurance review. These agencies provided comments which were addressed and incorporated into the final area source chapter. The QA/QC activities described here have produced high levels of confidence in the area source emissions estimates detailed in this chapter, and represent the best efforts of the inventory preparers.

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4. Nonroad Mobile Sources

4.1 Introduction

Nonroad mobile sources are defined as those sources that move or are moved within a 12-month period and are not licensed or certified as highway vehicles. Nonroad mobile sources are vehicles and engines that fall under the following categories:

- Agricultural equipment, such as tractors, combines and balers;
- Airport ground support equipment, such as baggage tugs and terminal tractors;
- Commercial equipment, such as generators and pumps;
- Industrial equipment, such as forklifts and sweepers;
- Construction and mining equipment, such as graders, back hoes and trenchers;
- Lawn and garden equipment, such as leaf blowers and lawn mowers;
- Logging equipment (not present in Maricopa County);
- Pleasure craft, such as power boats and personal watercraft;
- Railway maintenance equipment, such as rail straighteners;
- Recreational equipment, such as all-terrain vehicles and off-road motorcycles;
- Underground mining and oil field equipment (not present in Maricopa County);
- Aircraft, such as jet and piston engines; and
- Locomotives, such as switching and line haul trains.

Emission calculations for most nonroad mobile source categories except aircraft, airport ground support equipment (GSE) and locomotives were derived using EPA's NONROAD model, ver. 2008.1.0 (Core version 2008, April 2009). Aircraft and airport GSE emission estimates were made using the Federal Aviation Administration's EDMS (Emissions Dispersion Modeling System) model, ver. 5.1.1. Locomotive emission calculations were derived from surveys of the three railroad companies that have operations in the county (Burlington Northern Santa Fe, Union Pacific and Amtrak).

County specific temperature and fuel-related inputs are required for the operation of the NON-ROAD model. Monthly temperature and fuel data were provided by the Arizona Department of Weights and Measures. Table 4.1-1 below lists the local county inputs used:

Table 4.1–1. **NONROAD model county temperature- and fuel-related inputs.**

Month	Temperatures (°F)			Fuel RVP (psi)	Diesel Sulfur (ppm)	Gasoline Sulfur (ppm)	Ethanol Blend		
	Max.	Min.	Average				ETOH (Vol%)	Market Share (%)	Total Oxygen (wt%)
January	64	45	54.90	8.8	6	35	9.47	100	3.49
February	69	48	58.45	8.4	6	23	9.24	100	3.42
March	79	54	66.84	8.4	7	49	9.18	100	3.41
April	87	61	74.23	7.8	7	23	5.57	100	2.06
May	91	66	78.74	6.8 *	6 *	27*	0.00*	0*	0.00*
June	107	80	93.40	6.6	6	25	0.00	0	0.00
July	106	84	95.16	7.0	4	19	0.00	0	0.00
August	104	82	93.16	6.8	6	29	0.00	0	0.00
September	101	79	90.07	6.5	6	35	0.00	0	0.00
October	91	65	78.13	7.9	7 †	25	6.79	100	2.52
November	81	56	68.67	8.4	7 †	15	8.78	100	3.27
December	65	46	56.03	8.3 †	7	28†	8.17†	100†	3.03†

* Since measurements were not available, the average of June, July, August and September data was used.
† Since measurements were not available, the average of October, November, January, February, March and April data was used.

EPA recommends adjusting default NONROAD model values (such as equipment population, activity levels of equipment, growth factors, etc.) where local data is available, as the default values in the model are derived from national averages.

NONROAD model default values were adjusted based on 2003 survey results of the commercial lawn and garden industry as part of an inventory developed to study the impact of visibility impairing pollutants (ENVIRON et al., 2003). Survey results show that for most categories of lawn and garden equipment, the equipment population estimates for Maricopa County are significantly lower than EPA default values, while the average annual hours of operation for most equipment types are slightly higher than EPA's values. Using these local data results in a considerable decrease in emissions from this category, compared with earlier results using EPA default data.

Spatial allocation factors were developed (based on EPA guidance documents) to apportion non-road emissions to the CO maintanence area. The approaches used are described in each section of this chapter.

Temporal allocations (used to calculate CO season-day emissions) for nonroad equipment categories modeled in the NONROAD model come from EPA recommendations on weekday and weekend day activity levels for each nonroad equipment category (US EPA, 1999). Table 4.1–2 below lists the weighted activity level allocation fractions for each equipment class for weekdays and weekend days. For this report, the most conservative (highest) allocation fraction in each nonroad equipment class was used to calculate season-day emissions.

Table 4.1–2. Default weekday and weekend day activity allocation fractions.

Equipment category	Weekday	Weekend day
Agricultural	0.1666667	0.0833334
Airport ground support	0.1428571	0.1428571
Commercial	0.1666667	0.0833334
Construction and mining	0.1666667	0.0833334
Industrial	0.1666667	0.0833334
Lawn and garden (residential)	0.1111111	0.2222222
Lawn and garden (commercial)	0.1600000	0.1000000
Pleasure craft	0.0600000	0.3500000
Railway maintenance	0.1800000	0.0500000
Recreational	0.1111111	0.2222222

4.2 Agricultural equipment

Annual emissions from agricultural equipment in Maricopa County were calculated using EPA's NONROAD model, as discussed above. CO maintenance area annual emissions were calculated based on EIIP guidance (US EPA, 2002) which recommends using the ratio of agricultural land inside the maintenance area (84,979 acres) to agricultural land inside the county (295,509 acres). See Section 1.5.2 for a discussion of land-use data used.

County season-day emissions were calculated by multiplying CO season emissions (generated by the NONROAD2002 model) by the most conservative weekday/weekend day activity allocation factor for agricultural equipment listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999).

CO maintenance area season-day emissions were calculated by multiplying county season-day emissions by the agricultural land-use allocation factor.

Table 4.2–1. Annual and season-day CO emissions from agricultural equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	367.01	513.7
CO Maintenance Area	105.55	147.7

4.3 Airport ground support equipment

Annual emissions from airport ground support equipment (GSE) and auxiliary power units (APUs) at most airports in the county were estimated using the Emissions Dispersion Modeling System (EDMS, v. 5.1.1) from the U.S. Federal Aviation Administration (FAA). The model can estimate emissions from affiliated GSE and APUs, by using either default equipment profiles, or user-specified data on equipment populations and activity patterns. In most cases, activity data on 2008 aircraft operations and GSE/APU usage was obtained from individual airport surveys issued by MAG and/or MCAQD. Where survey responses were incomplete or information was otherwise unavailable, activity data was estimated using commercially available data, and EDMS default assumptions where appropriate. Further details concerning the modeling input data and results are presented in Section 4.11 of this report.

For Luke Air Force Base (AFB), emissions estimates for ground support equipment were obtained from a recent base-wide mobile source emissions inventory for calendar year 2008 that had recently been completed for the US Air Force (Weston, 2010). GSE emissions from the Luke AFB study were added to the EDMS-estimated emissions from the other airports in the County. (The Luke study assumed APU usage, and thus emissions, to be negligible.) A simplifying assumption was made for all airports; i.e., that activity is spread fairly evenly throughout the week and year; thus CO season day emissions were estimated by dividing annual totals by 366 (= days/yr in 2008). Table 4.3–1 below presents the totals for all airport GSE and APU usage within both Maricopa County and the CO maintenance area, on an annual and season-day basis, respectively.

Table 4.3–1. Annual and season day CO emissions from airport ground support equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	4,842.26	26,460.4
CO Maintenance Area	4,765.55	26,041.3

4.4 Commercial equipment

Annual emissions from commercial equipment in Maricopa County were calculated using EPA's NONROAD model, as described in Section 4.1. Annual emissions for the CO maintenance area for this category were derived by applying the ratio of industrial employment in the maintenance area to Maricopa County-level totals, as data on the number of wholesale establishments recommended by EIIP guidance (US EPA, 2002) was not available. See Section 1.5.1 for a discussion of the industrial employment data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/ weekend day activity allocation factor for commercial equipment (0.1666667) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on industrial employment ratios as described above.

Table 4.4–1. Annual and season day CO emissions from commercial equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	37,407.59	204,928.7
CO Maintenance Area	36,816.55	201,690.8

4.5 Construction and mining equipment

Annual emissions from construction and mining equipment in Maricopa County were calculated using EPA's NONROAD model as described in Section 4.1. Annual emissions for the CO maintenance area for this category were derived by applying the ratio of population in the maintenance area to Maricopa County-level totals as a conservative estimate, as the EIIP-recommended allocation factor of total dollar value of construction was unavailable (US EPA, 2002). See Section 1.5.1 for a discussion of the population data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/ weekend day activity allocation factor for construction/mining equipment (0.1666667) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on population ratios as described above.

Table 4.5–1. Annual and season day CO emissions from construction and mining equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	17,097.10	90,379.7
CO Maintenance Area	15,753.27	83,275.9

4.6 Industrial equipment

Annual emissions from industrial equipment in Maricopa County were calculated using EPA's NONROAD model, as described in Section 4.1. Annual emissions for the CO maintenance area for this category were derived by applying the ratio of industrial employment in the maintenance area to Maricopa County-level totals as a conservative estimate, as the number of employees in manufacturing recommended by EIIP guidance (US EPA, 2002) was not available. See Section 1.5.1 for a discussion of the industrial employment data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/weekend day activity allocation factor for industrial equipment (0.1666667) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on industrial employment ratios as described above.

Table 4.6–1. Annual and season day CO emissions from industrial equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	10,294.56	64,617.8
CO Maintenance Area	10,131.90	63,596.8

4.7 Lawn and garden equipment

Annual emissions from lawn and garden equipment in Maricopa County were calculated using EPA's NONROAD model, as described in Section 4.1. These results reflect new equipment population and usage estimates from survey work done in early 2003 for the Arizona Department of Environmental Quality (discussed further in Section 4.1). Annual emissions for the CO maintenance area for this category were derived by applying the ratio of population in the maintenance area to Maricopa County-level totals, since housing units was not available, as recommended by EIIP guidance (US EPA, 2002). See Section 1.5.1 for a discussion of the population data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/weekend day activity allocation factor for lawn and garden equipment (0.1600000 for the commercial segment, 0.2222222 for residential) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on population as described above.

Table 4.7–1. **Annual and season day CO emissions from lawn and garden equipment.**

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	66,712.36	100,753.6
CO Maintenance Area	64,657.62	97,650.4

4.8 Pleasure craft

Annual emissions from pleasure craft equipment in Maricopa County were calculated using EPA's NONROAD model, as described in Section 4.1. Annual emissions for the CO maintenance area for this category were derived by applying the ratio of water surface area in the maintenance area to Maricopa County-level totals, as recommended by EIIP guidance (US EPA, 2002). See Section 1.5.2 for a discussion of the land-use data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/weekend day activity allocation factor for pleasure craft (0.350000) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on water surface area as described above.

Table 4.8–1. **Annual and season day CO emissions from pleasure craft equipment.**

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	1,627.41	5,008.5
CO Maintenance Area	431.81	1,328.9

4.9 Railway maintenance equipment

Annual emissions from railway maintenance equipment in Maricopa County were calculated using EPA's NONROAD model, as described in Section 4.1. Annual emissions for the CO maintenance area for this category were derived by applying the ratio of population in the maintenance area to Maricopa County-level totals, as recommended by EIIP guidance (US EPA, 2002). See Section 1.5.1 for a discussion of the population data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/weekend day activity allocation factor for railway maintenance equipment (0.1800000) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on the population ratio as described above.

Table 4.9–1. **Annual and season day CO emissions from railway maintenance equipment.**

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	19.33	120.8
CO Maintenance Area	18.73	117.1

4.10 Recreational equipment

Annual emissions from recreational equipment in Maricopa County were calculated using EPA's NONROAD model (see Section 4.1). Annual emissions for the CO maintenance area were derived by applying the ratio of passive open space, golf courses and vacant land use in the CO maintenance area to Maricopa County-level totals per EIIP guidance (US EPA, 2002). See Section 1.5.2 for a discussion of the land use data used.

County season-day emissions were calculated by multiplying Maricopa County CO season emissions (generated by the NONROAD model) by the most conservative weekday/weekend day activity allocation factor for recreational equipment (0.2222222) listed in Table 4.1–2, and dividing the product by the number of weeks (13) in the CO season (US EPA, 1999). CO maintenance area season-day emissions were calculated based on land use as described above.

Table 4.10–1. Annual and season day CO emissions from recreational equipment.

Geographic area	Annual CO emissions (tons/yr)	Season-day CO emissions (lbs/day)
Maricopa County	7,270.41	24,593.7
CO Maintenance Area	412.23	1,394.5

4.11 Aircraft

Emissions from aircraft operations at the largest civilian airports in Maricopa County were estimated using the Federal Aviation Administration's Emissions and Dispersion Model (EDMS, v. 5.1.1). The EDMS model combines specified aircraft type and activity levels with default emission factors in order to estimate annual emissions inventories for a specific airport. The model also estimates emissions from affiliated ground support equipment (GSE) and auxiliary power units (APUs); these emissions are reported separately and are summarized in Section 4.3.

MCAQD surveyed medium and large airports in Maricopa County to gather data on aircraft type and activity level of aircraft operations. Specifically, the number of landing and takeoff cycles, or (LTO's) or touch and go operations, (TGOs), along with information on the types of aircraft that comprise the airport's typical fleet mix, and other operational data, such as typical usage patterns of ground support equipment (GSE) and auxiliary power units (APUs), average taxi/idle times, etc. Where survey responses were unavailable or incomplete, aircraft activity data from publicly accessible databases, such as the FAA's Air Traffic Activity Data System (ATADS) and Enhanced Traffic Management System Counts (ETMSC), were used.

All emission estimates in this section have been developed using the EDMS model, with the exception of Luke Air Force Base (AFB), whose emissions calculations have been prepared as part of a base-wide 2008 mobile source emissions inventory that has recently been completed (Weston, 2010). Luke AFB's emissions reported as 'aircraft activity' actually comprise three distinct, though related, types of activity: (1) the operation of aircraft stationed at the base, (2) a much smaller level of "transient" aircraft traffic within Luke's airspace, and (3) emissions produced during on-wing engine testing – considered a "mobile source" emission category. As with all other airports included in this inventory, emissions from ground support equipment (GSE) at Luke AFB are addressed in Section 4.3.

In addition to the LTOs (and occasional TGO activity) reported by other airports in the area, Luke reported two additional, types of aircraft operations: aircraft low fly bys (LFB), and aircraft low fly patterns (LFP). Each of these types of operations can be characterized by a distinctive combination of the times in mode (TIM); (e.g., approach, taxi in/out, takeoff and climb out.) Luke's emissions are not based on the number of LTOs, but rather the aggregate annual operational time in modes (TIMs) for all aircraft of similar type. For the F-16, an LTO cycle includes five modes of operation: idle (taxi in/out), intermediate, approach, military and afterburner. F-16 emissions were estimated using the annual TIMs provided by Luke AFB and emission factors from military guidance documents.

Table 4.11–1 lists the data sources for each airport's activity level, as well as fleet mix. The total number of aircraft operations in 2008 is also listed. For all airports other than Luke AFB, aircraft emissions were estimated for four aircraft categories:

- Air carriers (abbreviated "AC"): Larger commercial aircraft with at least 60 seats or 18,000 lbs payload capacity, used for scheduled service to transport passengers and/or freight;
- Air taxis ("AT"): Smaller commercial turbine- or piston-powered aircraft with less than 60 seats or 18,000 lbs payload capacity;
- General aviation ("GA"): Aircraft used on an unscheduled basis for recreational flying, personal transportation, and other activities, including business travel; and
- Military ("ML"): Aircraft used to support military operations.

Table 4.11–1. Annual airport operations (by aircraft category), and related data sources.

Airport	Airport Code	Operations Data Source[1]	Fleet Mix Data Source[2]	Aircraft Type	2008 Operations
Buckeye Municipal	BXK	airnav.com	Generic GA profile	GA	26,535
Chandler Municipal	CHD	FAA/ATADS	FAA/ETMSC	AT	2,882
				GA	233,713
				ML	247
Falcon Field	FFZ	FAA/ATADS	FAA/ETMSC	AC	6
				AT	3,813
				GA	313,448
				ML	2,152
Gila Bend Municipal	E63	airnav.com	Generic GA profile	GA	1,768
Glendale Municipal	GEU	FAA/ATADS, Survey response	FAA/ETMSC	AT	1,873
				GA	134,282
				ML	57
Luke Air Force Base	LUF	[Emission totals provided by Luke AFB are based on times-in-mode.]			
Phoenix Deer Valley	DVT	Survey response	Survey response, FAA/ETMSC	AC	284
				AT	6,217
				GA	370,003 *
				ML	130
Phoenix Goodyear	GYR	Survey response	Survey response, FAA/ETMSC	AC	140
				AT	1962
				GA	169,177 *
				ML	6,747
Phoenix-Mesa Gateway (formerly Williams Gateway)	IWA	FAA/ATADS, Survey response	FAA/ETMSC	AC	3,876
				AT	5,937
				GA	211,674
				ML	5,939
Phoenix Sky Harbor	PHX	Survey response	Survey response, FAA/ETMSC	AC	391,518
				AT	77,354
				GA	30,868
				ML	2,759
Pleasant Valley	P48	airnav.com	Generic GA profile	GA	23,535
Scottsdale	SDL	FAA/ATADS	FAA/ETMSC	AT	11,232
				GA	179,619
				ML	560
Sky Ranch at Carefree	18AZ	Survey response	Generic GA profile	GA	1,515
Stellar Airpark	P19	airnav.com	Generic GA profile	GA	19,528
Wickenburg Municipal	E25	Survey responses	Generic GA profile	GA	6,000

1. FAA/ATADS: Federal Aviation Administration's Air Traffic Activity Data System (database); http://aspm.faa.gov.
2. FAA/ETMSC: Federal Aviation Administration's Enhanced Traffic Management System Counts (database); http://aspm.faa.gov.
* includes touch-and-go (TGO) operations levels reported by the airport.

The following section describes how activity and emissions were estimated for a representative airport, Chandler Municipal (CHD). Data from FAA's Air Traffic Activity Data System (ATADS, http://www.aspm.faa.gov) provided data on 2008 activity by aircraft type; these results are contained in Table 4.11–1. While ATADS reported a total of 233,713 general aviation operations at this airport in 2008, further information on the aircraft types comprising this activity was needed. The FAA's Enhanced Traffic Management System Counts (ETMSC) database was used to "grow" available aircraft-specific operational data as described below.

The ETMSC database on general aviation activity at CHD in 2008 comprises 152 different aircraft types, totaling 3,589 operations (See Table 4.11–2). To simplify modeling input requirements, this aircraft-specific activity data was ranked in order of decreasing frequency and activity data for the most frequently reported aircraft was then grown to represent all general aviation ("GA") activity, as shown in Table 4.11–2 below.

Table 4.11–2. Example showing how most common aircraft-specific activity was grown for modeling.

Rank	Aircraft Type	ETMSC-reported operations	% of total reported operations	Cumulative Percent	"Grown" operations for EDMS modeling
1	BE20 - Beech 200 Super King	240	6.7%		21,919
2	BE58 - Beech 58	233	6.5%		21,280
3	PA28 - Piper Cherokee	233	6.5%		21,280
4	C525 - Cessna CitationJet/CJ1	232	6.5%		21,189
5	C182 - Cessna Skylane 182	203	5.7%	31.8%	18,540
6	C172 - Cessna Skyhawk 172/Cutlass	194	5.4%		17,718
7	TBM7 - Socata TBM-7	166	4.6%		15,161
8	R22 - Robinson R-22 Mariner	138	3.8%		12,604
9	BE9L - Beech King Air 90	106	3.0%		9,681
10	BE36 - Beech Bonanza 36	97	2.7%	51.3%	8,859
11	BE55 - Beech Baron 55	90	2.5%		8,220
12	BE35 - Beech Bonanza 35	87	2.4%		7,946
13	C210 - Cessna 210 Centurion	75	2.1%		6,850
14	PA32 - Piper Cherokee Six	73	2.0%		6,667
15	P28R - Cherokee Arrow/Turbo	71	2.0%	62.4%	6,484
16	P46T - Piper Malibu Meridian	67	1.9%		6,119
17	SR22 - Cirrus SR 22	67	1.9%		6,119
18	BE30 - Raytheon 300 Super King Air	65	1.8%		5,936
19	MO20 - Mooney M-20	62	1.7%		5,662
20	C560 - Cessna Citation V/Ultra/Encore	60	1.7%	71.3%	5,480
⋮	⋮	⋮	⋮	⋮	
152	XL2 - Liberty XL-2	1	< 0.1%	100.0%	(n/a)
	Totals:	**3,589**			**233,713**

This approach of ranking reported activity, and then growing the most frequently occurring subset of aircraft typically resulted in a set comprised of 10 to 30 aircraft types being modeled for each airport/aircraft class combination, representing 60 to 100% of all reported activity. For ease in modeling computation and the assessment of emissions, all activity was assumed to occur evenly throughout the year. Thus, CO season day emissions were calculated by dividing annual totals by 366 (= days per year in 2008). Table 4.11–3 lists the total annual emissions and season-day emissions, of each airport and aircraft type, and for airports within and outside the CO maintenance area, respectively.

Table 4.11–3. Annual and season-day CO emissions, by airport and aircraft type.

Airport	Category[1]	Annual CO Emissions (tons/yr)	Typical season day CO emissions (lbs/day)
Buckeye Muni (BXK)	Aircraft: GA	351.30	1,919.7
Chandler Muni (CHD)	Aircraft: AT	13.70	74.8
	Aircraft: GA	2,146.93	11,731.8
	Aircraft: ML	1.28	7.0
	CHD total	2,161.90	11,813.7
Falcon Field (FFZ)	Aircraft: AC	0.03	0.2
	Aircraft: AT	15.25	83.3
	Aircraft: GA	2,824.89	15,436.5
	Aircraft: ML	9.28	50.7
	FFZ total	2,849.45	15,570.8
Gila Bend Muni (E63)	Aircraft: GA	23.42	128.0
Glendale Muni (GEU)	Aircraft: AT	118.76	648.9
	Aircraft: GA	1,068.47	5,838.6
	Aircraft: ML	0.65	3.6
	GEU total	1,187.88	6,491.1
Luke AFB (LUF)	Aircraft: ML	665.20	3,635.0
Phx Deer Valley (DVT)	Aircraft: AC	2.29	12.5
	Aircraft: AT	26.75	146.2
	Aircraft: GA	3,159.04	17,262.5
	Aircraft: ML	0.83	4.5
	DVT total	3,188.91	17,425.7
Phx Goodyear (GYR)	Aircraft: AC	0.81	4.4
	Aircraft: AT	8.30	45.3
	Aircraft: GA	2,428.23	13,269.0
	Aircraft: ML	36.49	199.4
	GYR total	2,473.82	13,518.1
Phx Sky Harbor (PHX)	Aircraft: AC	1,795.49	9,811.4
	Aircraft: AT	200.51	1,095.7
	Aircraft: GA	151.06	825.5
	Aircraft: ML	24.69	134.9
	PHX total	2,171.75	11,867.5
Williams Gateway (IWA)	Aircraft: AC	14.37	78.5
	Aircraft: AT	30.55	166.9
	Aircraft: GA	823.11	4,497.8
	Aircraft: ML	48.93	267.4
	IWA total	916.95	5,010.7
Pleasant Valley (P48)	Aircraft: GA	2.70	14.7
Scottsdale (SDL)	Aircraft: AT	52.75	288.3
	Aircraft: GA	702.20	3,837.1
	Aircraft: ML	3.53	19.3
	SDL total:	758.48	4,144.7
Sky Ranch / Carefree	Aircraft: GA	11.61	63.4
Stellar Airpark (P19)	Aircraft: GA	294.75	1,610.7
Wickenburg Muni (E25)	Aircraft: GA	47.39	259.0
	County totals:	17,105.50	93,472.7
Maricopa County	Aircraft: AC	1,812.99	9,907.0
	Aircraft: AT	466.56	2,549.5
	Aircraft: GA	14,035.08	76,694.4
	Aircraft: ML	790.88	4,321.8
	Aircraft, total	17,105.50	93,472.7
CO Maintenance area: (excludes Buckeye, Gila Bend and Wickenburg)	Aircraft: AC	1,812.99	9,907.0
	Aircraft: AT	466.56	2,549.5
	Aircraft: GA	13,613.0	74,387.8
	Aircraft: ML	790.88	4,321.8
	Aircraft, total	16,683.40	91,166.1

1. AC = air carrier, GA = general aviation, AT = air taxi, ML = military.

4.12 Locomotives

Annual emissions from locomotives were calculated based on diesel fuel usage provided by Burlington Northern/Santa Fe Railway (BNSF), Union Pacific Railway (UP) and Amtrak. Railway operations from these companies fall into two categories: Class I haul lines and yard/switching operations. Annual emissions from Class I haul operations and yard/switching operations were calculated by multiplying diesel fuel usage by the emission factors listed in Table 4.12–1 (US EPA, 2009).

Table 4.12–1. Emission factors for locomotives.

Activity type	Emission factors (lbs/gal diesel)
Class I haul line	0.059
Yard/switch operations	0.061

Fuel use reported by railroads, and annual emission totals are summarized in Table 4.12–2.

Table 4.12–2. Fuel use and annual CO emissions from locomotives in Maricopa County.

Locomotive type	Diesel fuel used (gals)	Annual CO emissions (tons/yr)
BNSF Class I haul line	750,094	22.13
UP Class I haul line	7,780,284	229.52
BNSF yard/switch operations	400,000	12.20
UP yard/switch operations	378,199	11.54
Amtrak	52,416	1.55
Totals:	**9,360,993**	**276.93**

CO maintenance area emissions were calculated by multiplying Maricopa County emissions by the percentage of track miles inside the CO maintenance area, determined by GIS mapping. Results are shown in Table 4.12–3.

Table 4.12–3. Annual CO emissions (in tons/yr) from locomotives in the CO maintenance area.

Locomotive type	Track in maintenance area (%)	Annual CO emissions (tons/yr)
BNSF Class I haul line	37.95	8.40
UP Class I haul line	37.95	87.10
BNSF yard/switch operations	100.00	12.20
UP yard/switch operations	100.00	11.54
Amtrak	0.00	0.00
Totals:		**119.23**

CO season-day emissions for both the county and the CO maintenance area (shown in Table 4.12–4) were calculated by dividing annual totals by 366 days per year (= days/yr in 2008), as locomotive activity is assumed to be uniform throughout the year.

Table 4.12–4. Season-day emissions (in lbs/day) from locomotives in Maricopa County and the CO maintenance area.

Locomotive type	Maricopa County	CO maintenance area
BNSF Class I haul line	120.9	45.9
UP Class I haul line	1,254.2	476.0
BNSF yard/switch operations	66.7	66.7
UP yard/switch operations	63.0	63.0
Amtrak	8.4	0.0
Totals:	**1,513.3**	**651.6**

4.13 Summary of all nonroad mobile source emissions

Table 4.13−1 summarizes the annual and season-day emissions of carbon monoxide from nonroad mobile sources in Maricopa County and the CO maintenance area.

Table 4.13–1. Summary of annual and season-day CO emissions from nonroad mobile sources.

	Annual CO emissions (tons/yr)		Season-day CO emissions	
Equipment category	Maricopa County	CO maintenance area	Maricopa County	CO mainten-ance area
Agricultural	367.01	513.7	105.55	147.7
Airport GSE (+APU)	4,842.26	26,460.4	4,765.55	26,041.3
Commercial equipment	37,407.59	204,928.7	36,816.55	201,690.8
Construction & mining equipment	17,097.10	90,379.7	15,753.27	83,275.9
Industrial equipment	10,294.56	64,617.8	10,131.90	63,596.8
Lawn & garden equipment	66,712.36	100,753.6	64,657.62	97,650.4
Pleasure craft	1,627.41	5,008.5	431.81	1,328.9
Railway maintenance	19.33	120.8	18.73	117.1
Recreational equipment	7,270.41	24,593.7	412.23	1,394.5
Aircraft	17,105.50	93,472.7	16,683.40	91,166.1
Locomotives	276.93	1,513.3	119.23	651.6
Totals:	**163,020.46**	**612,362.8**	**149,895.85**	**567,061.0**

4.14 Quality assurance procedures

Established procedures were used to check, and correct when necessary, the off-road mobile sources emissions estimates. All NONROAD model input and output files, and Excel spreadsheets used to calculate the emissions, were checked by personnel who were not involved in the development of the modeling inputs/outputs and spreadsheets. In addition, the emissions estimates were reviewed for reasonableness by external agency staff.

4.15 References

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5. Onroad Mobile Sources

5.1 Introduction

Onroad mobile source emissions for carbon monoxide (CO) have been calculated for the CO maintenance area and Maricopa County for the 2008 Periodic Emissions Inventory (PEI).

Motor Vehicle Emission Simulator (MOVES2010b) is the latest model developed by the U.S. Environmental Protection Agency (EPA) for the purpose of estimating onroad and off-network motor vehicle emission factors.

The MOVES2010b modeling accounted for the oxygenated fuel and the Arizona Vehicle Inspection/Maintenance (I/M) programs applied in Maricopa County in 2008. The fuel use assumptions, including oxygen content and Reid Vapor Pressure (RVP), were derived from the 2008 fuel inspection results provided by the Arizona Department of Weights and Measures.

In order to develop the 2008 onroad mobile source emissions, the 2008 vehicle miles traveled (VMT) estimates by facility type and road type were derived from the 2008 Highway Performance Monitoring System (HPMS) data provided by the Arizona Department of Transportation (ADOT). The distribution of VMT by vehicle type is based on the July 2008 vehicle registration data for Maricopa County provided by ADOT. The VMT by vehicle type was provided as local input data for MOVES2010b to produce onroad exhaust emissions.

The main references for preparing the onroad mobile source portion of the 2008 emissions inventory were:

- Emission Inventory Requirements for Ozone State Implementation Plans (EPA, 1991);
- Procedures for Emission Inventory Preparation Volume IV: Mobile Sources (EPA, 1992a);
- Quality Review Guidelines for 1990 Base Year Emission Inventories (EPA, 1992b);
- User's Guide for the SMOKE-MOVES Integration Tool (EPA, 2010a);
- Motor Vehicle Emission Simulator (MOVES) - User Guide Version, MOVES2010b (EPA, 2012a);
- Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes (EPA, 2012b); and
- Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b (EPA, 2012c).

5.2 Exhaust emissions

Vehicle exhaust emission factors for CO were calculated using MOVES2010b. The MOVES2010b runs were executed by MAG. The contact person for the MOVES2010b emission estimates is Ieesuck Jung (602-254-6300).

5.2.1 MOVES2010b model

The emissions were calculated using MOVES2010b. MOVES2010b is EPA's state-of-the-art emissions modeling tool, which replaces EPA's previous mobile source emissions model, MOBILE6.2. MOVES2010b is intended for official use to estimate national, state, and county level inventories of criteria air pollutants from highway vehicles. The user of MOVES2010b is allowed to specify vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types for a particular scenario to be modeled by creating a Run Specification (RunSpec).

In order to calculate vehicle emissions for the calendar year 2008, MOVES2010b was executed using local input data for each month of the year and each geographical area (the CO maintenance area and Maricopa County). Each scenario was created using the County Domain/Scale and the Inventory Calculation Type. The specific MOVES2010b model RunSpec and RunSpec summaries are described in Appendix 3.

5.2.2 MOVES2010b local input data

Compared with MOBILE6.2, MOVES2010b requires a more detailed level of local data, including fuel data, I/M program, meteorological data, vehicle population, source type age distribution, annual VMT, monthly/daily/hourly VMT fractions, road type distribution, average speed distribution, ramp fraction, and Alternative Vehicle and Fuel Technologies (AVFT) strategy.

5.2.2.1 Fuel data

Regarding the fuel local input data, MOVES2010b provides two MOVES tables, which are [fuelsupply] and [fuelformulation]. The fuel data for each month were derived from the 2008 fuel inspection results in Maricopa County provided by the Arizona Department of Weights and Measures. The fuel data for Maricopa County were also applied to the CO maintenance area. The specific MOVES tables for fuel data are presented in Appendix 3.

5.2.2.2 I/M programs

MOVES2010b has an [IMCoverage] table for I/M programs; this table was prepared using MOBILE6.2 input. This table reflects the actual proportions of vehicles subject to the specified levels of inspection. The term “I/M vehicles” denotes vehicles which are required to undergo an emission test and/or inspection under the Vehicle Inspection/Maintenance Program. It is important to note that participation in the I/M program is required for all vehicles registered in the CO maintenance area, with the exception of certain model years and vehicle classes. However, it is assumed that 91.6 percent of the vehicles operating within the CO maintenance area and Maricopa County participate in the I/M program and the remaining 8.4 percent do not participate in the program. These percentages reflect the control measures “Tougher Enforcement of Vehicle Registration and Emissions Test Compliance” and “Expansion of Area A Boundaries,” described in the MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area (MAG, 2009). This percentage is directly applied to the Compliance Factor in the [IMCoverage] table. The same I/M programs were applied for the CO maintenance area and Maricopa County. The specific MOVES table for I/M programs is presented in Appendix 3.

5.2.2.3 Meteorological data

MOVES2010b requires hourly temperature and relative humidity data by specific month of the year. Meteorological data for the Phoenix Sky Harbor International Airport in 2008 were obtained from the National Climatic Data Center (http://www7.ncdc.noaa.gov/IPS/lcd/lcd.html?_page=1&state=AZ&wban=23183&_target2=Next+%3E). The same hourly average temperature and relative humidity data for each month were applied for the CO maintenance area and Maricopa County. The specific MOVES table [ZoneMonthHour] for meteorological data is presented in Appendix 3.

5.2.2.4 Vehicle population

In order to capture start, evaporative, and extended idle emissions, MOVES2010b introduced a new mobile source emission category called off-network emissions. In MOVES2010b, these off-network emissions are directly determined by population of vehicles in an area. The vehicle population in Maricopa County was obtained from the July 2008 vehicle registration data provided by ADOT. The vehicle population data were allocated to the 28 MOBILE6.2 vehicle types based on MOBILE6.2 VMT fractions for 2008. Then, the vehicle population data allocated to the 28 MOBILE6.2 vehicle types were assigned to the 13 MOVES source types using the match-up table (Table A.1) in EPA's technical guidance (EPA, 2010a). The vehicle population in the CO maintenance area was estimated by applying the population ratio of the two geographical areas to the vehicle population in Maricopa County. The population ratio for 2008 was derived from the MAG socioeconomic data, which is 3,688,000 people for the CO maintenance area and 3,988,000 people for Maricopa County. The specific MOVES table [SourceTypeYear] for vehicle population is presented in Appendix 3.

5.2.2.5 Source type age distribution

MOVES2010b categorizes vehicles according to vehicle classes and model years. The source type age distribution was prepared using EPA's data converter that takes the registration distribution input file created for MOBILE6.2 and converts it to the appropriate MOVES age distribution input table [SourceTypeAgeDistribution]. The same source type age distribution was applied for the CO maintenance area and Maricopa County. The specific MOVES table for source type age distribution is presented in Appendix 3.

5.2.2.6 Annual VMT

The 2008 daily VMTs by facility type were used to estimate onroad exhaust emissions. The 2008 VMT distributions by facility type for the CO maintenance area and Maricopa County were obtained from the 2008 Maricopa County Estimates of Daily Vehicle Travel by Highway Functional Classification provided by ADOT. The 2008 VMT distributions were multiplied by the 2008 HPMS VMT for the CO maintenance area and Maricopa County. The resultant VMT estimates by facility type for the CO maintenance area and Maricopa County are shown in Table 5.2-1.

Since MOVES2010b requires annual VMTs by HPMS vehicle type as a local input, the daily VMTs by HPMS vehicle type were derived from the 2008 traffic assignment data provided by the MAG transportation modeling group in January 2012 and the daily VMTs by facility type and the estimated percentages of daily vehicle travel by vehicle type and highway functional classification provided by ADOT. Then, the daily VMTs by HPMS vehicle type were multiplied by 366 days to obtain the annual VMTs by HPMS vehicle type. The specific MOVES table [HPMSvTypeYear] for annual VMT is presented in Appendix 3.

Table 5.2–1. 2008 daily VMT by facility type (annual average daily traffic).

	Facility Type	CO Maintenance Area (thousand miles/day)	Maricopa County (thousand miles/day)
Rural	Interstate	2,040	3,223
	Other Principal Arterial	819	1,293
	Minor Arterial	418	661
	Major Collector	1,065	1,682
	Minor Collector	130	205
	Local	498	787
Urban	Interstate	10,467	10,939
	Other Freeway/Expressway	18,907	19,760
	Other Principal Arterial	21,673	22,651
	Minor Arterial	14,285	14,930
	Collector	4,655	4,865
	Local	9,818	10,261
Totals:		**84,775**	**91,257**

5.2.2.7 Road type distribution

MOVES2010b requires the distribution of VMTs by road type as a local input. The road type VMT distribution by HPMS vehicle type was derived from the 2008 traffic assignment data and the daily VMTs by HPMS vehicle type mentioned in the previous section. As suggested in EPA's technical guidance (EPA, 2010a), the same road type distribution by HPMS vehicle type was used for all MOVES source types within an HPMS vehicle class. The specific MOVES table [RoadTypeDistribution] for road type distribution is presented in Appendix 3.

5.2.2.8 VMT fraction

Since VMT varies by month, day of week, and hour, MOVES2010b requires month/day/hour VMT fractions as a local input in order to derive hourly VMT for each weekday/weekend and month from the annual VMT. The month/day/hour VMT fractions were developed from data recorded by continuous traffic counters on freeways (ADOT Freeway Management System) and arterials (Phoenix Automatic Traffic Recorders) during the year 2007. The specific MOVES tables [MonthVMTFraction], [DayVMTFraction], and [HourVMTFraction] for VMT fractions are presented in Appendix 3.

5.2.2.9 Average speed distribution

In MOVES2010b, vehicle power, speed, and acceleration have a significant effect on vehicle emissions for all pollutants. MOVES2010b estimates those emission effects by assigning activity to operating mode distributions, which are determined by the distribution of vehicle hours traveled (VHT) by average speed. As recommended in EPA's technical guidance (EPA, 2010a), estimates of local average speeds were developed by post-processing the output from the 2008 traffic assignment data provided by the MAG transportation modeling group in January 2012. To develop the average speed distribution, VHTs in sixteen speed bins were accumulated separately for each hour of the day, source type, and road type in Maricopa County. Then, the average speed distribution was calculated by normalizing VHTs in sixteen speed bins for each hour of the day, source type, and road type. The same methodology was applied to develop the speed estimates for the CO maintenance area. The specific MOVES table [AvgSpeedDistribution] for the average speed distribution is presented in Appendix 3.

5.2.2.10 Ramp fraction

MOVES2010b requires the ramp fraction, which represents the percent of VHT on ramps, on both rural restricted roads (road type 2) and urban restricted roads (road type 4). The fraction of VHT on ramps was derived by dividing the total VHTs on ramps by the total VHTs for each restricted road type. Those VHTs were obtained from the 2008 traffic assignment data provided by the MAG transportation modeling group in January 2012. The specific MOVES table [RoadType] for ramp fractions is presented in Appendix 3.

5.2.2.11 AVFT strategy

MOVES2010b allows users to modify the fuel engine fraction using different fuels and technologies in each model year in order to reflect the local situation. The fleet information for transit buses for model years 1997 through 2010 was provided by Valley Metro and used to prepare the AVFT input file. Since the fleet data are available only for specific model years, MOVES2010b default values were obtained from the [fuelEngFraction] table in the MOVES default database and used for the rest of the model years. The specific MOVES table [AVFT] for AVFT strategy is presented in Appendix 3.

5.2.3 MOVES2010b outputs

MOVES2010b was executed with the RunSpec files described in Appendix 3 to obtain exhaust emissions for CO. These values were obtained for the following categories by month:

- Vehicle classes: light duty gasoline vehicles (LDGV), light duty gasoline trucks 1 & 2 (LDGT1), light duty gasoline trucks 3 and 4 (LDGT2), heavy duty gasoline vehicles 2B thru 8B and gasoline buses (HDGV), motorcycles (MC), light duty diesel vehicles (LDDV), light duty diesel trucks 1 thru 4 (LDDT), heavy duty diesel vehicles class 2B (2BHDDV), heavy duty diesel vehicles classes 3, 4, and 5 (LHDDV), heavy duty diesel vehicles classes 6 and 7 (MHDDV), heavy duty diesel vehicles classes 8A and 8B (HHDDV), and heavy duty diesel buses (BUSES)
- Facility types: rural interstate, rural principal arterial, rural minor arterial, rural major collector, rural minor collector, rural local, urban interstate, urban freeway/expressway, urban principal arterial, urban minor arterial, urban collector, urban local, and off-network, which was newly added in MOVES2010b
- Days: weekdays and weekend days

5.2.4 MOVES2010b emission estimates

MOVES2010b was used to generate onroad emissions by vehicle class, facility type, weekdays /weekend days, and month. By specifying the output time aggregate level as month, MOVES2010b produces monthly emissions including weekday and weekend emissions for a given month. The annual emissions were calculated by aggregating monthly onroad emissions derived by MOVES2010b. The CO season-day emissions were calculated by dividing the three-month peak CO season emissions from November through January by 92 days.

Table 5.2-2 shows the calculated annual and season-day CO emissions by facility type and vehicle class in the CO maintenance area and Maricopa County.

Table 5.2–2. Annual and CO season-day onroad mobile source emissions by facility type and vehicle class in the CO maintenance area and Maricopa County.

Facility Type	Vehicle Class	SCC	Annual CO emissions (tons/year) CO Maintenance Area	Annual CO emissions (tons/year) Maricopa County	Season-day CO emissions (lbs/day) CO Maintenance Area	Season-day CO emissions (lbs/day) Maricopa County
Rural Interstate	LDGV	2201001110	1,315.28	2,145.56	5,249.8	8,541.7
	LDGT1	2201020110	1,026.34	1,716.57	4,191.5	6,991.0
	LDGT2	2201040110	528.72	884.29	2,159.3	3,601.4
	HDGV	2201070110	410.53	540.14	1,970.5	2,543.7
	MC	2201080110	46.53	63.10	236.8	321.1
	LDDV	2230001110	0.35	0.52	1.5	2.3
	LDDT	2230060110	7.61	11.09	32.7	47.5
	2BHDDV	2230071110	3.33	4.85	14.3	20.7
	LHDDV	2230072110	18.21	26.48	78.5	113.7
	MHDDV	2230073110	64.39	84.06	351.2	458.6
	HHDDV	2230074110	162.43	260.03	886.0	1,418.6
	BUSES	2230075110	3.67	6.41	20.0	34.9
Rural Principal Arterial	LDGV	2201001130	682.58	1,062.08	2,788.2	4,329.5
	LDGT1	2201020130	562.67	876.46	2,345.7	3,643.6
	LDGT2	2201040130	289.86	451.51	1,208.4	1,877.0
	HDGV	2201070130	139.18	214.84	646.3	995.6
	MC	2201080130	32.65	46.22	166.2	235.2
	LDDV	2230001130	0.25	0.38	1.1	1.7
	LDDT	2230060130	5.68	8.45	24.9	36.8
	2BHDDV	2230071130	2.48	3.70	10.8	16.1
	LHDDV	2230072130	13.60	20.20	59.6	88.2
	MHDDV	2230073130	16.94	26.68	92.5	145.6
	HHDDV	2230074130	38.90	64.41	212.3	351.5
	BUSES	2230075130	3.01	5.30	16.5	28.9
Rural Minor Arterial	LDGV	2201001150	663.29	1,032.06	2,709.3	4,207.1
	LDGT1	2201020150	546.76	851.69	2,279.4	3,540.7
	LDGT2	2201040150	281.67	438.75	1,174.3	1,824.0
	HDGV	2201070150	135.25	208.77	628.1	967.4
	MC	2201080150	31.73	44.92	161.5	228.6
	LDDV	2230001150	0.24	0.37	1.1	1.6
	LDDT	2230060150	5.52	8.21	24.2	35.8
	2BHDDV	2230071150	2.41	3.59	10.5	15.6
	LHDDV	2230072150	13.21	19.63	57.9	85.7
	MHDDV	2230073150	16.46	25.93	89.8	141.5
	HHDDV	2230074150	37.80	62.59	206.3	341.5
	BUSES	2230075150	2.93	5.15	16.0	28.1
Rural Major Collector	LDGV	2201001170	123.63	192.36	505.0	784.1
	LDGT1	2201020170	101.91	158.74	424.9	659.9
	LDGT2	2201040170	52.50	81.78	218.9	340.0
	HDGV	2201070170	25.21	38.91	117.1	180.3
	MC	2201080170	5.91	8.37	30.1	42.6
	LDDV	2230001170	0.04	0.07	0.2	0.3
	LDDT	2230060170	1.03	1.53	4.5	6.7
	2BHDDV	2230071170	0.45	0.67	2.0	2.9
	LHDDV	2230072170	2.46	3.66	10.8	16.0
	MHDDV	2230073170	3.07	4.83	16.7	26.4
	HHDDV	2230074170	7.04	11.67	38.4	63.7
	BUSES	2230075170	0.55	0.96	3.0	5.2

Table 5.2–2. Annual and CO season-day onroad mobile source emissions by facility type and vehicle class in the CO maintenance area and Maricopa County (continued).

			Annual CO emissions (tons/year)		Season-day CO emissions (lbs/day)	
Facility Type	Vehicle Class	SCC	CO Maintenance Area	Maricopa County	CO Maintenance Area	Maricopa County
Rural Minor Collector	LDGV	2201001190	28.62	44.53	116.9	181.5
	LDGT1	2201020190	23.59	36.75	98.4	152.8
	LDGT2	2201040190	12.15	18.93	50.7	78.7
	HDGV	2201070190	5.84	9.01	27.1	41.7
	MC	2201080190	1.37	1.94	7.0	9.9
	LDDV	2230001190	0.01	0.02	0.0	0.1
	LDDT	2230060190	0.24	0.35	1.0	1.5
	2BHDDV	2230071190	0.10	0.16	0.5	0.7
	LHDDV	2230072190	0.57	0.85	2.5	3.7
	MHDDV	2230073190	0.71	1.12	3.9	6.1
	HHDDV	2230074190	1.63	2.70	8.9	14.7
	BUSES	2230075190	0.13	0.22	0.7	1.2
Rural Local	LDGV	2201001210	299.00	465.24	1,221.4	1,896.5
	LDGT1	2201020210	246.48	383.93	1,027.6	1,596.1
	LDGT2	2201040210	126.97	197.78	529.3	822.2
	HDGV	2201070210	60.97	94.11	283.1	436.1
	MC	2201080210	14.30	20.25	72.8	103.0
	LDDV	2230001210	0.11	0.17	0.5	0.7
	LDDT	2230060210	2.49	3.70	10.9	16.1
	2BHDDV	2230071210	1.09	1.62	4.7	7.0
	LHDDV	2230072210	5.96	8.85	26.1	38.6
	MHDDV	2230073210	7.42	11.69	40.5	63.8
	HHDDV	2230074210	17.04	28.21	93.0	154.0
	BUSES	2230075210	1.32	2.32	7.2	12.7
Urban Interstate	LDGV	2201001230	10,581.17	11,055.84	42,347.7	44,246.7
	LDGT1	2201020230	7,657.75	8,003.28	31,375.3	32,790.3
	LDGT2	2201040230	3,944.90	4,122.90	16,163.0	16,892.0
	HDGV	2201070230	3,124.96	3,260.99	15,041.9	15,695.1
	MC	2201080230	339.16	354.16	1,726.2	1,802.6
	LDDV	2230001230	2.69	2.81	11.7	12.2
	LDDT	2230060230	58.55	61.12	253.0	264.0
	2BHDDV	2230071230	25.58	26.70	110.3	115.1
	LHDDV	2230072230	140.47	146.62	608.2	634.8
	MHDDV	2230073230	436.75	455.92	2,382.4	2,486.9
	HHDDV	2230074230	990.85	1,036.24	5,404.9	5,652.5
	BUSES	2230075230	36.86	38.59	201.0	210.5
Urban Freeway And Expressway	LDGV	2201001250	11,101.55	11,599.57	44,430.4	46,422.8
	LDGT1	2201020250	8,034.36	8,396.88	32,918.3	34,402.9
	LDGT2	2201040250	4,138.91	4,325.66	16,957.9	17,722.7
	HDGV	2201070250	3,278.65	3,421.37	15,781.8	16,467.0
	MC	2201080250	355.84	371.58	1,811.1	1,891.2
	LDDV	2230001250	2.82	2.95	12.2	12.8
	LDDT	2230060250	61.43	64.13	265.4	277.0
	2BHDDV	2230071250	26.83	28.01	115.7	120.8
	LHDDV	2230072250	147.38	153.83	638.1	666.0
	MHDDV	2230073250	458.23	478.34	2,499.5	2,609.2
	HHDDV	2230074250	1,039.58	1,087.20	5,670.8	5,930.5
	BUSES	2230075250	38.67	40.49	210.9	220.9

Table 5.2–2. Annual and CO season-day onroad mobile source emissions by facility type and vehicle class in the CO maintenance area and Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual CO emissions (tons/year) CO Maintenance Area	Annual CO emissions (tons/year) Maricopa County	Season-day CO emissions (lbs/day) CO Maintenance Area	Season-day CO emissions (lbs/day) Maricopa County
Urban Principal Arterial	LDGV	2201001270	17,742.84	18,539.93	73,323.3	76,615.7
	LDGT1	2201020270	12,966.07	13,548.16	54,751.7	57,207.8
	LDGT2	2201040270	6,679.49	6,979.35	28,205.4	29,470.7
	HDGV	2201070270	3,594.78	3,756.21	16,948.1	17,708.9
	MC	2201080270	546.45	571.05	2,781.0	2,906.2
	LDDV	2230001270	6.86	7.17	30.6	31.9
	LDDT	2230060270	150.86	157.58	669.7	699.5
	2BHDDV	2230071270	65.87	68.80	291.9	304.8
	LHDDV	2230072270	362.20	378.33	1,611.1	1,682.7
	MHDDV	2230073270	463.74	484.61	2,530.6	2,644.5
	HHDDV	2230074270	965.51	1,008.84	5,268.8	5,505.2
	BUSES	2230075270	61.82	64.60	337.4	352.5
Urban Minor Arterial	LDGV	2201001290	9,018.61	9,423.76	37,270.0	38,943.4
	LDGT1	2201020290	6,590.60	6,886.47	27,830.0	29,078.5
	LDGT2	2201040290	3,395.16	3,547.57	14,336.7	14,979.8
	HDGV	2201070290	1,827.21	1,909.26	8,614.6	9,001.4
	MC	2201080290	277.76	290.26	1,413.6	1,477.2
	LDDV	2230001290	3.49	3.64	15.5	16.2
	LDDT	2230060290	76.68	80.10	340.4	355.6
	2BHDDV	2230071290	33.48	34.97	148.3	154.9
	LHDDV	2230072290	184.11	192.30	818.9	855.3
	MHDDV	2230073290	235.72	246.32	1,286.3	1,344.2
	HHDDV	2230074290	490.77	512.79	2,678.1	2,798.3
	BUSES	2230075290	31.43	32.83	171.5	179.2
Urban Collector	LDGV	2201001310	1,761.28	1,840.40	7,278.6	7,605.4
	LDGT1	2201020310	1,287.10	1,344.88	5,435.0	5,678.8
	LDGT2	2201040310	663.05	692.82	2,799.9	2,925.5
	HDGV	2201070310	356.84	372.87	1,682.4	1,757.9
	MC	2201080310	54.24	56.69	276.1	288.5
	LDDV	2230001310	0.68	0.71	3.0	3.2
	LDDT	2230060310	14.98	15.64	66.5	69.4
	2BHDDV	2230071310	6.54	6.83	29.0	30.3
	LHDDV	2230072310	35.95	37.56	159.9	167.0
	MHDDV	2230073310	46.03	48.11	251.2	262.5
	HHDDV	2230074310	95.84	100.14	523.0	546.5
	BUSES	2230075310	6.14	6.41	33.5	35.0
Urban Local	LDGV	2201001330	8,501.75	8,883.68	35,134.1	36,711.5
	LDGT1	2201020330	6,212.89	6,491.80	26,235.1	27,412.0
	LDGT2	2201040330	3,200.58	3,344.26	13,515.0	14,121.3
	HDGV	2201070330	1,722.49	1,799.84	8,120.9	8,485.5
	MC	2201080330	261.84	273.63	1,332.5	1,392.5
	LDDV	2230001330	3.29	3.43	14.6	15.3
	LDDT	2230060330	72.29	75.51	320.9	335.2
	2BHDDV	2230071330	31.56	32.97	139.8	146.1
	LHDDV	2230072330	173.56	181.28	772.0	806.3
	MHDDV	2230073330	222.21	232.21	1,212.6	1,267.1
	HHDDV	2230074330	462.64	483.40	2,524.6	2,637.9
	BUSES	2230075330	29.62	30.95	161.7	168.9

Table 5.2–2. Annual and CO season-day onroad mobile source emissions by facility type and vehicle class in the CO maintenance area and Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual CO emissions (tons/year) CO Maintenance Area	Annual CO emissions (tons/year) Maricopa County	Season-day CO emissions (lbs/day) CO Maintenance Area	Season-day CO emissions (lbs/day) Maricopa County
Off-Network	LDGV	2201001000	44,232.59	47,830.69	316,294.2	342,022.9
	LDGT1	2201020000	20,331.12	21,984.95	121,473.5	131,354.9
	LDGT2	2201040000	10,473.60	11,325.57	62,577.3	67,667.6
	HDGV	2201070000	5,302.43	5,733.76	29,934.9	32,370.0
	MC	2201080000	68.78	74.37	748.5	809.4
	LDDV	2230001000	12.03	13.01	71.6	77.5
	LDDT	2230060000	16.20	17.52	95.7	103.5
	2BHDDV	2230071000	6.96	7.52	41.2	44.5
	LHDDV	2230072000	37.59	40.65	222.4	240.5
	MHDDV	2230073000	216.62	233.95	1,201.1	1,297.2
	HHDDV	2230074000	1,231.54	1,326.20	6,745.5	7,264.1
	BUSES	2230075000	81.74	88.39	453.2	490.0

5.3 Summary of CO emissions from onroad mobile sources

Table 5.3-1 summarizes the annual and season-day emissions for CO from all onroad mobile sources in the CO maintenance area and Maricopa County in 2008.

Table 5.3–1. Annual and CO season-day emissions from all onroad mobile sources in the CO maintenance area and Maricopa County.

Emission Category	Annual CO emissions (tons/year)	Season-day CO emissions (lbs/day)
Maricopa County	255,355.67	1,293,502.6
CO maintenance area	237,324.41	1,201,621.5

5.4 Quality assurance process

5.4.1 VMT estimates

Normal quality assurance procedures, including automated and manual consistency checks, were conducted by MAG in developing the 2008 TransCAD traffic assignment network used to generate the VMT data. The VMT estimates using the MAG travel demand model have been validated against approximately 2,200 traffic counts collected in 2006–2008.

5.4.2 Emission estimates

The quality assurance process performed on the MOVES2010b analyses included accuracy, completeness, and reasonableness checks. For accuracy and completeness, all calculations were checked by an independent reviewer. Any errors found were corrected and the corrections were then rechecked by the reviewer.

5.4.3 Draft CO emissions inventory

The draft onroad mobile source portion of the 2008 periodic CO emissions inventory was reviewed using published EPA quality review guidelines for base year emission inventories (EPA, 1992b). The procedure review (Levels I, II, and III) included checks for completeness, consistency, and the correct use of appropriate procedures.

5.5 References

MAG, 2009. MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area, February 2009.

US EPA, 1991. Emission Inventory Requirements for Ozone State Implementation Plans, EPA-450/4-91-010, March 1991.

US EPA, 1992a. Procedures for Emission Inventory Preparation Volume IV: Mobile Sources, EPA-450/4-81-026d (Revised), 1992.

US EPA, 1992b. Quality Review Guidelines for 1990 Base Year Emission Inventories, EPA-454/R-92-007, July 1992.

US EPA, 2010a. User's Guide for the SMOKE-MOVES Integration Tool, EPA Contract EP-D-07-102 (WA 3-03), July 2010.

US EPA, 2012a. Motor Vehicle Emission Simulator (MOVES) - User Guide Version, MOVES2010b, EPA-420-B-12-001, March 2012.

US EPA, 2012b. Policy Guidance on the Use of MOVES2010 and Subsequent Minor Revisions for State Implementation Plan Development, Transportation Conformity, and Other Purposes, EPA-420-B-12-010, April 2012.

US EPA, 2012c. Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b, EPA-420-B-12-028, April 2012.

6. Biogenic Sources

6.1 Introduction

Biogenic emissions have been estimated for the 2008 Periodic Emissions Inventory for carbon monoxide (CO) in Maricopa County (9,223 square miles) and the CO maintenance area (MA) (1,814 square miles). The Model of Emissions of Gases and Aerosols from Nature (MEGAN) has been used to estimate the biogenic emissions. MEGAN is a state-of-the-art biogenic emissions model developed by the National Center for Atmospheric Research (NCAR). Some important corrections and improvements were made in the latest version of MEGAN2.04 (Guenther, 2007 and Feng Liu, 2009) compared to previous versions (Guenther, 2006, 2006a and 2006b). MEGAN2.04 was applied to compute biogenic emissions in Maricopa County and the CO MA. Estimated emissions for CO are included in this biogenic emissions inventory. The MEGAN runs were executed by the Maricopa Association of Governments. The contact person for the MEGAN emission estimates is Feng Liu (602-254-6300).

6.2 Modeling domain

As a numerical model, the MEGAN inputs and outputs are given in two dimensional grid cells. To develop biogenic emissions for the 2008 Periodic Emission Inventory for CO, the 4-km and 12-km modeling domains developed for the MAG Eight-Hour Ozone Plans for the Maricopa Nonattainment Area (MAG, 2007 and 2009), were employed to develop biogenic CO emissions for the CO MA and Maricopa County, respectively. The definition of the domains in the Universal Transverse Mercator (UTM) coordinate system is presented in Table 6.2–1. Since MEGAN estimates biogenic emissions for an entire modeling domain, masking areas covered by the CO MA and Maricopa County, were developed by applying Geographic Information Systems (GIS) to those two target areas. For the target area, the masking file assigns 1.0 for the grid cells fully covered by the target area, a fractional value for grid cells partially covered by the target area, and 0.0 for grid cells outside the target area. As shown in Figure 6.3–1, biogenic emissions for the CO MA and Maricopa County were extracted from MEGAN outputs for the masked grid cells in the 4-km and 12-km modeling domains, respectively.

Table 6.2–1. Two modeling domains defined in the UTM coordinate system.

Grid Horizontal Resolution	Grid Size	Domain Range (km)	Target Area
4-km	50 by 29	(297,3652) to (497,3768)	CO Maintenance Area
12-km	111 by 84	(-275,3188) to (1057,4196)	Maricopa County

6.3 Input data

To calculate biogenic emissions using MEGAN, the following gridded land-cover and meteorological input files were prepared:

1) EFMAP_LAI file: This file provides emission factors (EF) for 20 MEGAN species including NOx, CO and VOC, and monthly average leaf index (LAI) for 12 months for each grid cell.

2) PFTF file: This input file gives the percentage of four plant function types (PFT) including broadleaf trees (BT), needle leaf trees (NT), grass and crops (HB) and shrubs (SB) for each modeling domain grid location.

3) METCRO2D file: This file contains meteorological parameters including temperature, short wave radiation, wind speed, humidity and soil moisture for each grid.

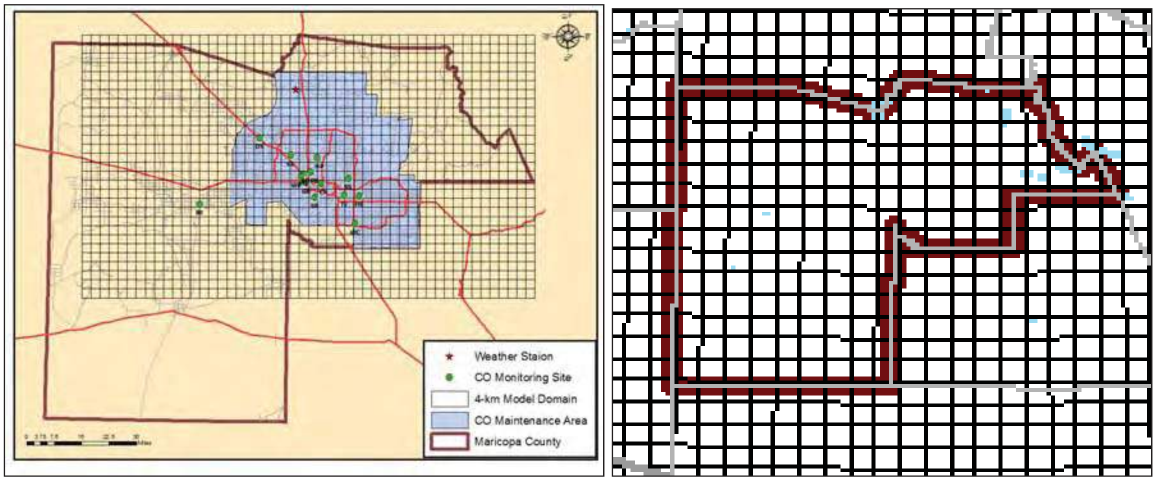

Figure 6.3–1. Masked CO maintenance area (blue area) in the 4-km domain (left) and Maricopa County in the 12-km domain (right). The red star in the left panel denotes the meteorological observation site.

6.3.1 Land cover data

The land cover data, including the monthly LAI, PFT, and EF, are provided by the EFMAP_LAI and PFTF files. These input data were derived from the MEGAN land cover database available at a base resolution of 30 seconds latitude by 30 seconds longitude (~ 1x1 km^2) in ArcGIS format (http://acd.ucar.edu/~guenther/MEGAN/MEGAN.htm). For the MEGAN runs, however, the default land cover data were replaced by local datasets, which were developed by a field study conducted by Dr. Guenther in June 2006 (ENVIRON, 2006). The substitution was made because the default database systematically underestimated the LAIs in Maricopa County.

6.3.2 Weather data

The weather data used by MEGAN include temperature, downward short wave radiation, wind speed, humidity and soil moisture. The Measurement and Instrumentation Data Center (MIDC) collects irradiance and meteorological data from nation-wide stations, one of which is located in northern Phoenix (33.83˚N, 112.17˚W, see the red star in Figure 6.3–1), and is operated by the Phoenix Federal Correction Institution (PFCI). The archived hourly temperature, wind speed, humidity and radiation data from this site are available to the public. Monthly mean diurnal cycles of the weather parameters were calculated based on hourly data for the year 2008 and a netCDF file representing 24-hour data for each month was prepared for MEGAN inputs.

Biogenic emissions of CO are highly dependent on temperature and downward short wave radiation. Figure 6.3–2 shows annual mean diurnal cycles of temperature and radiation. The peak temperature around 4:00-5:00 pm lags three hours behind the peak radiation. The delay is due to the fact that heating of the air occurs not from the sun’s rays, but from heating of the earth and infrared radiation leaving the ground in the form of heat. As a result, maximum hourly emission rates take place in the afternoon because the emission rates are positively related to both temperature and short wave radiation (Guenther, 2006). Data analysis indicates that temperature and radiation peak values occur in June. The maximum monthly CO biogenic emission rates would be expected to occur in the same month.

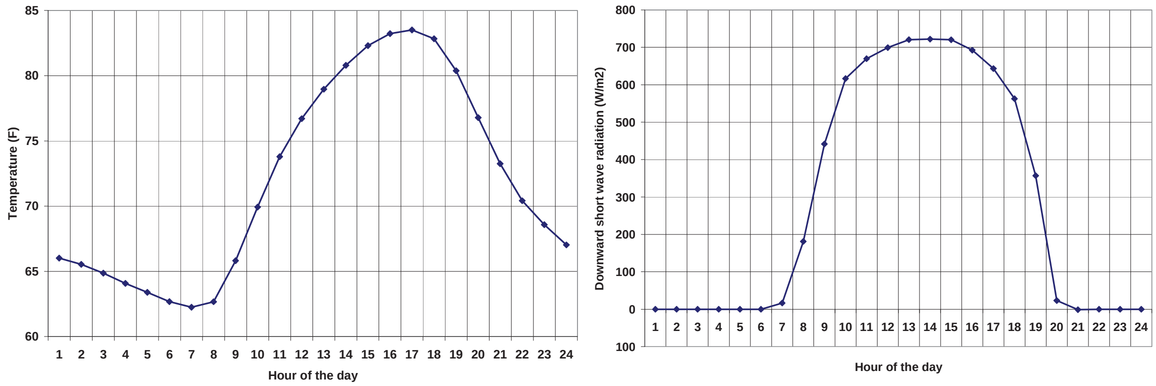

Figure 6.3–2. Annual mean diurnal cycles of measured temperature (left) and downward short wave radiation (right) in 2008.

6.4 Emission estimation

MEGAN runs for the 4-km modeling domain provide hourly biogenic emission outputs for the year 2008. Daily mean emissions for each month in 2008 are derived by using the hourly outputs for each month. The daily mean emissions for the 12 months in 2008 are shown in Table 6.4–1 for the MA and Maricopa County. Monthly total emissions were obtained by multiplying the daily mean emissions for each month by the number of days in the month. Monthly CO emissions for the MA and Maricopa County are presented in Table 6.4–2. Monthly mean emissions for the MA and Maricopa County are illustrated in Figure 6.4–1. It can be seen that the maximum monthly biogenic CO emissions took place in June, because monthly mean temperature and radiation reached the maximum in June.

Table 6.4–1. Daily mean biogenic CO emissions

	CO Maintenance Area		Maricopa County	
Month	**kg/day**	**lbs/day**	**kg/day**	**lbs/day**
Jan	1,419.3	3,129.0	6,511.4	14,355.2
Feb	1,900.4	4,189.7	9,092.3	20,045.1
Mar	4,967.9	10,952.3	23,109.3	50,947.3
Apr	7,192.1	15,855.9	33,191.0	73,173.6
May	7,744.2	17,073.0	34,216.2	75,433.8
Jun	17,801.6	39,245.8	77,086.0	169,945.6
Jul	16.420.2	36,200.3	70,985.5	156,496.3
Aug	14,891.7	32,830.5	63,556.3	140,117.7
Sep	12,355.4	27,239.0	58,326.4	128,587.7
Oct	6,675.2	14,716.3	31,130.4	68,630.8
Nov	3,408.8	7,515.1	15,432.2	34,022.2
Dec	1,494.1	3,293.9	6,829.6	15,056.7

Table 6.4–2. Monthly biogenic CO emissions in MA and Maricopa County

	CO Maintenance Area		Maricopa County	
Month	**Metric tons/month**	**Short tons/month**	**Metric tons/month**	**Short tons/month**
Jan	44.00	48.50	201.85	222.50
Feb	55.11	60.75	263.68	290.66
Mar	54.01	59.54	716.39	789.68
Apr	215.76	237.83	995.73	1,097.60
May	240.07	264.63	1,060.70	1,169.22
Jun	534.05	588.69	2,312.58	2,549.18
Jul	509.03	561.11	2,200.55	2,425.69
Aug	461.64	508.87	1,970.25	2,171.83
Sep	370.66	408.58	1,749.79	1,928.81
Oct	206.93	228.10	965.04	1,063.77
Nov	102.26	112.72	462.97	510.34
Dec	46.32	51.06	211.72	233.38

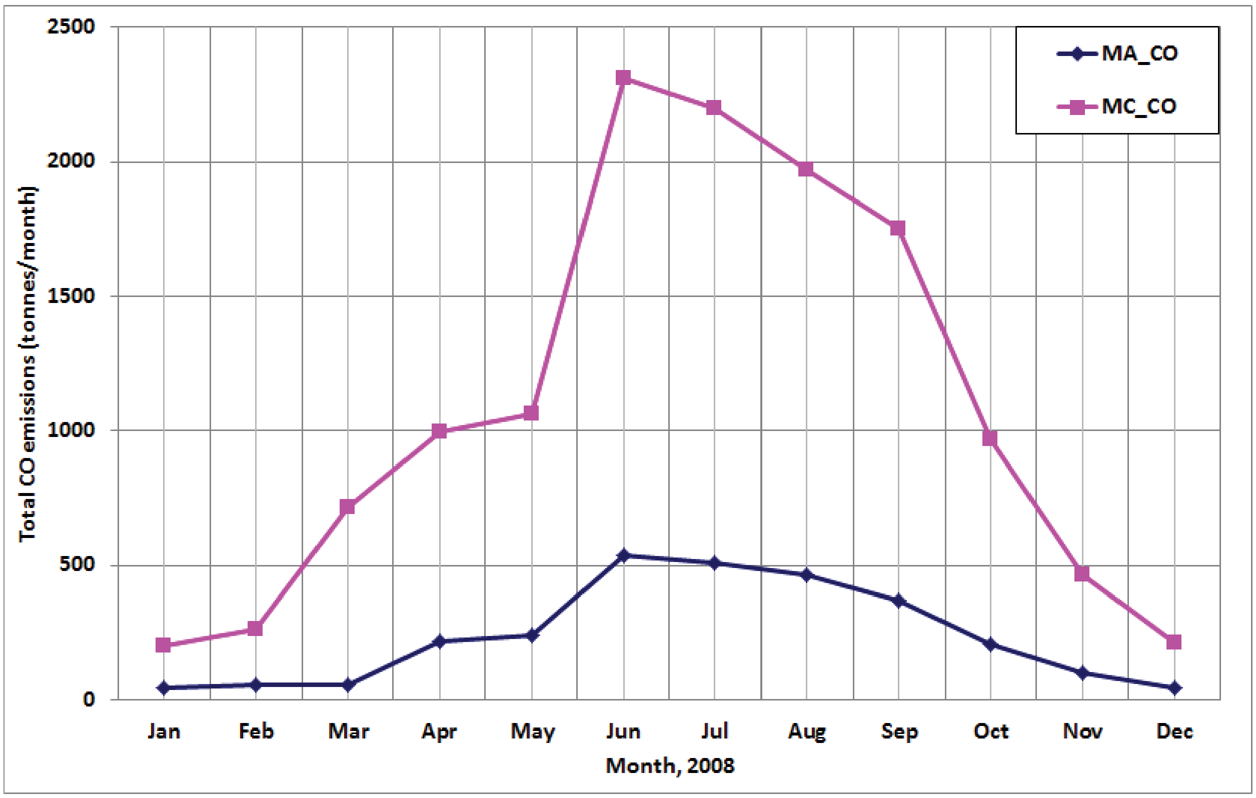

Figure 6.4–1. Monthly biogenic CO emissions in Maricopa County (pink solid line, "MC") and the CO Maintenance Area (dark blue line, "MA").

6.5 Summary of biogenic source emissions

Annual total biogenic CO emissions and daily mean biogenic CO emissions during the winter season for the MA and Maricopa County in 2008 are shown in Table 6.5–1. Due to the incorporation of land cover data that are more characteristic of plants located in the southwest desert area, as well as improvements in the MEGAN model, the 2008 biogenic CO emission estimates shown in Table 6.5–1 represent a substantial improvement over previous biogenic emission estimates for Maricopa County and the CO Maintenance Area.

Table 6.5–1. Annual total and winter season daily mean biogenic CO emissions

	Annual Total		Winter Season Daily Mean	
Area	**Tonnes*/yr**	**Tons*/yr**	**kg/day**	**lbs/day**
Maricopa County	13,111.25	14,452.68	9,591.1	21,144.7
CO Maintenance Area	2,839.84	3,130.39	2,107.4	4,646.0

** tonne denotes metric ton, and ton denotes short (or English) ton, 1 tonne = 1.10231 tons.*

6.6 References

ENVIRON International Corp., 2006. Final Report, Maricopa Association of Governments 2006 Biogenics Study.

Feng Liu, 2009: Prevention of Negative Emission Rate from MEGAN2.04, http://mailman.ucar.edu/pipermail/cdp/attachments/20110217/615f969f/attachment.pdf.

Guenther, A., T. Karl, P. Harley, C. Wiedinmyer, P. I. Palmer, and C. Geron, 2006. Estimates of global terrestrial isoprene emissions using MEGAN (Model of Emissions of Gases and Aerosols from Nature), Atmos. Chem. Phys., 6, 1-30.

Guenther, A., 2006a. User’s Guide to Processing Driving Variables for Model of Emissions of Gases and Aerosols from Nature (MEGAN).

Guenther, A., 2006b. User’s Guide to the Model of Emissions of Gases and Aerosols from Nature (MEGAN) Version MEGAN-VBA-2.0.

Guenther, 2007: Corrigendum to "Estimates of global terrestrial isoprene emissions using MEGAN (Model of Emissions of Gases and Aerosols from Nature)" published in Atmos. Chem. Phys., 6, 3181–3210, 2006, Atmos. Chem. Phys., 7, 4327-4327.

Maricopa Association of Governments, 2007. MAG Eight-Hour Ozone Plan for the Maricopa Nonattainment Area.

Maricopa Association of Governments, 2009. MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area.

Maricopa County Air Quality Department, 2010. 2008 Periodic Emission Inventory for Ozone Precursors for the Maricopa County, Arizona, Nonattainment Area, pp. 111-115.

Maricopa County
Air Quality Department

INSTRUCTIONS

FOR REPORTING 2008

ANNUAL AIR POLLUTION EMISSIONS

January 2009

Emissions Inventory Unit
1001 North Central Avenue, Suite 595
Phoenix, Arizona 85004
(602) 506-6790
(602) 506-6179 (Fax)

Copies of this document, related forms
and other reference materials are available online at our web site:
http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx

TABLE OF CONTENTS

WHAT'S NEW FOR 2008?

Reporting forms:

- Some **preprinted information** on your report may be different from last year's version. Please review the enclosed forms carefully, and verify all preprinted information.

- Many of our reporting forms **have changed** in past years. If you use your own forms, or a computerized reproduction of our forms, the forms used ***MUST*** conform to the current information requirements and **FORMAT** as supplied on our preprinted forms. "Homemade" reporting forms that vary significantly from the preprinted forms sent to you will ***not*** be accepted.

- **Please VERIFY that your reporting forms match the preprinted forms.**

Miscellaneous:

- **If this is the first emissions inventory for your permit and your business did not operate in 2008, you must still submit a completed Business Form and a signed Data Certification Form stating that there were no operations at your facility during 2008.**

- In accordance with Maricopa County Air Pollution Control Rule 280 (Fees), the 2008 annual emission fee for Title V sources only is $38.25/ton. **NOTE:** Only Title V sources (those whose air quality permit numbers have a **"V"** prefix) are subject to this annual emissions fee.

I. INTRODUCTION

An annual emissions inventory is a document submitted by a business that: (1) lists all processes emitting reportable air pollutants and (2) provides details about each of those processes. Submitting the emissions inventory report is ***required*** as a condition of your Maricopa County Air Quality Permit. A separate emissions report is required for each business location with its own air quality permit.

Follow these steps to complete your 2008 Maricopa County emissions inventory:

STEP 1: Determine which forms are needed for your business. There are eight different forms available, but not all are required for every type of business. For most permitted sources, the packet you received from us contains the necessary preprinted forms based on your site's most recent emissions inventory.

1. **Business Form**: Contains general contact information about the permitted site. This form is required for all businesses.
2. **Stack Form**: Only required if your business location annually emits over 10 tons of a single pollutant (CO, VOC, NO_x, PM_{10}, or SO_x). A "stack" is defined as a stack, pipe, vent or opening through which a significant percentage of emissions (from one or more processes) are released into the atmosphere. See the "Stack Form Instructions" on page 9 for specific requirements.
3. **Control Device Form**: Required only if there is one or more emission control devices used at the business location.
4. **General Process Form** and
5. **Evaporative Process Form**: } Either or both will be required for all businesses.
6. **Off-Site Recycling/Disposal Form**: Required if you want to claim off-site recycling or disposal.
7. **Emission Factor Calculations**: Required as attachment for each process for which you calculated your own emission factors.
8. **Data Certification Form or Data Certification/Fee Calculation Form**: Only sources with a **Title V** (permit number would start with **"V"**) permit are required to pay a fee for their emissions and need to use the Data Certification/Fee Calculation Form. All other sources use the Data Certification Form.

STEP 2: Complete the applicable forms. Verify all preprinted information, and make corrections where necessary. When making corrections, strike out the preprinted data and write in corrections beside it. Please make all changes readily noticeable. Detailed information on how to complete the most common forms is included in this document. The packet you received also contains information about other resources (workshops, one-on-one assistance, etc.) available to help you in completing the necessary forms.

STEP 3: Make a copy of your completed emissions inventory report. Make sure to KEEP COPIES of all forms submitted and copies of all records and calculations used in completing the forms. Air pollution control regulations require that you keep all documentation for at least FIVE YEARS at the location where pollution is being emitted.

STEP 4: Make sure the Data Certification Form (or Data Certification/Fee Calculation Form for Title V sources) is ***signed*** by a company representative. ***Include your air quality permit number on all correspondence and applicable checks submitted with your report.*** Return the ***original***, signed copy of your annual emission report, with payment for any applicable emission fees to:

MCAQD One Stop Shop
Emissions Inventory Intake
501 N. 44th St. Suite 200
Phoenix AZ 85008-6538

II. REPORTING REQUIREMENTS

POLLUTANTS TO BE REPORTED:
Your emissions inventory must include your business's emissions of the following air pollutants:

CO	=	Carbon monoxide
NO_x	=	Nitrogen oxides
PM_{10}	=	Particulate matter less than 10 microns
SO_x	=	Sulfur oxides
VOC	=	Volatile organic compounds *
HAP&NON	=	Hazardous Air Pollutant (HAP) that is also NOT a volatile organic compound (VOC)**
NH_x	=	Ammonia and ammonium compounds
Pb	=	Lead

* A ***volatile organic compound (VOC)*** is defined as any compound of carbon that participates in atmospheric photochemical reactions. This definition ***excludes***: carbon monoxide, carbon dioxide, acetone, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, as well as certain other organic compounds. (See Maricopa County Air Pollution Control Rule 100, Sections 200.69 and 200.110 for a full definition.)

EPA has re-designated the chemical **t-butyl acetate (CAS Number 540-88-5)** as a VOC for record-keeping requirements and emissions reporting, but not for emission limitations or content requirements. County Rule 100, Section 200.69b states:

"The following compound(s) are VOC for purposes of all recordkeeping, emissions reporting, photochemical dispersion modeling and inventory requirements which apply to VOC and shall be uniquely identified in emission reports, but are not VOC for purposes of VOC emissions limitations or VOC content requirements: t-butyl acetate (540-88-5)."

Therefore, if your facility uses t-butyl acetate, it is necessary to report t-butyl acetate as a separate material on the evaporative process form, <u>not</u> as part of a grouped material (e.g., solvents, thinners, activators, etc.). T-butyl acetate will continue to be identified as a VOC on your emission report and count towards any applicable emission fees.

** ***HAP&NON:*** Usage of certain materials that are: (1) a Hazardous Air Pollutant (HAP) **and** (2) **not** also a VOC (that is, not also an ozone precursor) should also be reported if:
(a) your site is subject to a Federal MACT (Maximum Achievable Control Technology) standard ***<u>or</u>***
(b) your air quality permit contains specific quantitative limits for HAP emissions.

The most common materials categorized as "HAP&NON" include:

- methylene chloride (dichloromethane)
- perchloroethylene
- 111-trichloroethane (111-TCA or methyl chloroform)
- hydrochloric acid
- hydrofluoric acid

NOTE: HAPs that are also considered volatile organic compounds are reported as <u>VOC</u>.

EMISSION CALCULATION METHOD HIERARCHY:

When preparing emission information for your report, the most accurate method for calculating **actual** emissions must be used. The hierarchy listed below outlines the preferred methods for calculating emission estimates (taken from County Rule 280, Section 305.1).

(1) Whenever available, emissions estimates should be calculated from continuous emissions monitors certified under 40 CFR Part 75, Subpart C, or data quality assured pursuant to Appendix F of 40 CFR, Part 60.

(2) When sufficient data obtained using the methods described in paragraph 1 is not available, emissions estimates should be calculated from source performance tests conducted pursuant to Rule 270 in Maricopa County's Air Pollution Control Rules and Regulations.

(3) When sufficient data obtained using the methods described in paragraphs 1 or 2 is not available, emissions estimates should be calculated from material balance using engineering knowledge of the process.

(4) When sufficient data obtained using the methods described in paragraphs 1 through 3 is not available, emissions estimates shall be calculated using emissions factors from EPA Publication No. AP-42 "Compilation of Air Pollutant Emission Factors," Volume I: Stationary Point and Area Sources.

(5) When sufficient data obtained using the methods described in paragraphs 1 through 4 is not available, emissions estimates should be calculated by equivalent methods supported by back-up documentation that will substantiate the chosen method.

III. CONFIDENTIALITY OF DATA SUBMITTED

Information submitted in your annual emissions reports must be made available to the public unless it meets certain criteria of Arizona State Statutes and Maricopa County Rules. Applicable excerpts concerning confidentiality of data are reproduced below.

ARS § 49-487 D. ...the following information shall be available to the public:…

2. The chemical constituents, concentrations and amounts of any emission of any air contaminant. ...

MARICOPA COUNTY AIR POLLUTION CONTROL RULES AND REGULATIONS, Rule 100:

§ **200.107 TRADE SECRETS -** Information to which all of the following apply:

a. A person has taken reasonable measures to protect from disclosure and the person intends to continue to take such measures.

b. The information is not, and has not been, reasonably obtainable without the person's consent by other persons, other than governmental bodies, by use of legitimate means, other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding.

c. No statute, including ARS §49-487, specifically requires disclosure of the information to the public.

d. The person has satisfactorily shown that disclosure of the information is likely to cause substantial harm to the business's competitive position.

§ **402 CONFIDENTIALITY OF INFORMATION:**

402.2 Any records, reports or information obtained from any person under these rules shall be available to the public ... unless a person:

a. Precisely identifies the information in the permit(s), records, or reports which is considered confidential.

b. Provides sufficient supporting information to allow the Control Officer to evaluate whether such information satisfies the requirements related to trade secrets as defined in Section 200.107 of this rule.

For emissions inventory information to be deemed confidential, the following steps must be followed:

- Specific data which you request be held confidential must be identified by marking an "X" in the corresponding gray confidentiality box(es) on the relevant report forms.
- Provide a written explanation which gives factual information satisfactorily describing why releasing this information could cause substantial harm to the business's competitive position.
- Use the gray-shaded boxes on the reporting forms to indicate which data are to be held confidential. Do NOT stamp "Confidential", highlight data, or otherwise mark the page.
  No data can be held confidential without proper justification.

IV. HELPFUL HINTS AND INFORMATION

Be sure to verify all preprinted information on forms. If any information is incorrect or blank, please provide correct information. Making a change on the Business Form will **NOT** transfer the permit ownership or location. You must contact the Department's One Stop Shop at (602) 506-6464 to accomplish this.

WHAT IS A PROCESS? A ***process*** is a business activity at your location that emits one or more of the pollutants listed on page 3, and has only ***one*** material type as input and ***one*** operating schedule. For each applicable process at your business, you must assign a unique Process ID number to differentiate each process.

PROCESSES AND MATERIALS THAT DO ***NOT*** HAVE TO BE REPORTED:

- Welding.
- Acetone usage.
- Fuel use for forklifts or other vehicles. (NOTE: Fuel use in ***non-vehicle*** engines ***is*** reportable.)
- Soil remediation activities. (Note: Other periodic reporting requirements may exist; consult your permit.)
- Storage emissions from fuels or organic chemicals in any tank with a capacity of 250 gallons or less.
- Storage emissions of diesel and Jet A fuel in underground tanks of any size.
- Storage emissions of diesel and Jet A fuel in aboveground tanks, with throughput < 4,000,000 gal/yr.
- Routine pesticide usage, housekeeping cleaners, and routine maintenance painting at your facility.

Please group all similar equipment and materials together before applying the following limitations:

- Internal combustion engines (e.g., emergency generators) or external combustion equipment (e.g., boilers and heaters) that operated less than 100 hrs. and burned less than 200 gals. diesel or gas, or less than 100,000 cubic feet of natural gas.
- Materials with usage of less than 15 gallons or 100 pounds per year.

GROUPING MATERIALS AND/OR EQUIPMENT UNDER ONE PROCESS ID:
You can group together under one process ID:

- All internal combustion engines ***less than 600 hp*** if they burn the same fuel and have similar operating schedules.
- All external combustion equipment (boilers, heaters) with a capacity of ***less than 10,000,000 Btu*** per hour if they burn the same fuel and have similar operating schedules.
- All similar evaporative materials with similar emission factors that have similar operating schedules and process descriptions. For example, group low-VOC red paint, green paint and white paint together as one material: "Paint: Low-VOC." Do ***not*** group dissimilar materials together, such as thinners and paints. Attach documentation (see example, p. 20) showing how the grouped emission factor was determined.
- All underground tanks with the same fuel and same type of vapor recovery system.

ASSIGNING IDENTIFICATION NUMBERS (IDs):
Unique IDs are required for the following report elements: Stacks, Control Devices and Processes. For processes, that means a process ID number may be used only once on each General Process form and for each material reported on the Evaporative Process Forms.

These numbers are usually assigned by the person who prepares the original report. If you are adding a new item to a preprinted report, assign a number not already in use. Once an ID number is assigned, continue using the same number for that item each year. If that item is no longer reportable, mark it with 'DELETE' and return the preprinted form with a brief explanation. Do not use that ID number again.

INDUSTRY-SPECIFIC INSTRUCTIONS: Additional help sheets, detailed examples, and special instructions are available for a number of specific processes or industries listed below. To get copies of any of these documents, please visit our web site at:
http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx
or call (602) 506-6790.

- Bakeries
- Concrete Batch Plants
- Fuel Storage and Handling
- Incinerators and Crematories
- Lg. Aboveground Storage Tanks
- Natural Gas Boilers/Heaters
- Polyester Resin
- Printing Plants
- Roofing Asphalt
- Sand and Gravel Plants
- Using EPA's TANKS 4.09d Program
- Vehicle Refinishing
- Vehicle Travel on Unpaved Roads
- Woodworking

COMMONLY USED CONVERSION FACTORS:

1 gram/liter	=	0.00834 lbs/gal	1 foot	=	0.0001894 mile
1 liter	=	0.2642 gallon (US)	1 square foot	=	0.000022957 acre
1 therm	=	0.0000952 MMCF	1 pound	=	0.0005 ton

NOTE: MM = 1,000,000 Example: MMCF = 1,000,000 cubic feet
M = 1,000 Example: MGAL = 1,000 gallons

ADDITIONAL RESOURCES AND ASSISTANCE:
The Maricopa County Emissions Inventory web site at:
http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx
contains additional reference materials, such as:

- blank copies of most emissions reporting forms.
- an updated list of emission factors for a large number of industrial processes, including SCC codes.
- a list of Tier Codes for industrial processes.
- detailed help sheets for a number of specific industries or processes.

To receive any of the above materials by fax or mail, or for additional information or assistance in how to calculate and report your emissions, please call us at (602) 506-6790.

V. INSTRUCTIONS AND EXAMPLES FOR COMPLETING EMISSIONS REPORTING FORMS

Business Form Instructions

Verify all preprinted information, and make corrections where necessary. When making corrections, strike out the preprinted data and write in corrections beside it. Please make all changes readily noticeable.

NOTE: Indicating a change in ownership or business location on the Business Form will ***not*** serve to transfer the permit ownership or location. You must contact the MCAQD One Stop Shop at (602) 506-6464 to accomplish this.

Data fields:

6 Number of employees: This should be the annual average number of full-time equivalent (FTE) employee positions ***at this business location***.

9 NAICS Code: This 5- or 6-digit North American Industrial Classification System (NAICS) code has been introduced to replace the 4-digit Standard Industrial Classification (SIC) codes. Please list the primary and secondary NAICS codes for your business, if known. (Consult our website, at: http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx, for a link to a full list of NAICS codes.)

10 Preparer of the Inventory (primary contact for technical questions concerning this report): This should be the person who knows the most about the data in the report. If this person has an e-mail address used for business purposes, please provide it.

Stack Form Instructions

A “stack” is defined as a **stationary** stack, pipe, vent or opening through which a significant percentage of emissions (from one or more processes) are released into the atmosphere (with or without a control device).

NOTE: Stack information is required only if your business location annually emits over 10 tons of any one individual pollutant. If so, you must complete a Stack Form for:

- each stack connected to a control device.
- any stack that discharges annually more than 5 tons of combined pollutant emissions (such as a paint booth exhaust).

EXAMPLE Stack Form Information:

1	**2**	**3**	**4**	**5a OR**	**5b**	**6a OR**	**6b & 6c**		**7**
Stack ID	Stack Type Code*	Stack Height**	Exit Gas Temperature	Velocity feet/sec	Flow Rate acfm	Diameter inside inch	Length / Width inside inch		Stack Name/Description. Include lat/long coordinates of stack (in decimal degrees)
1	W	30 ft	90 ^{o}F		20,000	36			paint booth Lat: N33.5276 Long: W112.2626
2	V	14 ft	200 ^{o}F		19,186	40			thermal oxidizer, Bldg. 2 Lat:N33.5259 Long: W112.2611

* Stack Type Codes:
- **V** = Vertical unobstructed
- **D** = Downward unobstructed
- **W** = Obstructed vertical (e.g. weather cap)
- **H** = Horizontal unobstructed
- **G** = Gooseneck

** Stack height is calculated relative to the surrounding terrain. For instance, the stack height of a 10-foot stack on top of a 20-foot tall building is 30 feet.

Data fields:

1 Stack ID: (See “Assigning Identification Numbers” on page 6.) A number (up to three digits, numeric only) which identifies a specific stack. It is suggested you start with 1, then 2, etc.

4 Exit Gas Temperature: Should represent average operating conditions, in degrees Fahrenheit. ***DO NOT*** report “ambient”.

5a Exit Gas Velocity: ***OR*** 5b Gas Flow Rate:
Provide ***EITHER*** the exit velocity (in feet per second) ***OR*** the flow rate of gas (in actual cubic feet per minute) exiting the stack during normal operations. Preprinted information provides both.

6a Inside Stack Diameter: For round stacks, provide Inside Stack ***Diameter*** in inches.
OR
6b & 6c Inside Stack Length and Width: For square or rectangular stacks, provide inside ***Length and inside Width*** in inches.

7 Stack Name/Description and Lat/Long Coordinates: Provide a brief text description of the stack along with the latitude and longitude coordinates of the stack (in decimal degrees).

Control Device Form Instructions

EXAMPLE Control Device Form Information

1	2	3	4	5	6
Control ID	Installation/ Reconstruction* Date	Size or Rated Capacity**	Control Type Code	Control Device Name/Description	Stack ID
1	*05/09/98*	*25,000.0* cfm	*021*	*Thermal oxidizer*	*2*
4	*03/10/97*	cfm	*153*	*Watering with water trucks*	

Data fields:

1 Control ID: (See "Assigning Identification Numbers" on page 6.) A unique number (up to three digits) that you assign to identify a specific control device.

2 Installation/Reconstruction Date: The completion date (given in *mm/dd/yy* format) of installation or the most recent reconstruction of the identified control device. This is not a date on which routine repair or maintenance was done. "Reconstruction" means any component of the control device was replaced and the cost (fixed capital) of the new component(s) was more than half of what it would have cost to purchase or construct a new control device.

3 Size or Rated Capacity: Report the air or water flow rate in ***cubic feet per minute***. Some devices (e.g., water trucks for dust control) will not include a value in this field.

4 Control Type Code: A 3-digit code designating the type of control device. A complete list of all EPA control device codes can be found on the Web at: http://www.maricopa.gov/aq/divisions/planning_analysis/emissions inventory/Default.aspx or call (602) 506-6790 for assistance.

6 Stack ID: Not all businesses require a Stack ID. This is required if the Stack Form is used for your site (see page 9) ***and*** the control device is vented through that identified stack. This is the ID number shown in column 1 of the Stack Form. The Stack ID can be entered on this form after the Stack Form has been filled out.

General Process Form Instructions

The General Process Form is used to record data on all emissions-producing processes <u>except</u> evaporative processes. A "***general process***" is normally characterized by the burning or handling of a material. One form reports all the pollutants for one process. For example, several pollutants are produced by burning fuel, and PM_{10} is emitted by processing rock products, processing materials such as wood or cotton, and driving on unpaved areas.

Data fields: (See sample forms on pages 13 and 14.)

1 <u>Process ID</u>: A number (up to three digits) that is preprinted or you assign. (See "<u>Assigning Identification Numbers</u>" on page 6.) This Process ID number can <u>not</u> be used for any other process at this location.

2 <u>Process Type/Description</u>: Brief details on the type of activity that is occurring.

3 <u>Stack ID(s)</u>: The stack ID number(s) shown in column 1 of the Stack Form that identify the stack(s) which vent pollution created by this process. Not all businesses are required to report stacks. This is only required if the Stack Form is required for your site (see page 9) ***and*** the process has a stack.

4 <u>Process Tier Code</u> and
5 <u>SCC Code</u>: If these codes are not preprinted on your form, please consult the section "Other Resources" on our web site, or call (602) 506-6790.

6 <u>Seasonal Throughput Percent</u>: Enter the percent of total annual operating time that occurred per season, rounded to the nearest percent. For example, "Dec-Feb <u>30%</u> " means 30% of total annual activity occurred in January, February and December 2008. The total for all four seasons must equal 100%.

7 <u>Normal Operating Schedule</u> and
8 <u>Typical Hours of Operation</u>: These reflect the normal daily, weekly, and annual operating parameters of ***this process*** during 2008.

9 <u>Emissions Based on</u>: Provide the ***name*** of the material used, fuel used, product produced, or whatever was measured for the purpose of calculating emissions, such as "natural gas", "hours of operation," "vehicle miles traveled," or "acres."

10 <u>Used, Produced or Existing</u>: Indicate whether calculated emissions are based on a material type or fuel *used* (an input, such as "paint" or "natural gas"), or an *output* (such as "sawdust produced" or "finished product"). Use "Existing" if the parameter reported on line 9 is not directly used or produced in the process (such as "vehicle miles traveled" or "acres").

11 <u>Annual Amount</u>: The annual amount (a number) of material that was used, fuel combusted, product produced, hours of operation, vehicle miles traveled, or acres.

12 <u>Fuel Sulfur Content (in percent)</u>: For processes that involve the combustion of oil or diesel fuels, report the sulfur content of the fuel as a decimal value. Example: <u>0.05</u> % (= 500 ppm)

13 <u>Unit of Measure</u>: Units of the material used, fuel used or product produced shown on line 9. For example: gallons, pounds, tons, therms, acres, vehicle miles traveled, units produced.

14 <u>Unit Conversion Factor</u>: You must provide this if you use an emission factor with an emission factor unit (see item 17 below) that is ***not*** the same as the unit of measure (from line 13). This is the standard number you would multiply your amount (line 11) by to convert it to the units of the emission factor. See page 7 for a list of commonly used conversion factors.

15 Pollutant: See page 3 for a list of pollutants that need to be reported.

16 Emission Factor (EF): The number to be multiplied by the annual amount (line 11) to determine how much of the pollutant was emitted. If you calculate your own emission factor or change the preprinted emission factor, you must provide details of your calculations in an attachment.

17 Emission Factor (EF) Units: Enter the appropriate Emission Factor Units in pounds (lb) per unit; e.g., lb/ton, lb/MMCF, lb/gal.

18 Controlled Emission Factor (EF)? YES or NO: Indicate "YES" if: 1) you have your own emission factor from testing **and** included the control device efficiency within the factor, or 2) the emission factor used is clearly identified as a controlled emission factor. A "YES" response requires the use of Formula A (see #25 below). Indicate "NO" if: 1) there is no emission control device, or 2) the emission factor represents emission rates **before** controls. A "NO" response requires the use of Formula B (see #25 below).

19 Calculation Method: Enter the number code (listed at the bottom of the General Process Form) which best describes the method you used to obtain this emission factor. Code 5, "AP-42/FIRE Method or Emission Factor" means that the factor comes from EPA documents or software. ***NOTE:*** If you have continuous emissions monitors (CEM) data or conducted a source test that was required and approved by the County for a specific process or piece of equipment, you ***must*** use the emission data from the CEM or the test results. Report "1" in this column for CEM data or "4" for performance test data.

20 through 24: Leave blank if there is no control device.

20 Capture % Efficiency: The percent of the pollutant that is captured and sent to the primary control device in this process. Be sure to list capture efficiency separately for ***each*** pollutant affected.

21 Primary Control Device ID: If this pollutant is being controlled in this process, enter the Control Device ID number which represents the first control device affecting the pollutant.

22 Secondary Control Device ID: If this pollutant is being controlled sequentially by 2 devices, enter the Control Device ID number which represents the second control device; otherwise leave this field blank.

23 Control Device(s) % Efficiency: Enter the total control efficiency of the control device(s). Be sure to list control device efficiency separately for ***each*** pollutant affected. If you report control device efficiency, you must ***also*** show capture efficiency in column 20.

24 Efficiency Reference Code: Enter the code (1 through 6) that best describes how you determined the ***control device efficiency***. A list of possible codes is included at the bottom of the form.

25 Estimated Actual Emissions (in pounds/year): You may round the calculated emissions values to the nearest pound. Calculate as follows:

A. *Emissions with no controls* or *controls are reflected in the emission factor:*
Column 25 = line 11 × line 14 × column 16

B. *Emissions after control:*
Column 25 = line 11 × line 14 × column 16 × (1 – [column 20 × column 23])

Use the decimal equivalent for columns 20 and 23. Example: 96.123% = 0.96123

General Process Form **2008** **EXAMPLE: Internal Combustion** Permit number(s) V99999

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process ID 80

2- Process Type/Description: 3 ENGINES FOR CRUSHING (EACH LESS THAN 600 HP)

3- Stack ID(s) *(only if required on Stack Form)* ______ ______ ______ ______ ______

4- Process TIER Code: 020599 FUEL COMB. INDUSTRIAL: INTERNAL COMBUSTION

5- SCC Code 20200102 *(8 digit number)* IND:DIESEL-RECIPROCATING

6- Seasonal Throughput Percent: Dec-Feb 25 % Mar-May 25 % Jun-Aug 25 % Sep-Nov 25 %

7- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

8- Typical Hours of Operation: *(military time)* Start 0700 End 1530

9- Emissions based on *(name of material or other parameter, e.g. "rock", "diesel", "vehicle miles traveled")* DIESEL

10- ☒ Used (input) or ☐ Produced (output) or ☐ Existing (e.g. VMT, acres)

11- Annual Amount: *(a number)* 16,250 12- Fuel Sulfur Content (in percent) 0.05 %

13- Unit of Measure: *(for example: tons, gallons, million cu ft, acres, units produced, etc.)* GALLONS

14- Unit Conversion Factor *(if needed to convert Unit of Measure to correlate with emission factor units)* 0.001

	Emission Factor (EF) Information					Control Device Information					
	15	16	17	18	19	20	21	22	23	24	25
Pollutant	Emission Factor (EF) (number)		Emission Factor Unit (lb per)	Controlled EF? Yes or No	Calculation Method Code*	Capture % Efficiency	Primary Control Device ID	Secondary Control Device ID	Control Device(s) % Efficiency	Efficiency Reference Code**	Estimated Actual Emissions
CO	130		M GALS	N	5						2,113 lbs
NOx	604		M GALS	N	5						9,815 lbs
PM-10	42.5		M GALS	N	5						691 lbs
SOx	39.7		M GALS	N	5						645 lbs
VOC	49.3		M GALS	N	5						801 lbs

*** Calculation Method Codes:**
- **1** = Continuous Emissions Monitoring Measurements
- **2** = Best Guess / Engineering Judgment
- **3** = Material Balance
- **4** = Source Test Measurements (Stack Test)
- **5** = AP-42 / FIRE Method or Emission Factor
- **6** = State or Local Agency Emission Factor
- **7** = Manufacturer Specifications
- **8** = Site-Specific Emission Factor
- **9** = Vendor Emission Factor
- **10** = Trade Group Emission Factor

**** Control Efficiency Reference Codes:**
- **1** = Tested efficiency / EPA reference method
- **2** = Tested efficiency / other source test method
- **3** = Design value from manufacturer
- **4** = Best guess / engineering estimate
- **5** = Calculated based on material balance
- **6** = Estimated, based on a published value

General Process Form 2008

EXAMPLE: Unpaved Road Travel

Permit number(s) V99999

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process ID 28

2- Process Type/Description: UNPAVED ROAD TRAVEL: HEAVY-DUTY TRUCKS @ 15 MPH

3- Stack ID(s) *(only if required on Stack Form)* ______ ______ ______ ______ ______

4- Process TIER Code: 140799 MISCELLANEOUS: FUGITIVE DUST

5- SCC Code 30502504 *(8 digit number)* SAND/GRAVEL: HAULING

6- Seasonal Throughput Percent: Dec-Feb 25 % Mar-May 25 % Jun-Aug 25 % Sep-Nov 25 %

7- Normal Operating Schedule: Hours/Day 8 Days/Week 5 Hours/Year 2080 Weeks/Year 52

8- Typical Hours of Operation: *(military time)* Start 0700 End 1530

9- Emissions based on *(name of material or other parameter, e.g. "rock", "diesel", "vehicle miles traveled")* VEHICLE MILES TRAVELED (VMT)

10- ☐ Used (input) or ☐ Produced (output) or ☒ Existing (e.g. VMT, acres)

11- Annual Amount: *(a number)* 7,500 12- Fuel Sulfur Content (in percent) ______ %

13- Unit of Measure: *(for example: tons, gallons, million cu ft, acres, units produced, etc.)* VMT

14- Unit Conversion Factor *(if needed to convert Unit of Measure to correlate with emission factor units)* ______

	Emission Factor (EF) Information				Control Device Information					
15	16	17	18	19	20	21	22	23	24	25
Pollutant	Emission Factor (EF) (number)	Emission Factor Unit (lb per)	Controlled EF? Yes or No	Calculation Method Code*	Capture % Efficiency	Primary Control Device ID	Secondary Control Device ID	Control Device(s) % Efficiency	Efficiency Reference Code**	Estimated Actual Emissions
PM-10	3.2	VMT	N	6	100	4		70	6	7200 lbs
										lbs
										lbs
										lbs
										lbs
										lbs

NOTE: Emissions in col. 25 are calculated as follows: (line 11 × col. 16) × (1 – [col. 20 × col. 23])

*** Calculation Method Codes:**
- **1** = Continuous Emissions Monitoring Measurements
- **2** = Best Guess / Engineering Judgment
- **3** = Material Balance
- **4** = Source Test Measurements (Stack Test)
- **5** = AP-42 / FIRE Method or Emission Factor
- **6** = State or Local Agency Emission Factor
- **7** = Manufacturer Specifications
- **8** = Site-Specific Emission Factor
- **9** = Vendor Emission Factor
- **10** = Trade Group Emission Factor

**** Control Efficiency Reference Codes**
- **1** = Tested efficiency / EPA reference method
- **2** = Tested efficiency / other source test method
- **3** = Design value from manufacturer
- **4** = Best guess / engineering estimate
- **5** = Calculated based on material balance
- **6** = Estimated, based on a published value

Evaporative Process Form Instructions

The Evaporative Process Form is used to report all emissions produced by evaporation. Examples include: cleaning with solvents, painting and other coatings, printing, using resin, evaporation of fuels from storage tanks, ammonia use, etc. All other processes should be shown on the General Process Form.

One Evaporative Process Form may be used to report numerous materials, with each material given a separate process ID number, as long as the information on lines 1–5 apply to all items on that form. Use a separate form for each group of materials that has a different Process Type/Description (shown on line 1), different Tier Code (line 2) or different operating schedule (lines 3, 4, or 5).

Data fields: (See sample forms on pages 17 and 18.)

1 Process Type/Description: Brief details of the activity in which the listed materials were used.

2 Process Tier Code: If this 6-digit code is not preprinted on your form, please refer to the Tier Code list at: http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx or call (602) 506-6790.

3 Seasonal Throughput Percent: Enter the percent of total annual operating time that occurred per season (rounded to the nearest percent). For example, "Dec-Feb 30% " means 30% of the total annual activity occurred during January, February and December 2008. The total for all four seasons must equal 100%.

4 Normal Operating Schedule and
5 Typical Hours of Operation: These represent the usual number of hours, time of day and weeks per year when ***this process*** occurred during the calendar year.

6 Process ID: A number (up to three digits) that represents this specific material (process). Each process on one form must have the same tier code and operating schedule as that shown in the top portion of the form. This Process ID number can ***not*** be used for any other process at this business location. See page 6 of these instructions for more explanation of ID numbers and for exclusions and guidance on grouping materials.

7 Stack ID(s): The stack ID number(s) shown in column 1 of the Stack Form that identify the stack(s) which vent pollution created by this process. Not all businesses are required to report stacks. This is only required if the Stack Form is required for your site (see page 9) ***and*** the process has a stack.

8 Material Type: Provide the name of the material used in this process. Give the chemical name for pure chemicals or a name that reflects its use (paint, ink, etc.), rather than just a brand name or code number. Examples of materials include: paint, thinner, degreasing solvent (plus its common name), ink, fountain solution, ammonia, alcohol, ETO (ethylene oxide), gasoline (in a storage tank).

9 Annual Material Usage/Input: Amount of this material used during the year. In most cases, the amount purchased is suitable. Write in "lbs" or "gal" (pounds or gallons).

10 Pollutant: The only pollutants reported on this form are VOC, HAP&NON and NH_X (see definitions on page 3). When one process (or material) has more than one of these pollutants, list each pollutant on a separate line, using the same process ID number.

Evaporative Process Form (continued)

11 Emission Factor (EF): An emission factor is a number used to calculate the pounds of pollutant emitted based on the quantity of material used in a process. Emission factors can be obtained from your supplier (usually provided on a Material Safety Data Sheet or environmental data sheet), and must correspond with the material units reported in column 9. If the material unit is "gal," then the emission factor must be in pounds of pollutant per gallon. If the material unit is "lb," then the emission factor must be in pounds of pollutant per pound of material.

Verify (and correct, where necessary) all preprinted emission factors, as the composition of materials used may have changed since your last report. A "lb/gal" emission factor is almost always less than 8 and never greater than 14. A "lb/lb" emission factor is never larger than 1.0.

12 <u>Pounds of pollutant sent off-site</u>: Required only if you wish to take credit for reduced emissions because waste of this material is sent off-site for recycling or disposal. Only waste generated during the report year may be claimed. The Off-Site Recycling/Disposal Form ***must*** be completed if you wish to claim a credit. The number of pounds reported in column 12 ***must*** equal the number of pounds reported on the Off-Site Recycling/Disposal Form(s) for the same Process ID number.

13 and 14: Leave these fields blank if there is no control device present.

13 <u>Capture % Efficiency</u>: The percent of the pollutant from this process that is captured and sent to the control device.

14 <u>Control ID</u>: If this pollutant is being controlled in this process, enter the Control Device ID number from column 1 of the Control Device Form.

<u>Control % Efficiency</u>: Enter the percent of this pollutant that is controlled by this control device.

<u>Code</u>: Select the Control Efficiency Reference Code from the list at the bottom of the form.

15 <u>Estimated Emissions (lbs/yr)</u>: Estimated pounds of the pollutant emitted during the year, after off-site recycling/disposal and controls if applicable. **Credit will not be given for off-site recycling/disposal unless it is shown on the Off-Site Recycling/Disposal Form.** Round to the nearest pound. If the answer is 0, give a decimal answer to the first significant digit. Column 15 is calculated as follows:

<u>Emissions without off-site recycling/disposal or controls</u>:
Column 15 = column 9 × column 11

<u>Emissions with off-site recycling/disposal</u>:
Column 15 = (column 9 × column 11) – column 12

*<u>Emissions with off-site recycling/disposal **and** controls</u>:*
Column 15 = ([column 9 × column 11] – column 12) × (1 – [column 13 × column 14])

Use the decimal equivalent for columns 13 and 14. Example: 96.123% = 0.96123

EXAMPLE: Coating and Painting

Evaporative Process Form* 2008** Permit number(s) ***V99999

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process Type/Description: ***Coating metal parts***

2- Process TIER Code: ***080415*** **SOLVENT USE: SURFACE COATING - MISC METAL PARTS**

3- Seasonal Throughput Percent: Dec-Feb ***25*** % Mar-May ***25*** % Jun-Aug ***25*** % Sep-Nov ***25*** %

4- Normal Operating Schedule: Hours/Day ***8*** Days/Week ***5*** Hours/Year ***2080*** Weeks/Year ***52***

5- Typical Hours of Operation *(military time)* Start ***0800*** End ***1700***

6	7	8	9		10	11		12	13	14			15
Process ID	Stack ID(s)	Material Type	Annual Usage Input	lb or gal	VOC, HAP&NON or NHx	Emission Factor	EF Units (lbs per)	Pounds of pollutant* sent off site	Capture Efficiency %	Control ID	Control Efficiency %	Control Efficiency Code**	Estimated Emissions (lbs/yr)
800	***1***	***Lacquer 6455-06***	***95***	***gl***	***VOC***	***4.7***	***gal***		%		%		***447***
801	***1***	***lacq thinner***	***120***	***gl***	***VOC***	***7.1***	***gal***		%		%		***852***
802	***1***	***Paint red 4039-03***	***940***	***gl***	***VOC***	***4.2***	***gal***		%		%		***3,948***
803	***1***	***paint thinner***	***707***	***gl***	***VOC***	***7.0***	***gal***		%		%		***4,949***
804	***1***	***powder paint 8730-11***	***20,200***	***lb***	***VOC***	***0.001***	***lb***		%		%		***20***
									%		%		

Note: Do NOT change preprinted Process ID numbers. See page 6 of these instructions for information on how to delete materials that are no longer used, or to assign Process ID numbers for new materials.

* If you have off-site recycling/disposal of any of the materials listed above, you must complete an Off-site Recycling/Disposal Form to receive credit for reduced emissions.

NOTE: Emissions in col. 15 are calculated as follows: **([col. 9 × col. 11] – col. 12) × (1 – [col. 13 × col. 14])**

**** Control Efficiency Reference Codes**

1 = Tested efficiency / EPA reference method
2 = Tested efficiency / other source test method
3 = Design value from manufacturer
4 = Best guess / engineering estimate
5 = Calculated based on material balance
6 = Estimated, based on a published value.

EXAMPLE: Cleaning solvent (with recycling)

Evaporative Process Form 2008

Permit number(s) ***V99999***

Place an X in any gray cell to mark data requested to be held confidential. See page 5 for requirements for information to be deemed confidential.

1- Process Type/Description: CLEANING METAL PARTS

2- Process TIER Code: ***080103*** SOLVENT USE: DEGREASING - COLD CLEANING

3- Seasonal Throughput Percent: Dec-Feb ***25*** % Mar-May ***25*** % Jun-Aug ***25*** % Sep-Nov ***25*** %

4- Normal Operating Schedule: Hours/Day ***8*** Days/Week ***5*** Hours/Year ***2080*** Weeks/Year ***52***

5- Typical Hours of Operation *(military time)* Start ***1300*** End ***1700***

6	7	8		9			10	11			12	13	14			15
Process ID	Stack ID(s)	Material Type		Annual Usage Input		lb or gal	VOC, HAP&NON or NHx	Emission Factor		EF Units (lbs per)	Pounds of pollutant* sent off site	Capture Efficiency %	Control ID	Control Efficiency %	Control Efficiency Code**	Estimated Emissions (lbs/yr)
3	***2***	***SANITIZER***		***716***		***lb***	***VOC***	***1.0***		***lb***		***95*** %	***1***	***80*** %	***3***	***172***
6		***GUN CLEANER***		***180***		***gl***	***VOC***	***7.2***		***gl***	***569***	%		%		***727***
7		***XYZ STRIPPER***		***1300***		***gl***	***VOC***	***3.3***		***gl***	***1,884***	%		%		***2,406***
8		***CLEANING SOLVENTS***		***358***		***gl***	***VOC***	***6.4***		***gl***	***1,006***	%		%		***1,285***
9		***MEGASOLVE***		***2258***		***gl***	***VOC***	***6.8***		***gl***	***6,741***	%		%		***8,613***
												%		%		

Note: Do NOT change preprinted Process ID numbers. See page 6 of these instructions for information on how to delete materials that are no longer used, or to assign Process ID numbers for new materials.

* If you have off-site recycling/disposal of any of the materials listed above, you must complete an Off-site Recycling/Disposal Form to receive credit for reduced emissions.

NOTE: ***This example shows the case where 2,400 of the original 4,096 gallons of materials #6 through 9 were captured for off-site recycling, and the pollutant content of the waste material was estimated to be 75% of the original. The pounds of pollutant sent off-site shown in column 12 is calculated on the example Off-Site Recycling/Disposal Form on the next page.***

EXAMPLE

Off-Site Recycling/Disposal Form 2008

Permit number(s) ***V99999***

NOTE: If you need blank copies of this form, call the Emissions Inventory Unit at (602) 506-6790 or consult our web page at http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx

Provide one off-site recycling/disposal form for each waste stream at your business location. A waste stream is the waste from one or more processes mixed together to make one waste product before it is taken off site for recycling, disposal or combustion.

1) Assign a unique two-digit ID number to identify the waste stream that will be described below. ***01***
(Start with ID# 01 for first waste stream. Make copies of a blank Off-Site Recycling/Disposal form and use 02 for second, etc.)

Check one

☐ pounds
☒ gallons

2) What was the quantity of this waste stream in 2008? 2,400
Indicate whether this quantity is reported in pounds or gallons. Keep waste disposal company manifests as proof that this amount of waste was taken off-site.

3) What was the **average** pollutant content of the waste stream? NOTE: Report in the same units (pounds or gallons) as used in line 2.

VOC ***4.25*** lbs/unit HAP&NON ________ lbs/ unit NHx ________ lbs/ unit

NOTE: Waste normally has less pollutant content than the new product. Some of the pollutant evaporates during the use of the product, and there is usually dirt, water or other contaminants in the waste stream. The estimated pollutant content of the waste is usually between 50% and 95% of the new product. This example estimates an average VOC content (on line 3) to be 75% of the original VOC content of 5.67 lbs/gal., to account for evaporation and contaminants. See page 20 to calculate a weighted average.

4) Calculate the **total** annual pollutant content of the waste in this waste stream.
(volume of waste, from Line 2) × (pollutant content, from Line 3) = Total pollutants in waste stream, in lbs/yr.

VOC ***10,200*** lbs/yr HAP&NON ________ lbs/yr NHx ________ lbs/yr

5) List the process ID numbers of the processes contributing to this waste stream. Also estimate the pounds of pollutant that each process contributed to this waste stream.

NOTE: In this example, the amount each process material contributed to total pollutants in the waste stream (Line 4) is based on the percentage, by weight, of each material that contributed to the waste stream (e.g., Process ID #6 contributed 5.6%, therefore 5.6% × 10,200 lbs/yr = 569 lbs. See example on page 20).

NOTE: Column totals in the table below must equal the total for each pollutant type reported on line 4. The quantities you report below for each pollutant and process must also be reported in column 12 on the Evaporative Process Form.

Process ID	Annual VOC (lbs)	Annual HAP&NON (lbs)	Annual NHx (lbs)
6 Contributed about	***569*** lbs	lbs	lbs
7 Contributed about	***1,884*** lbs	lbs	lbs
8 Contributed about	***1,006*** lbs	lbs	lbs
9 Contributed about	***6,741*** lbs	lbs	lbs

EXAMPLE: Documentation of Emission Factor Calculations

Identify the process ID number(s) and pollutant(s). Show calculations made to obtain the emission factors used for the process(es). Include references to data sources used, including the document name, date published, page numbers, etc.

Emission Factor Calculation

Process ID ***201*** Permit number ***V99999***

Emission factors derived from source test performed 12/2/00 by XYZ Engineering Company (copy of summary tables also attached).

Outlet (after controls):

CO = 0.43 lb/hr × 1 hr/60 min × 1 min/77.9 cu. ft × 1,000,000 cu. ft/MMCF
= 92.0 lb/MMCF

NOx = 0.09 lb/hr × 1 hr/60 min × 1 min/77.9 cu. ft × 1,000,000 cu. ft/MMCF
= 19.3 lb/MMCF

Weighted average sample calculation

NOTE: The example below shows how the weighted average of the materials going into the waste stream is calculated. A weighted-average emission factor has been calculated by listing usage amounts and emission factors for each material, summing each column, and then dividing the total emissions by the total gallons used.

In this example: 23,231 lbs ÷ 4,096 gal = 5.67 lb/gal average VOC content. This emission factor is then used to calculate the average pollutant content in the Off-site Recycling / Disposal Form example.

This process can also be used to find the weighted average emission factor for similar materials if you are reporting them together as a single line item on the Evaporative Process form. Refer to the explanation of "grouping" on page 6.

Process ID #	Material Type	2008 Usage	Units	VOC (lbs/unit)	VOC Emissions (= Usage × VOC content)	Percent contributed to waste stream
6	*gun cleaner*	*180*	*gal*	*7.2*	*1,296 lbs.*	*5.6 %*
7	*xyz stripper*	*1,300*	*gal*	*3.3*	*4,290 lbs.*	*18.5 %*
8	*cleaning solvent*	*358*	*gal*	*6.4*	*2,291 lbs.*	*9.9 %*
9	*MEGASOLVE*	*2,258*	*gal*	*6.8*	*15,354 lbs.*	*66.1 %*
	Totals:	***4,096***	***gal***		***23,231 lbs.***	*100.0 %*

Average VOC content:	***23,231 lbs. / 4,096 gals***	***=***	***5.67 lb/gal***

EXAMPLE (for all sources except Title V sources)

Data Certification Form* 2008** Permit number ***999999

For EACH pollutant listed, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, “Totals from Process Forms.” Report any emissions from accidental releases in column 2. Add the figures in each row across, and enter the result in column 3, “Total Emissions”.

NOTE: “Accidental Releases” reported in column 2 should include all excess emissions reported to the Department under Rule 140, Section 500.

Summary of 2008 Annual Emissions:	**(1) Totals from Process Forms**	**(2) + Accidental Releases**	**(3) = TOTAL 2008 Emissions**
CO	***2,113***	***0***	***2,113***
NH_x	***0***	***0***	***0***
Lead	***0***	***0***	***0***
HAP&NON	***0***	***0***	***0***
VOC	***24,220***	***0***	***24,220***
NO_x	***9,815***	***0***	***9,815***
SO_x	***645***	***0***	***645***
PM_{10}	***7,891***	***0***	***7,891***

NOTE: Review specific requirements for data confidentiality on page 5. We cannot hold any data confidential without the required documentation.

TO COMPLETE YOUR EMISSIONS INVENTORY REPORT:

- Complete the Confidentiality Statement below.
- Sign and date this form below where indicated.
- Send the **original** copy of your completed forms to: Maricopa County Air Quality Department, One Stop Shop, Emissions Inventory Intake, 501 N. 44th Street, Suite 200, Phoenix, AZ 85008-6538. Keep a copy of all forms for your records.

CONFIDENTIALITY STATEMENT:

This annual emissions report contains requests to keep some data confidential. ☐ YES ☒ NO

If you check “YES”, you must submit documentation and meet certain requirements before your data can be deemed confidential. See enclosed instructions for further details.

NOTE: The Data Certification form must be signed by a responsible company official.

CERTIFICATION STATEMENT:

I declare under penalty of perjury that the data (e.g. inputs, emission factors, controls, and annual emissions) presented herein represents the best available information and is true, accurate and complete to the best of my knowledge.

Signature of owner/business officer | Date of signature | Telephone number

Type or print full name of owner/business officer | Type or print full title

How to calculate an emission fee (for Title V sources only):

1. For each pollutant listed on the "Data Certification/Fee Calculation" form, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, "Totals from Process Forms."

NOTE: While most processes that generate PM_{10} should be reported on line 5 of the Data Certification/Fee Calculation form, "[f]ugitive emissions of PM_{10} from activities other than crushing, belt transfers, screening, or stacking" (County Rule 280, § 305.2d) are NOT subject to annual emission fees. The most common occurrences of these PM_{10}-producing activities that are NON-billable are listed below:

SCC codes and description of PM_{10}-producing processes that are NOT subject to emission fees

SCC	Major Category	Subcategory	Facility / Process Type	Process Description
30200814	Industrial Processes	Food and Agriculture	Feed Manufacture	Storage
30400737	Industrial Processes	Secondary Metal Production	Steel Foundries	Raw Material Silo
30500120	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Storage Bins: Ferric Chloride
30500121	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Storage Bins: Mineral Stabilizer
30500134	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Blown Saturant Storage
30500135	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Blown Coating Storage
30500141	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Granules Storage
30500143	Industrial Processes	Mineral Products	Asphalt Roofing Manufacture	Mineral Dust Storage
30500203	Industrial Processes	Mineral Products	Asphalt Concrete	Storage Piles
30500212	Industrial Processes	Mineral Products	Asphalt Concrete	Heated Asphalt Storage Tanks
30500213	Industrial Processes	Mineral Products	Asphalt Concrete	Storage Silo
30500290	Industrial Processes	Mineral Products	Asphalt Concrete	Haul Roads: General
30500303	Industrial Processes	Mineral Products	Brick Manufacture	Storage of Raw Materials
30500608	Industrial Processes	Mineral Products	Cement Manufacturing (Dry Process)	Raw Material Piles
30500708	Industrial Processes	Mineral Products	Cement Manufacturing (Wet Process)	Raw Material Piles
30501710	Industrial Processes	Mineral Products	Mineral Wool	Storage of Oils and Binders
30502007	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Open Storage
30502011	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Hauling
30502504	Industrial Processes	Mineral Products	Construction Sand and Gravel	Hauling
30502507	Industrial Processes	Mineral Products	Construction Sand and Gravel	Storage Piles
30502760	Industrial Processes	Mineral Products	Industrial Sand and Gravel	Sand Handling, Transfer, & Storage
30531090	Industrial Processes	Mineral Products	Coal Mining, Cleaning, Material Handling	Haul Roads: General
30532007	Industrial Processes	Mineral Products	Stone Quarrying - Processing	Open Storage
30704002	Industrial Processes	Pulp and Paper & Wood Pdts.	Bulk Handling and Storage - Wood/Bark	Stockpiles
31100199	Industrial Processes	Building Construction	Construction: Building Contractors	Other Not Classified
31100299	Industrial Processes	Building Construction	Demolitions/Special Trade Contracts	Other Construction/Demolition
50100401	Waste Disposal	Solid Waste Disposal	Landfill Dump	Unpaved Road Traffic
50100402	Waste Disposal	Solid Waste Disposal	Landfill Dump	Fugitive Emissions
50100403	Waste Disposal	Solid Waste Disposal	Landfill Dump	Area Method
50100404	Waste Disposal	Solid Waste Disposal	Landfill Dump	Trench Method
50100405	Waste Disposal	Solid Waste Disposal	Landfill Dump	Ramp Method

2. Report any accidental releases in column 2. Add columns 1 and 2 together for each pollutant, and enter the sum in column 3. Sum lines 1 through 5 together, and enter the total on line 6.

3. Divide your facility's total billable emissions (on line 6) by 2000 to convert pounds into tons. **Round to the nearest ton.** Enter this value on line 7. Multiply this number by **$38.25**, and enter the result on line 8. This is your 2008 emission fee.

EXAMPLE (for Title V sources only)

Data Certification/Fee Calculation Form **2008** Permit number V99999

For EACH pollutant listed, total up all emissions recorded on your General Process and Evaporative Process Forms. Enter these numbers in column 1, "Totals from Process Forms." Report any emissions from accidental releases in column 2.
Add the figures in each row across, and enter the result in column 3, "Total Emissions".
Carefully follow the instructions on lines 6 through 8 to calculate any emission fee owed.

> ***NOTE: "Accidental Releases" reported in column 2 should include all excess emissions reported to the Department under Rule 140, Section 500.***

	Summary of 2008 Annual Emissions:	**(1) Totals from Process Forms**	**(2) + Accidental Releases**	**(3) = TOTAL 2008 Emissions**
	CO	2,113	0	2,113
	NH_x	0	0	0
	Lead	0	0	0
	PM_{10} (non-billable; see page 22)	7,200	0	7,200
	Emissions fees are based on your emissions of the following pollutants ONLY:			
1	HAP&NON	0	0	0
2	VOC	24,220	0	24,220
3	NO_x	9,815	0	9,815
4	SO_x	645	0	645
5	PM_{10} (billable; see page 22)	691	0	691
6	**Add "TOTAL" column from lines 1 through 5 ONLY:**			35,371 lbs.
7	Divide the total on line 6 by 2000 (pounds per ton) to get tons, and round the number to the nearest ton. (Drop any decimal of .499 or less. Increase to the next whole number any decimal of .500 or more.) Enter the resulting WHOLE NUMBER here.			18 TONS
8	Multiply line 7 (a WHOLE number) by **$ 38.25**. This is your **2008 ANNUAL EMISSION FEE**.			$ 688.50

> ***NOTE: Review specific requirements for data confidentiality on page 5. We cannot hold any data confidential without the required documentation.***

TO COMPLETE YOUR EMISSIONS INVENTORY REPORT:

- Include a check (made payable to Maricopa County Air Quality Department) for the amount calculated on line 8 above.
- Complete the Confidentiality Statement below.
- Sign and date this form below where indicated.
- Send the **original** copy of your completed forms, along with any emission fee due to: Maricopa County Air Quality Department, One Stop Shop, Emissions Inventory Intake, 501 N. 44th Street, Suite 200, Phoenix, AZ 85008-6538. Keep a copy of all forms for your records.

CONFIDENTIALITY STATEMENT:

This annual emissions report contains requests to keep some data confidential. ☐ YES ☒ NO
If you check "YES", you must submit documentation and meet certain requirements before your data can be deemed confidential. See enclosed instructions for further details.

> ***NOTE: The Data Certification form must be signed by a responsible company official.***

CERTIFICATION STATEMENT:

I declare under penalty of perjury that the data (e.g. inputs, emission factors, controls, and annual emissions) presented herein represents the best available information and is true, accurate and complete to the best of my knowledge.

Signature of owner/business officer Date of signature Telephone number

Type or print full name of owner/business officer Type or print full title

Appendix 2. Calculating Rule Effectiveness (RE) Studies for Controlled Title V and Non-Title V Point Source Processes

A2.1 Introduction

Rule effectiveness (RE) studies are designed to assess the success of regulatory rules at controlling their targeted emissions. It is acknowledged that facilities and source categories subject to control techniques and devices mandated by rules do not always achieve 100% compliance with those requirements. Given this reality, the US EPA recommends the use of rule effectiveness studies to improve the quality of emission estimates presented in emission inventories.

Once an RE rate has been calculated, its value is applied to relevant sources at an individual process level, thus adjusting (i.e., increasing) emission estimates to reflect a lower degree of control efficiency. The formulas below illustrate how inclusion of rule effectiveness can significantly affect the resulting emission estimates:

Emissions before the application of rule effectiveness:

Uncontrolled Emissions	×	[1 – (Control Efficiency)]	= Emissions with Control
100 tons	**×**	**[1 – (0.90)]**	**= 10.0 tons**

Emissions including the application of rule effectiveness:

Uncontrolled Emissions	×	[1 – (Control Efficiency × RE)]	= Emissions with Control
100 tons	**×**	**[1 – (0.90 × 0.83)]**	**= 25.3 tons**

In general, the RE rate is applied to all processes where a control device or control technique is in use. There are however some limitations to this blanket rule, as expressed in US EPA's most recent guidance:

> *…not all emission estimates involving use of a control device or technique need to be adjusted to account for RE…For example, a state or local agency may conclude that a control device that operates in conjunction with a continuous emissions monitor, or is equipped with an automatic shutdown device, may provide a sufficient level of assurance that intended emission reductions will be achieved, and therefore an adjustment for rule effectiveness is not necessary. Another example would be in instances where a direct determination of emissions, such as via a mass balance calculation, can be made.* (US EPA, 2005)

Another complication in any attempt to apply a blanket RE percentage rate occurs where control device efficiencies are extremely high. Some categories of control devices routinely operate at efficiencies of 99% or greater (e.g., baghouses, thermal oxidizers). For these activities, even small adjustments through the application of RE can cause a dramatic increase in reported emissions. As an example, a process with a control device of 99.9% efficiency may report controlled emissions of 10 tons. If an RE rate of 85% were applied to this process, the adjusted emissions would total 1,508.5 tons (an increase of nearly 15,000%). In these types of instances, the department evaluated the affected processes on a case-by-case basis to determine the appropriateness of applying an RE adjustment.

A2.2 Calculating Rule Effectiveness Rates for Title V Facilities and Non-Title V Facilities

The observed compliance rate in some cases, such as multi-source Title V and non-Title V facilities, can be better described as a rate at which inspection staff issue violations. Inspection staff has a range of experience and training which influences their proficiency in issuing appropriate violations. There may be instances when a rule violation goes unnoticed by staff, or conversely a violation may be issued in error. Even when a compliance rate has a high statistical measure of accuracy, it can fail to reflect a number of programmatic measures that affect overall rule effectiveness; measures like the strength of rule language, departmental enforcement and penalty actions, inspector training programs, educational and public outreach efforts, etc. This reality is reflected in earlier US EPA guidance:

> *A percentage effectiveness rating is not enough to describe the compliance effectiveness of a rule for a source category. An SSCD [Stationary Source Compliance Division] study should attempt to link the rating to a regulatory agency's overall effort. The study should address the factors that affect the percentage effectiveness rating such as the compliance rate of the sources in a category, inspection frequency and thoroughness, the language of the rule (i.e., whether or not it has loopholes), and the reporting and recordkeeping by the regulatory agency. Evaluating these factors will provide a more complete evaluation of the effectiveness of a rule.* (US EPA, 1994)

In order to incorporate all the salient factors described above, a matrix was created to produce a final RE rate. US EPA's latest guidance (2005) provides a listing of factors that can impact rule effectiveness rates (e.g., inspector training, frequency of inspections, media outreach, enforcement policies, recordkeeping requirements, etc.), grouped into major categories such as most important factors, important factors and other factors. The department used these suggested factors as the basis for developing the RE matrices contained in Tables A2–2 and A2–3.

In brief, the compliance rate developed from inspection data accounts for 70% of the overall RE rate, while all other factors account for the remaining 30%. Each factor is scored individually, based upon the department's success in implementing that factor. As an example, the score for the factor "Compliance History" is the compliance rate developed from the study period inspection data, while the score for "Enforcement Penalties" is based upon the department's timely response to, and settlement of, observed violations associated with the subject rule or source category. The complete matrices for each applicable rule or source category for which rule effectiveness was addressed, are contained in Tables A2–2 and A2–3.

The following sections describe in further detail the data and methods used in the development of the remaining RE factors for Title V and non-Title V permitted facilities; results are summarized in Table A2–1 below.

Table A2–1. Compliance and rule effectiveness rates, by source category analyzed.

Source Category	Compliance Rate	Rule Effectiveness (RE) Rate
Title V Facilities	89.14% *	90.94%
Non-Title V Facilities	81.00% *	84.27%

** Compliance rates for both Title V and Non-Title V facilities are based upon 2008-2009 inspection data, and reflect compliance self-monitoring recordkeeping practice, in addition to violation data.*

For the emission processes that include a control device or technique that limits carbon monoxide, separate multi-rule RE rates have been calculated for permitted Title V and non-Title V facilities. Factor-based matrices have been utilized to develop RE rates for Title V and non-Title V facilities. Compliance rates for these sources are based upon two full years of data (2008 through 2009), as compliance information for these sources tends to be detailed (as reflected in the matrix). The compliance rate for these facilities also includes data on self-monitoring recordkeeping practices in addition to inspection data. The combination of monitoring data and inspection data comprise the 'compliance rate' section of the RE calculation matrix, and still account for 70% of the overall RE rate. The combined compliance rate for Title V facilities is 89.14% and 81.00% for non-Title V facilities, resulting in RE rates of 90.94% and 84.27% for Title V and non-Title V facilities, respectively, as shown in Tables A2–2 and A2–3 below.

A2.3 References

US EPA, 1994. Rule Effectiveness Guidance: Integration of Inventory, Compliance and Assessment Applications. EPA Rep. 452/R-94-001, January 1994.

US EPA, 2005. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. EPA Rep. 454/R-05-001, November 2005.

Table A2–2. Rule Effectiveness Matrix for Title V Facilities

A. Most important factors (2 criteria, each assigned weighting of 35% of total):

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Monitoring	94%	100%	97%	Source specific monitoring used for compliance purposes, and monitoring records filed with regulatory agency at least every 4 months.			
	87%	93%	90%	Source specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency every 6 to 9 months.	35%	90%	**31.5%**
	81%	86%	84%	Source specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency each year.			
	70%	80%	75%	General guidance exists for source specific enhanced monitoring, and monitoring records required but aren't submitted to regulatory agency.			
		< 70%	35%	No requirements for any type of monitoring.			

Compliance History	94%	100%	97%	The facility has been in compliance for the past eight quarters.	35%	10 of 19 facilities	**17.9%**
	87%	93%	90%	The facility is believed to have been in compliance for the past eight quarters, although inspection frequency is such that this can't be positively confirmed.			
	81%	86%	84%	On schedule; the facility is meeting its compliance schedule.			
	70%	80%	75%	In Violation; facility is in violation of emissions and/or procedural requirements.		8 of 19 facilities	**12.4%**
		< 70%	35%	High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA.		1 of 19 facilities	**0.6%**
						Sum:	**30.9%**

B. Other important factors (4 criteria, each assigned weighting of 3% of total):

Type of Inspection	94%	100%	97%	Inspections involve compliance test methods with a high degree of accuracy, such as stack testing or other types of precise emissions measurement.	3%	97%	**2.9%**
	87%	93%	90%	Inspections involve detailed review of process parameters & inspection of control equipment.			
	81%	86%	84%	Inspections involve review of process and inspection of control equipment.			
	70%	80%	75%	Inspections generally consist of only a records review.			
		< 70%	35%	Inspections most likely consist of visual inspection (e.g., opacity), or drive by.			

Operation & Maintenance	94%	100%	97%	Control equipment operators follow and sign daily O&M instructions.			
	87%	93%	90%	Control equipment operators follow daily O&M instructions.	3%	90%	**2.7%**
	81%	86%	84%	Control equipment operators follow daily or weekly O&M instructions.			
	70%	80%	75%	O&M requirements exist, but on no specific schedule.			
		< 70%	35%	No specific O&M requirements.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Unannounced Inspections	94%	100%	97%	Routinely conducted.	3%	97%	**2.9%**
	87%	93%	90%	Sometimes done.			
	81%	86%	84%	Done, but infrequently.			
	70%	80%	75%	Rarely done.			
		< 70%	35%	Never done.			

Enforcement Penalties	94%	100%	97%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.	3%	97%	**2.91%**
	87%	93%	90%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	81%	86%	84%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	70%	80%	75%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
		< 70%	35%	Agency does not have sufficient authority to impose punitive measures towards violators.			

C. Other factors (9 criteria, each assigned weighting of 2% of total):

Compliance Certifications	94%	100%	97%	Source subject to Title V or other type of compliance certification.	2%	97%	**1.94%**
	87%	93%	90%	Source subject to Title V or other type of compliance certification.			
	81%	86%	84%	Source not subject to any type of compliance certification.			
	70%	80%	75%	Source not subject to any type of compliance certification.			
		< 70%	35%	Source not subject to any type of compliance certification.			

Inspection Frequency	94%	100%	97%	Source(s) are inspected once every 2 years or more frequently.	2%	97%	**1.94%**
	87%	93%	90%	Source(s) are inspected once every 3 years or more frequently.			
	81%	86%	84%	Source(s) are inspected once every 5 years or more frequently.			
	70%	80%	75%	Inspection of source(s) infrequent; > every 5 years.			
		< 70%	35%	Inspections rarely, if ever, performed.			

EPA HPV Enforcement	94%	100%	97%	Agency has sufficient resources to implement EPA's 12/22/98 HPV policy.	2%	97%	**1.94%**
	87%	93%	90%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	81%	86%	84%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	70%	80%	75%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy more often than not.			
		< 70%	35%	Resource constraints prohibit agency from implementing EPA's 12/22/98 HPV policy in most instances.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Operator Training	94%	100%	97%	Control equipment operators complete a formal training program on use of the equipment, and such program is kept up to date and has been reviewed by the regulatory agency.			
	87%	93%	90%	Control equipment operators complete formal training program, and such program is kept up to date and available for review by the regulatory agency upon request.			
	81%	86%	84%	Control equipment operators complete some amount of formal training.	2%	84%	**1.68%**
	70%	0.8	75%	Control equipment operators receive only on the job training.			
		< 70%	35%	Control equipment operators receive no specific training.			

Media Publicity	94%	100%	97%	Media publicity of enforcement actions.	2%	97%	**1.94%**
	87%	93%	90%	Media publicity of enforcement actions.			
	81%	86%	84%	Media publicity of enforcement actions.			
	70%	80%	75%	Media publicity of enforcement actions.			
		< 70%	35%	No media publicity of enforcement actions.			

Regulatory Workshops	94%	100%	97%	Regulatory workshops are available annually, and/or the implementing agency mails regulatory information packages each year.	2%	97%	**1.94%**
	87%	93%	90%	Regulatory workshops are available every 1-2 years, and/or the implementing agency mails regulatory information packages every 1-2 years.			
	81%	86%	84%	Regulatory workshops are available every 2-3 years, and/or the implementing agency mails regulatory information packages once every 2-3 years.			
	70%	80%	75%	Regulatory workshop not routinely available, but implementing agency mails regulatory information packages out about once every 2-3 years.			
		< 70%	35%	Regulatory workshops not routinely available. Implementing agency mails regulatory information packages infrequently, if ever.			

Inspector Training	94%	100%	97%	Inspectors must undergo 2 weeks of compre-hensive basic training, and 1 to 2 weeks of source specific training, and such training is updated each year.			
	87%	93%	90%	Inspectors must undergo 1 to 2 weeks of basic training and 1 week of source specific training and such training is updated every 1-2 years.	2%	90%	**1.80%**
	81%	86%	84%	Inspectors must undergo 1 to 2 weeks of basic training and 3 to 5 days of source specific training, and such training is updated every 1-2 years.			
	70%	80%	75%	Inspectors must undergo 1 to 2 weeks of basic training and 1 to 3 days of source specific training, and such training is updated every 1-2 years.			
		< 70%	35%	Inspectors must undergo less than 5 days of basic training less than 3 days of source specific training, and such training is updated only every 2 years or less frequently.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Testing Guidelines	94%	100%	97%	Specific guidelines and schedule for testing and test methods exist.	2%	97%	**1.94%**
	87%	93%	90%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	81%	86%	84%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	70%	80%	75%	Specific guidelines on testing and test methods, but no schedule for testing.			
		< 70%	35%	Only general guidance on testing, or no mention of testing requirements.			

Follow-up Inspections	94%	100%	97%	Follow-up inspections always or almost always conducted (90 % of the time or more).	2%	97%	**1.94%**
	87%	93%	90%	Follow-up inspections usually conducted (approximately 75% of the time).			
	81%	86%	84%	Follow-up inspections sometimes conducted (approximately 50% of the time).			
	70%	80%	75%	Follow-up inspections infrequently conducted (approximately 25% of the time).			
		< 70%	35%	Follow-up inspections rarely or never conducted (10% of the time or less).			

Overall rule effectiveness score for Title V facilities: **90.94%**

Table A2–3. Rule Effectiveness Matrix for Non-Title V Facilities

A. Most important factors (2 criteria, each assigned weighting of 35% of total):

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Monitoring	94%	100%	97%	Source specific monitoring used for compliance purposes, and monitoring records filed with regulatory agency at least every 4 months.			
	87%	93%	90%	Source specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency every 6 to 9 months.			
	81%	86%	84%	Source specific monitoring used as an indicator of compliance, and monitoring records filed with regulatory agency each year.			
	70%	80%	75%	General guidance exists for source specific enhanced monitoring, and monitoring records required but aren't submitted to regulatory agency.	35%	75%	**26.3%**
		< 70%	35%	No requirements for any type of monitoring.			

Compliance History	94%	100%	97%	The facility has been in compliance for the past eight quarters.	35%	156 of 298 facilities	**17.8%**
	87%	93%	90%	The facility is believed to have been in compliance for the past eight quarters, although inspection frequency is such that this can't be positively confirmed.		10 of 298 facilities	**1.1%**
	81%	86%	84%	On schedule; the facility is meeting its compliance schedule.			
	70%	80%	75%	In Violation; facility is in violation of emissions and/or procedural requirements.		130 of 298 facilities	**11.5%**
		< 70%	35%	High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA.		2 of 298 facilities	**0.1%**
						Sum:	**30.4%**

B. Other important factors (4 criteria, each assigned weighting of 3% of total):

Type of Inspection	94%	100%	97%	Inspections involve compliance test methods with a high degree of accuracy, such as stack testing or other types of precise emissions measurement.			
	87%	93%	90%	Inspections involve detailed review of process parameters & inspection of control equipment.	3%	90%	**2.7%**
	81%	86%	84%	Inspections involve review of process and inspection of control equipment.			
	70%	80%	75%	Inspections generally consist of only a records review.			
		< 70%	35%	Inspections most likely consist of visual inspection (e.g., opacity), or drive by.			

Operation & Maintenance	94%	100%	97%	Control equipment operators follow and sign daily O&M instructions.			
	87%	93%	90%	Control equipment operators follow daily O&M instructions.	3%	90%	**2.7%**
	81%	86%	84%	Control equipment operators follow daily or weekly O&M instructions.			
	70%	80%	75%	O&M requirements exist, but on no specific schedule.			
		< 70%	35%	No specific O&M requirements.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score (= weight × value)
Unannounced Inspections	94%	100%	97%	Routinely conducted.	3%	97%	**2.91%**
	87%	93%	90%	Sometimes done.			
	81%	86%	84%	Done, but infrequently.			
	70%	80%	75%	Rarely done.			
		< 70%	35%	Never done.			

Enforcement Penalties	94%	100%	97%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.	3%	97%	**2.91%**
	87%	93%	90%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	81%	86%	84%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
	70%	80%	75%	Agency has the authority to impose punitive measures, including monetary fines, towards violators such as in delegated Title V Operating Permit programs.			
		< 70%	35%	Agency does not have sufficient authority to impose punitive measures towards violators.			

C. Other factors (9 criteria, each assigned weighting of 2% of total):

Compliance Certifications	94%	100%	97%	Source subject to Title V or other type of compliance certification.			
	87%	93%	90%	Source subject to Title V or other type of compliance certification.			
	81%	86%	84%	Source not subject to any type of compliance certification.			
	70%	80%	75%	Source not subject to any type of compliance certification.	2%	75%	**1.5%**
		< 70%	35%	Source not subject to any type of compliance certification.			

Inspection Frequency	94%	100%	97%	Source(s) are inspected once every 2 years or more frequently.	2%	97%	**1.94%**
	87%	93%	90%	Source(s) inspected every 3 years or more frequently.			
	81%	86%	84%	Source(s) inspected every 5 years or more frequently.			
	70%	80%	75%	Inspection of source(s) infrequent; > every 5 years.			
		< 70%	35%	Inspections rarely, if ever, performed.			

EPA HPV Enforcement	94%	100%	97%	Agency has sufficient resources to implement EPA's 12/22/98 HPV policy.	2%	97%	**1.94%**
	87%	93%	90%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	81%	86%	84%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy in most instances.			
	70%	80%	75%	Agency's resources allow it to implement EPA's 12/22/98 HPV policy more often than not.			
		< 70%	35%	Resource constraints prohibit agency from implementing EPA's 12/22/98 HPV policy in most instances.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score(= weight × value)
Operator Training	94%	100%	97%	Control equipment operators complete a formal training program on use of the equipment; the program is kept up to date and has been reviewed by the regulatory agency.			
	87%	93%	90%	Control equipment operators complete formal training program, and such program is kept up to date and available for review by the regulatory agency upon request.			
	81%	86%	84%	Control equipment operators complete some amount of formal training.			
	70%	0.8	75%	Control equipment operators receive only on the job training.	2%	75%	**1.5%**
		< 70%	35%	Control equipment operators receive no specific training.			

Media Publicity	94%	100%	97%	Media publicity of enforcement actions.	2%	97%	**1.94%**
	87%	93%	90%	Media publicity of enforcement actions.			
	81%	86%	84%	Media publicity of enforcement actions.			
	70%	80%	75%	Media publicity of enforcement actions.			
		< 70%	35%	No media publicity of enforcement actions.			

Regulatory Workshops	94%	100%	97%	Regulatory workshops are available annually, and/or the implementing agency mails regulatory information packages each year.	2%	97%	**1.94%**
	87%	93%	90%	Regulatory workshops are available every 1-2 years, and/or the implementing agency mails regulatory information packages every 1-2 years.			
	81%	86%	84%	Regulatory workshops are available every 2-3 years, and/or the implementing agency mails regulatory information packages once every 2-3 years.			
	70%	80%	75%	Regulatory workshop not routinely available, but implementing agency mails regulatory information packages out about once every 2-3 years.			
		< 70%	35%	Regulatory workshops not routinely available. The implementing agency mails regulatory information packages infrequently, if ever.			

Inspector Training	94%	100%	97%	Inspectors must undergo 2 weeks of comprehensive basic training, and 1 to 2 weeks of source specific training, and such training is updated each year.			
	87%	93%	90%	Inspectors must undergo 1 to 2 weeks of basic training and 1 week of source specific training and such training is updated every 1-2 years.	2%	90%	**1.80%**
	81%	86%	84%	Inspectors must undergo 1 to 2 weeks of basic training and 3 to 5 days of source specific training, and such training is updated every 1-2 years.			
	70%	80%	75%	Inspectors must undergo 1 to 2 weeks of basic training and 1 to 3 days of source specific training, and such training is updated every 1-2 years.			
		< 70%	35%	Inspectors must undergo less than 5 days of basic training less than 3 days of source specific training, and such training is updated only every 2 years or less frequently.			

Factor	Range		Midpt. value	Description	Weight	Value assigned to MCAQD	Score(= weight × value)
Testing Guidelines	94%	100%	97%	Specific guidelines and schedule for testing and test methods exist.	2%	97%	**1.94%**
	87%	93%	90%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	81%	86%	84%	Specific guidelines on testing and test methods exist, but no schedule for testing.			
	70%	80%	75%	Specific guidelines on testing and test methods, but no schedule for testing.			
		< 70%	35%	Only general guidance on testing, or no mention of testing requirements.			

Follow-up Inspections	94%	100%	97%	Follow-up inspections always or almost always conducted (90 % of the time or more).	2%	97%	**1.94%**
	87%	93%	90%	Follow-up inspections usually conducted (approximately 75% of the time).			
	81%	86%	84%	Follow-up inspections sometimes conducted (approximately 50% of the time).			
	70%	80%	75%	Follow-up inspections infrequently conducted (approximately 25% of the time).			
		< 70%	35%	Follow-up inspections rarely or never conducted (10% of the time or less)			

Overall rule effectiveness score for non-Title V facilities: **84.27%**

Appendix 3. MOVES2010b Local Input Data and RunSpecs

In order to calculate the 2008 annual and CO season-day onroad source emissions, MOVES2010b was executed using local input data for each month of the year and each geographical area (the CO maintenance area and Maricopa County).

A portion of the MOVES2010b RunSpec Summary, RunSpec, and local input data for Maricopa County are provided in this appendix as an example.

MOVES2010b RunSpec Summary (Maricopa County, December 2008)

* Output Database Server Name: [using default]

* Scale:
  - Domain/Scale: County
  - Calculation Type: Inventory

* Time Spans:
  - Time Aggregation Level: Hour
  - Years: 2008
  - Months: December
  - Days: Weekend & Weekdays
  - Hours: Start Hour 00:00 - 00:59 | End Hour 23:00 - 23:59

* Geographic Bounds:
  - Region: County
  - Selections: ARIZONA - Maricopa County
  - Domain Input Database: mag_MC_2008PEI_in

* Vehicles/Equipment
  - On Road Vehicle Equipment:
    - Diesel Fuel - Combination Long-haul Truck
    - Diesel Fuel - Combination Short-haul Truck
    - Diesel Fuel - Intercity Bus
    - Diesel Fuel - Light Commercial Truck
    - Diesel Fuel - Motor Home
    - Diesel Fuel - Motorcycle
    - Diesel Fuel - Passenger Car
    - Diesel Fuel - Passenger Truck
    - Diesel Fuel - Refuse Truck
    - Diesel Fuel - School Bus
    - Diesel Fuel - Single Unit Long-haul Truck
    - Diesel Fuel - Single Unit Short-haul Truck
    - Diesel Fuel - Transit Bus
    - Gasoline - Combination Long-haul Truck
    - Gasoline - Combination Short-haul Truck
    - Gasoline - Intercity Bus
    - Gasoline - Light Commercial Truck
    - Gasoline - Motor Home
    - Gasoline - Motorcycle
    - Gasoline - Passenger Car
    - Gasoline - Passenger Truck
    - Gasoline - Refuse Truck
    - Gasoline - School Bus
    - Gasoline - Single Unit Long-haul Truck
    - Gasoline - Single Unit Short-haul Truck
    - Gasoline - Transit Bus
    - Compressed natural Gas (CNG) - Combination Long-haul Truck
    - Compressed natural Gas (CNG) - Combination Short-haul Truck
    - Compressed natural Gas (CNG) - Intercity Bus
    - Compressed natural Gas (CNG) - Light Commercial Truck
    - Compressed natural Gas (CNG) - Motor Home
    - Compressed natural Gas (CNG) - Motorcycle
    - Compressed natural Gas (CNG) - Passenger Car
    - Compressed natural Gas (CNG) - Passenger Truck
    - Compressed natural Gas (CNG) - Refuse Truck
    - Compressed natural Gas (CNG) - School Bus
    - Compressed natural Gas (CNG) - Single Unit Long-haul Truck
    - Compressed natural Gas (CNG) - Single Unit Short-haul Truck
    - Compressed natural Gas (CNG) - Transit Bus

* Road Type
  - Off-Network
  - Rural Restricted Access
  - Rural Unrestricted Access
  - Urban Restricted Access
  - Urban Unrestricted Access

* Pollutants and Processes
  - Carbon Monoxide (CO) - Running Exhaust
  - Carbon Monoxide (CO) - Start Exhaust
  - Carbon Monoxide (CO) - Crankcase Running Exhaust
  - Carbon Monoxide (CO) - Crankcase Start Exhaust
  - Carbon Monoxide (CO) - Crankcase Extended Idle Exhaust
  - Carbon Monoxide (CO) - Extended Idle Exhaust

* Manage Input Data Sets
  - Selections: / StageII_Input / Stage II Refueling Input

* Output
  - General Output:
    - Output Database: mag_MC_2008PEI_out
    - Units: Mass Units (Grams) | Energy Units (Joules) | Distance Units (Miles)
    - Activity: Distance Traveled | Source Hours | Source Hours Idling | Source Hours Operating | Source Hours Parked | Population | Starts
  - Output Emissions Detail:
    - Always: Time (Month) | Location (NATION) | Pollutant
    - For All Vehicle/Equipment Categories: Fuel Type | Emission Process
    - On Road: SCC

MOVES2010b RunSpec (Maricopa County, December 2008)


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   <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
      <donotperformfinalaggregation selected="false"/>
   <lookuptableflags scenarioid="mag_MC_2008PEI_in_v3" truncateoutput="true" truncateactivity="true"/>
</runspec>
```

MOVES2010b Local Input Data (Maricopa County, December 2008)

[FuelFormulation]

Fuel Formulation ID	Fuel Subtype ID	RVP	Sulfur Level	ETOH Volume	MTBE Volume	ETBE Volume	TAME Volume	Aromatic Content	Olefin Content	Benzene Content	e200	e300	volToWt PercentOxy	BioDiesel Ester Volume	Cetane Index	PAH Content	T50	T90
10801	12	8 76	35 00	9 5	0	0	0	14 4	4 9	1 0	53 0	91 0	3 4933	0	0	0	190 333	292 333
10802	12	8 42	23 14	9 2	0	0	0	12 8	3 9	0 9	50 3	91 1	3 4229	0	0	0	196 286	291 286
10803	12	8 40	49 00	9 2	0	0	0	12 0	4 0	0 8	50 3	92 0	3 4075	0	0	0	197 250	285 500
10804	14	7 77	23 00	5 6	0	0	0	17 7	6 0	1 0	45 5	88 5	2 0567	0	0	0	205 833	304 833
10805	14	6 95	26 04	1 3	0	0	0	16 8	7 6	0 8	40 2	88 4	0 5086	0	0	0	213 954	307 884
10806	11	6 64	25 20	0 0	0	0	0	16 3	7 0	0 7	38 4	86 4	0 0000	0	0	0	217 000	321 400
10807	14	7 07	18 83	0 7	0	0	0	16 6	7 3	0 8	37 9	89 0	0 3367	0	0	0	216 917	304 667
10808	14	6 81	28 59	0 4	0	0	0	15 0	7 4	0 8	38 9	89 2	0 1495	0	0	0	215 518	302 768
10809	11	6 48	34 56	0 0	0	0	0	18 2	10 1	0 9	40 3	88 8	0 0000	0	0	0	214 500	305 750
10810	13	7 91	24 95	6 8	0	0	0	17 1	8 0	0 9	46 5	89 5	2 5173	0	0	0	204 600	302 467
10811	12	8 41	15 17	9 5	0	0	0	16 1	5 9	1 1	53 3	90 9	3 5425	0	0	0	185 500	294 333
10812	13	8 38	29 45	8 8	0	0	0	14 5	5 3	0 9	50 7	90 9	3 2767	0	0	0	194 794	293 184
30801	20	0	6 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30802	20	0	6 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30803	20	0	6 65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30804	20	0	6 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30805	20	0	5 78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30806	20	0	5 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30807	20	0	4 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30808	20	0	6 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30809	20	0	6 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30810	20	0	6 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30811	20	0	6 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30812	20	0	6 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[FuelSupply]

countyID	fuelYearID	monthGroupID	fuelFormulationID	marketShare	marketShareCV
4013	2008	1	10801	1	0 5
4013	2008	2	10802	1	0 5
4013	2008	3	10803	1	0 5
4013	2008	4	10804	1	0 5
4013	2008	5	10805	1	0 5
4013	2008	6	10806	1	0 5
4013	2008	7	10807	1	0 5
4013	2008	8	10808	1	0 5
4013	2008	9	10809	1	0 5
4013	2008	10	10810	1	0 5
4013	2008	11	10811	1	0 5
4013	2008	12	10812	1	0 5
4013	2008	1	30801	1	0 5
4013	2008	2	30802	1	0 5
4013	2008	3	30803	1	0 5
4013	2008	4	30804	1	0 5
4013	2008	5	30805	1	0 5
4013	2008	6	30806	1	0 5
4013	2008	7	30807	1	0 5
4013	2008	8	30808	1	0 5
4013	2008	9	30809	1	0 5
4013	2008	10	30810	1	0 5
4013	2008	11	30811	1	0 5
4013	2008	12	30812	1	0 5
4013	2008	1	30	1	0 5
4013	2008	2	30	1	0 5
4013	2008	3	30	1	0 5
4013	2008	4	30	1	0 5
4013	2008	5	30	1	0 5
4013	2008	6	30	1	0 5
4013	2008	7	30	1	0 5
4013	2008	8	30	1	0 5
4013	2008	9	30	1	0 5
4013	2008	10	30	1	0 5
4013	2008	11	30	1	0 5
4013	2008	12	30	1	0 5

[HPMSvTypeYear]

HPMSVtypeID	yearID	VMTGrowthFactor	HPMSBaseYearVMT	baseYearOffNetVMT
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20	2008	0	17,967,179,969	0
30	2008	0	11,891,041,958	0
40	2008	0	79,229,536	0
50	2008	0	1,602,088,402	0
60	2008	0	1,722,837,641	0

[SourceTypeYear]

yearID	sourceTypeID	sourceTypePopulation
2008	11	72,411
2008	21	2,056,832
2008	31	475,013
2008	32	183,701
2008	41	1,147
2008	42	703
2008	43	7,041
2008	51	828
2008	52	27,030
2008	53	1,745
2008	54	3,531
2008	61	13,884
2008	62	11,439

[ZoneMonthHour]

monthID	zoneID	HourID	temperature	relHumidity
12	40130	1	51 0	65 0
12	40130	2	51 0	66 0
12	40130	3	50 0	68 0
12	40130	4	49 0	69 0
12	40130	5	49 0	68 0
12	40130	6	48 0	67 0
12	40130	7	48 0	68 0
12	40130	8	48 0	67 0
12	40130	9	51 0	60 0
12	40130	10	54 0	52 0
12	40130	11	57 0	45 0
12	40130	12	60 0	39 0
12	40130	13	61 0	38 0
12	40130	14	63 0	36 0
12	40130	15	64 0	35 0
12	40130	16	64 0	33 0
12	40130	17	63 0	35 0
12	40130	18	61 0	41 0
12	40130	19	59 0	47 0
12	40130	20	57 0	51 0
12	40130	21	55 0	54 0
12	40130	22	54 0	56 0
12	40130	23	54 0	59 0
12	40130	24	52 0	61 0
7	40130	24	91 0	38 0

[SourceTypeAgeDistribution]

Source TypeID	YearID	AgeID	AgeFraction
11	2008	0	0 097639
11	2008	1	0 153685
11	2008	2	0 124466
11	2008	3	0 088073
11	2008	4	0 100239
11	2008	5	0 075075
11	2008	6	0 060726
11	2008	7	0 050223
11	2008	8	0 041801
11	2008	9	0 030675
11	2008	10	0 024748
11	2008	11	0 023188
11	2008	12	0 019341
11	2008	13	0 014557
11	2008	14	0 013518
11	2008	15	0 009462
11	2008	16	0 006967
11	2008	17	0 006863
11	2008	18	0 006447
11	2008	19	0 006239
11	2008	20	0 006551
11	2008	21	0 01019
11	2008	22	0 008734
11	2008	23	0 006239
11	2008	24	0 004456
11	2008	25	0 003183
11	2008	26	0 002274
11	2008	27	0 001624
11	2008	28	0 00116
11	2008	29	0 000829
11	2008	30	0 000829
21	2008	0	0 0586
21	2008	1	0 0898
21	2008	2	0 0909
21	2008	3	0 0847
21	2008	4	0 0786
21	2008	5	0 071
21	2008	6	0 069
21	2008	7	0 0639
21	2008	8	0 0628
21	2008	9	0 0539
21	2008	10	0 044
21	2008	11	0 0383
21	2008	12	0 0297
21	2008	13	0 0294
21	2008	14	0 023
21	2008	15	0 0187
21	2008	16	0 0147
21	2008	17	0 0129
21	2008	18	0 0106
21	2008	19	0 0088
21	2008	20	0 0066
21	2008	21	0 0056
21	2008	22	0 0043
21	2008	23	0 0036
21	2008	24	0 003014
21	2008	25	0 002523
21	2008	26	0 002113
21	2008	27	0 001769
21	2008	28	0 001481
21	2008	29	0 00124
21	2008	30	0 014461
31	2008	0	0 056148
31	2008	1	0 089988
31	2008	2	0 092916
31	2008	3	0 074872
31	2008	4	0 076932
31	2008	5	0 063022
31	2008	6	0 057914
31	2008	7	0 065833
31	2008	8	0 06192
31	2008	9	0 048255
31	2008	10	0 042507
31	2008	11	0 042947
31	2008	12	0 031419
31	2008	13	0 030928
31	2008	14	0 028403
31	2008	15	0 018757
31	2008	16	0 012649
31	2008	17	0 011138
31	2008	18	0 010056
31	2008	19	0 011393
31	2008	20	0 008919
31	2008	21	0 005793
31	2008	22	0 007552
31	2008	23	0 005668
31	2008	24	0 004272
31	2008	25	0 003242
31	2008	26	0 002452
31	2008	27	0 001919
31	2008	28	0 001515
31	2008	29	0 001206
31	2008	30	0 029464
32	2008	0	0 059763
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32	2008	4	0 074825
32	2008	5	0 060022
32	2008	6	0 054098
32	2008	7	0 061759
32	2008	8	0 062509
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32	2008	10	0 041619
32	2008	11	0 043153
32	2008	12	0 031489
32	2008	13	0 031005
32	2008	14	0 029429
32	2008	15	0 019239
32	2008	16	0 011888
32	2008	17	0 010528
32	2008	18	0 009695
32	2008	19	0 011148
32	2008	20	0 008679
32	2008	21	0 005441
32	2008	22	0 007091
32	2008	23	0 005301
32	2008	24	0 004014
32	2008	25	0 003071
32	2008	26	0 002418
32	2008	27	0 001846
32	2008	28	0 001426
32	2008	29	0 001119
32	2008	30	0 027915
41	2008	0	0 0544
41	2008	1	0 127
41	2008	2	0 1378
41	2008	3	0 1142
41	2008	4	0 0624
41	2008	5	0 042
41	2008	6	0 0312
41	2008	7	0 0413
41	2008	8	0 0576
41	2008	9	0 0536
41	2008	10	0 0309
41	2008	11	0 0297
41	2008	12	0 0305
41	2008	13	0 0291
41	2008	14	0 0546
41	2008	15	0 0142
41	2008	16	0 0082
41	2008	17	0 0076
41	2008	18	0 0148
41	2008	19	0 0231
41	2008	20	0 0175
41	2008	21	0 0045
41	2008	22	0 0035
41	2008	23	0 0023
41	2008	24	0 001511
41	2008	25	0 000993
41	2008	26	0 000653
41	2008	27	0 000429
41	2008	28	0 000282
41	2008	29	0 000185
41	2008	30	0 003947
42	2008	0	0 0544
42	2008	1	0 127
42	2008	2	0 1378
42	2008	3	0 1142
42	2008	4	0 0624
42	2008	5	0 042
42	2008	6	0 0312
42	2008	7	0 0413
42	2008	8	0 0576
42	2008	9	0 0536
42	2008	10	0 0309
42	2008	11	0 0297
42	2008	12	0 0305
42	2008	13	0 0291
42	2008	14	0 0546
42	2008	15	0 0142
42	2008	16	0 0082
42	2008	17	0 0076
42	2008	18	0 0148
42	2008	19	0 0231
42	2008	20	0 0175
42	2008	21	0 0045
42	2008	22	0 0035
42	2008	23	0 0023
42	2008	24	0 001511
42	2008	25	0 000993
42	2008	26	0 000653
42	2008	27	0 000429
42	2008	28	0 000282
42	2008	29	0 000185
42	2008	30	0 003947
43	2008	0	0 091684
43	2008	1	0 148636
43	2008	2	0 157944
43	2008	3	0 09869
43	2008	4	0 056752
43	2008	5	0 03343
43	2008	6	0 020118
43	2008	7	0 025423
43	2008	8	0 069363
43	2008	9	0 042739
43	2008	10	0 034531
43	2008	11	0 046342
43	2008	12	0 03293
43	2008	13	0 031173
43	2008	14	0 038212
43	2008	15	0 02194
43	2008	16	0 004822
43	2008	17	0 004813
43	2008	18	0 00647
43	2008	19	0 009141
43	2008	20	0 006922
43	2008	21	0 002448
43	2008	22	0 002714
43	2008	23	0 001715
43	2008	24	0 001077
43	2008	25	0 000681
43	2008	26	0 00043
43	2008	27	0 00029
43	2008	28	0 000183
43	2008	29	0 000115
43	2008	30	0 008269
51	2008	0	0 091611
51	2008	1	0 148519
51	2008	2	0 15782
51	2008	3	0 098612
51	2008	4	0 056707
51	2008	5	0 033404
51	2008	6	0 020103
51	2008	7	0 025403
51	2008	8	0 069309
51	2008	9	0 042705
51	2008	10	0 034504
51	2008	11	0 046306
51	2008	12	0 032904
51	2008	13	0 031602
51	2008	14	0 038601
51	2008	15	0 022601
51	2008	16	0 004899
51	2008	17	0 0049
51	2008	18	0 006499
51	2008	19	0 009099
51	2008	20	0 006797
51	2008	21	0 0024
51	2008	22	0 0027

Source TypeID	YearID	AgeID	AgeFraction
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51	2008	24	0 00107
51	2008	25	0 000674
51	2008	26	0 000424
51	2008	27	0 000267
51	2008	28	0 000168
51	2008	29	0 000106
51	2008	30	0 007586
52	2008	0	0 082905
52	2008	1	0 133171
52	2008	2	0 140432
52	2008	3	0 091977
52	2008	4	0 061324
52	2008	5	0 040558
52	2008	6	0 029326
52	2008	7	0 03528
52	2008	8	0 066813
52	2008	9	0 043674
52	2008	10	0 036113
52	2008	11	0 04492
52	2008	12	0 032191
52	2008	13	0 031518
52	2008	14	0 036333
52	2008	15	0 022117
52	2008	16	0 006913
52	2008	17	0 006552
52	2008	18	0 007429
52	2008	19	0 00972
52	2008	20	0 007356
52	2008	21	0 003264
52	2008	22	0 004084
52	2008	23	0 002855
52	2008	24	0 002131
52	2008	25	0 001652
52	2008	26	0 001562
52	2008	27	0 001023
52	2008	28	0 000676
52	2008	29	0 000468
52	2008	30	0 015661
53	2008	0	0 090873
53	2008	1	0 146351
53	2008	2	0 155089
53	2008	3	0 097122
53	2008	4	0 056197
53	2008	5	0 033312
53	2008	6	0 020196
53	2008	7	0 025496
53	2008	8	0 068212
53	2008	9	0 042125
53	2008	10	0 034022
53	2008	11	0 04548
53	2008	12	0 032373
53	2008	13	0 033217
53	2008	14	0 040496
53	2008	15	0 025464
53	2008	16	0 00539
53	2008	17	0 005435

Source TypeID	YearID	AgeID	AgeFraction
53	2008	18	0 006778
53	2008	19	0 009212
53	2008	20	0 006638
53	2008	21	0 002389
53	2008	22	0 00301
53	2008	23	0 001941
53	2008	24	0 0014
53	2008	25	0 001053
53	2008	26	0 001075
53	2008	27	0 000559
53	2008	28	0 00031
53	2008	29	0 000179
53	2008	30	0 008605
54	2008	0	0 092048
54	2008	1	0 149226
54	2008	2	0 158572
54	2008	3	0 099082
54	2008	4	0 056977
54	2008	5	0 033563
54	2008	6	0 020198
54	2008	7	0 025524
54	2008	8	0 069639
54	2008	9	0 042909
54	2008	10	0 034669
54	2008	11	0 046526
54	2008	12	0 033061
54	2008	13	0 030138
54	2008	14	0 036854
54	2008	15	0 020274
54	2008	16	0 004587
54	2008	17	0 004591
54	2008	18	0 006362
54	2008	19	0 009049
54	2008	20	0 007043
54	2008	21	0 002525
54	2008	22	0 002703
54	2008	23	0 001719
54	2008	24	0 001069
54	2008	25	0 000675
54	2008	26	0 000432
54	2008	27	0 000338
54	2008	28	0 000212
54	2008	29	0 000131
54	2008	30	0 009302
61	2008	0	0 092019
61	2008	1	0 14918
61	2008	2	0 158522
61	2008	3	0 099051
61	2008	4	0 056959
61	2008	5	0 033553
61	2008	6	0 020192
61	2008	7	0 025516
61	2008	8	0 069617
61	2008	9	0 042895
61	2008	10	0 034658
61	2008	11	0 046512
61	2008	12	0 033051

Source TypeID	YearID	AgeID	AgeFraction
61	2008	13	0 031559
61	2008	14	0 037665
61	2008	15	0 022381
61	2008	16	0 004788
61	2008	17	0 004864
61	2008	18	0 006421
61	2008	19	0 008694
61	2008	20	0 006439
61	2008	21	0 002319
61	2008	22	0 00261
61	2008	23	0 001634
61	2008	24	0 001022
61	2008	25	0 000627
61	2008	26	0 000397
61	2008	27	0 000256
61	2008	28	0 000154
61	2008	29	9 03E-05
61	2008	30	0 006355
62	2008	0	0 091775
62	2008	1	0 148783
62	2008	2	0 158101
62	2008	3	0 098788
62	2008	4	0 056808
62	2008	5	0 033464
62	2008	6	0 020138
62	2008	7	0 025448
62	2008	8	0 069432
62	2008	9	0 042781
62	2008	10	0 034566
62	2008	11	0 046388
62	2008	12	0 032963
62	2008	13	0 031586
62	2008	14	0 03824
62	2008	15	0 022517
62	2008	16	0 004855
62	2008	17	0 004882
62	2008	18	0 006464
62	2008	19	0 00894
62	2008	20	0 006652
62	2008	21	0 002363
62	2008	22	0 002658
62	2008	23	0 00167
62	2008	24	0 001049
62	2008	25	0 000654
62	2008	26	0 000412
62	2008	27	0 000262
62	2008	28	0 000162
62	2008	29	9 96E-05
62	2008	30	0 007099

[IMCoverage]

polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	useIMyn	Compliance Factor
101	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
101	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
101	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
101	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
101	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
101	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
101	4	4013	2008	32	1	3	1967	1980	1	13	N	95 8845
101	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
101	4	4013	2008	32	1	10	1996	2002	2	51	N	95 8845
101	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
102	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
102	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
102	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
102	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
102	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
102	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
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102	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
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102	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
112	4	4013	2008	21	1	8	1996	2002	2	43	N	95 8845
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112	4	4013	2008	31	1	8	1996	2002	2	43	N	95 8845
112	4	4013	2008	31	1	9	1981	1995	1	44	N	95 8845
112	4	4013	2008	32	1	8	1996	2002	2	43	N	95 8845
112	4	4013	2008	32	1	9	1981	1995	1	44	N	95 8845
112	4	4013	2008	52	1	7	1967	2002	1	41	N	95 8845
113	4	4013	2008	21	1	8	1996	2002	2	43	N	95 8845
113	4	4013	2008	21	1	9	1981	1995	1	44	N	95 8845
113	4	4013	2008	31	1	8	1996	2002	2	43	N	95 8845
113	4	4013	2008	31	1	9	1981	1995	1	44	N	95 8845
113	4	4013	2008	32	1	8	1996	2002	2	43	N	95 8845
113	4	4013	2008	32	1	9	1981	1995	1	44	N	95 8845
113	4	4013	2008	52	1	7	1967	2002	1	41	N	95 8845
201	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
201	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
201	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
201	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
201	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
201	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
201	4	4013	2008	32	1	3	1967	1980	1	13	N	95 8845
201	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
201	4	4013	2008	32	1	10	1996	2002	2	51	N	95 8845
201	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
202	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
202	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
202	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
202	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
202	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
202	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
202	4	4013	2008	32	1	3	1967	1980	1	13	N	95 8845
202	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
202	4	4013	2008	32	1	10	1996	2002	2	51	N	95 8845
202	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
301	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
301	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
301	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
301	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
301	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
301	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
301	4	4013	2008	32	1	3	1967	1980	1	13	N	95 8845
301	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
301	4	4013	2008	32	1	10	1996	2002	2	51	N	95 8845
301	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
302	4	4013	2008	21	1	3	1967	1980	1	13	N	95 8845
302	4	4013	2008	21	1	6	1981	1995	2	33	N	95 8845
302	4	4013	2008	21	1	10	1996	2002	2	51	N	95 8845
302	4	4013	2008	31	1	3	1967	1980	1	13	N	95 8845
302	4	4013	2008	31	1	6	1981	1995	2	33	N	95 8845
302	4	4013	2008	31	1	10	1996	2002	2	51	N	95 8845
302	4	4013	2008	32	1	3	1967	1980	1	13	N	95 8845
302	4	4013	2008	32	1	6	1981	1995	2	33	N	95 8845
302	4	4013	2008	32	1	10	1996	2002	2	51	N	95 8845
302	4	4013	2008	52	1	3	1967	2002	1	13	N	95 8845
101	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
101	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12
101	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
101	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
101	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
101	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
101	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
101	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
101	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
101	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20
102	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
102	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12

polProcess ID	State ID	County ID	yearID	sourceTypeID	fuelTypeID	IMProgramID	Beg ModelYearID	End ModelYearID	inspectFreq	Test StandardsID	useIMyn	Compliance Factor
102	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
102	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
102	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
102	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
102	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
102	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
102	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
102	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20
112	4	4013	2008	21	1	108	1996	2004	2	43	Y	83 81
112	4	4013	2008	21	1	109	1981	1995	2	44	Y	64 12
112	4	4013	2008	31	1	108	1996	2004	2	43	Y	83 81
112	4	4013	2008	31	1	109	1981	1995	2	44	Y	64 12
112	4	4013	2008	32	1	108	1996	2004	2	43	Y	83 81
112	4	4013	2008	32	1	109	1981	1995	2	44	Y	64 12
112	4	4013	2008	52	1	107	1981	2004	1	41	Y	86 29
113	4	4013	2008	21	1	108	1996	2004	2	43	Y	83 81
113	4	4013	2008	21	1	109	1981	1995	2	44	Y	64 12
113	4	4013	2008	31	1	108	1996	2004	2	43	Y	83 81
113	4	4013	2008	31	1	109	1981	1995	2	44	Y	64 12
113	4	4013	2008	32	1	108	1996	2004	2	43	Y	83 81
113	4	4013	2008	32	1	109	1981	1995	2	44	Y	64 12
113	4	4013	2008	52	1	107	1981	2004	1	41	Y	86 29
201	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
201	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12
201	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
201	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
201	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
201	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
201	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
201	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
201	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
201	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20
202	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
202	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12
202	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
202	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
202	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
202	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
202	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
202	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
202	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
202	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20
301	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
301	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12
301	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
301	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
301	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
301	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
301	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
301	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
301	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
301	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20
302	4	4013	2008	21	1	103	1967	1980	1	13	Y	57 62
302	4	4013	2008	21	1	106	1981	1995	2	31	Y	64 12
302	4	4013	2008	21	1	110	1996	2004	2	51	Y	90 04
302	4	4013	2008	31	1	103	1967	1980	1	13	Y	57 62
302	4	4013	2008	31	1	106	1981	1995	2	31	Y	64 12
302	4	4013	2008	31	1	110	1996	2004	2	51	Y	90 04
302	4	4013	2008	32	1	103	1967	1980	1	13	Y	57 62
302	4	4013	2008	32	1	106	1981	1995	2	31	Y	64 12
302	4	4013	2008	32	1	110	1996	2004	2	51	Y	90 04
302	4	4013	2008	52	1	103	1967	2004	1	13	Y	87 20

[RoadType]

roadTypeID	rampFraction
2	0 045682
4	0 083288

[RoadTypeDistribution]

sourceTypeID	roadTypeID	roadTypeVMTFraction
11	1	0 00000
11	2	0 02735
11	3	0 05584
11	4	0 32284
11	5	0 59397
21	1	0 00000
21	2	0 03230
21	3	0 05044
21	4	0 31932
21	5	0 59794
31	1	0 00000
31	2	0 03350
31	3	0 05453
31	4	0 31647
31	5	0 59550
32	1	0 00000
32	2	0 03350
32	3	0 05453
32	4	0 31647
32	5	0 59550
41	1	0 00000
41	2	0 03009
41	3	0 06747
41	4	0 34506
41	5	0 55738
42	1	0 00000
42	2	0 03009
42	3	0 06747
42	4	0 34506
42	5	0 55738
43	1	0 00000
43	2	0 03009
43	3	0 06747
43	4	0 34506
43	5	0 55738
51	1	0 00000
51	2	0 04027
51	3	0 03530
51	4	0 49257
51	5	0 43186
52	1	0 00000
52	2	0 04027
52	3	0 03530
52	4	0 49257
52	5	0 43186
53	1	0 00000
53	2	0 04027
53	3	0 03530
53	4	0 49257
53	5	0 43186
54	1	0 00000
54	2	0 04027
54	3	0 03530
54	4	0 49257
54	5	0 43186
61	1	0 00000
61	2	0 07566
61	3	0 04041
61	4	0 50755
61	5	0 37638
62	1	0 00000
62	2	0 07566
62	3	0 04041
62	4	0 50755
62	5	0 37638

[MonthVMTFraction]

sourceTypeID	isLeapYear	monthID	monthVMTFraction
11	Y	12	0 083229
21	Y	12	0 083229
31	Y	12	0 083229
32	Y	12	0 083229
41	Y	12	0 083229
42	Y	12	0 083229
43	Y	12	0 083229
51	Y	12	0 083229
52	Y	12	0 083229
53	Y	12	0 083229
54	Y	12	0 083229
61	Y	12	0 083229
62	Y	12	0 083229

[DayVMTFraction]

Source TypeID	Month ID	Road TypeID	dayID	Day VMTFraction
11	12	1	5	0 767488
21	12	1	5	0 767488
31	12	1	5	0 767488
32	12	1	5	0 767488
41	12	1	5	0 767488
42	12	1	5	0 767488
43	12	1	5	0 767488
51	12	1	5	0 767488
52	12	1	5	0 767488
53	12	1	5	0 767488
54	12	1	5	0 767488
61	12	1	5	0 767488
62	12	1	5	0 767488
11	12	2	5	0 768458
21	12	2	5	0 768458
31	12	2	5	0 768458
32	12	2	5	0 768458
41	12	2	5	0 768458
42	12	2	5	0 768458
43	12	2	5	0 768458
51	12	2	5	0 768458
52	12	2	5	0 768458
53	12	2	5	0 768458
54	12	2	5	0 768458
61	12	2	5	0 768458
62	12	2	5	0 768458
11	12	3	5	0 766507
21	12	3	5	0 766507
31	12	3	5	0 766507
32	12	3	5	0 766507
41	12	3	5	0 766507
42	12	3	5	0 766507
43	12	3	5	0 766507
51	12	3	5	0 766507
52	12	3	5	0 766507
53	12	3	5	0 766507
54	12	3	5	0 766507
61	12	3	5	0 766507
62	12	3	5	0 766507
11	12	4	5	0 768458
21	12	4	5	0 768458
31	12	4	5	0 768458
32	12	4	5	0 768458
41	12	4	5	0 768458
42	12	4	5	0 768458
43	12	4	5	0 768458
51	12	4	5	0 768458
52	12	4	5	0 768458
53	12	4	5	0 768458
54	12	4	5	0 768458
61	12	4	5	0 768458
62	12	4	5	0 768458
11	12	5	5	0 766507
21	12	5	5	0 766507
31	12	5	5	0 766507
32	12	5	5	0 766507
41	12	5	5	0 766507
42	12	5	5	0 766507
43	12	5	5	0 766507
51	12	5	5	0 766507
52	12	5	5	0 766507
53	12	5	5	0 766507
54	12	5	5	0 766507
61	12	5	5	0 766507
62	12	5	5	0 766507
11	12	1	2	0 232512
21	12	1	2	0 232512
31	12	1	2	0 232512
32	12	1	2	0 232512
41	12	1	2	0 232512
42	12	1	2	0 232512
43	12	1	2	0 232512
51	12	1	2	0 232512
52	12	1	2	0 232512
53	12	1	2	0 232512
54	12	1	2	0 232512
61	12	1	2	0 232512
62	12	1	2	0 232512
11	12	2	2	0 231542
21	12	2	2	0 231542
31	12	2	2	0 231542
32	12	2	2	0 231542
41	12	2	2	0 231542
42	12	2	2	0 231542
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53	12	2	2	0 231542
54	12	2	2	0 231542
61	12	2	2	0 231542
62	12	2	2	0 231542
11	12	3	2	0 233493
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31	12	3	2	0 233493
32	12	3	2	0 233493
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42	12	3	2	0 233493
43	12	3	2	0 233493
51	12	3	2	0 233493
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53	12	3	2	0 233493
54	12	3	2	0 233493
61	12	3	2	0 233493
62	12	3	2	0 233493
11	12	4	2	0 231542
21	12	4	2	0 231542
31	12	4	2	0 231542
32	12	4	2	0 231542
41	12	4	2	0 231542
42	12	4	2	0 231542
43	12	4	2	0 231542
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42	12	5	2	0 233493
43	12	5	2	0 233493
51	12	5	2	0 233493
52	12	5	2	0 233493
53	12	5	2	0 233493
54	12	5	2	0 233493
61	12	5	2	0 233493
62	12	5	2	0 233493

[HourVMTFraction] (SourceTypeID 21: Passenger Car)

Source TypeID	Road TypeID	dayID	hourID	hourVMT Fraction
21	1	5	1	0 007957
21	1	5	2	0 005448
21	1	5	3	0 004973
21	1	5	4	0 006014
21	1	5	5	0 013468
21	1	5	6	0 034281
21	1	5	7	0 054676
21	1	5	8	0 06466
21	1	5	9	0 060292
21	1	5	10	0 052697
21	1	5	11	0 050973
21	1	5	12	0 054873
21	1	5	13	0 057626
21	1	5	14	0 059009
21	1	5	15	0 064762
21	1	5	16	0 06924
21	1	5	17	0 070039
21	1	5	18	0 07009
21	1	5	19	0 05904
21	1	5	20	0 04192
21	1	5	21	0 033428
21	1	5	22	0 029157
21	1	5	23	0 02144
21	1	5	24	0 013936
21	2	5	1	0 009807
21	2	5	2	0 006923
21	2	5	3	0 00651
21	2	5	4	0 007961
21	2	5	5	0 017302
21	2	5	6	0 042783
21	2	5	7	0 060321
21	2	5	8	0 059377
21	2	5	9	0 057361
21	2	5	10	0 055026
21	2	5	11	0 052104
21	2	5	12	0 05478
21	2	5	13	0 05683
21	2	5	14	0 059985
21	2	5	15	0 065538
21	2	5	16	0 065523
21	2	5	17	0 061668
21	2	5	18	0 059173
21	2	5	19	0 054281
21	2	5	20	0 040837
21	2	5	21	0 033031
21	2	5	22	0 030836
21	2	5	23	0 024921
21	2	5	24	0 017121
21	3	5	1	0 006081
21	3	5	2	0 003952
21	3	5	3	0 003413
21	3	5	4	0 004039
21	3	5	5	0 009578
21	3	5	6	0 025656
21	3	5	7	0 04895
21	3	5	8	0 07002
21	3	5	9	0 063264
21	3	5	10	0 050335
21	3	5	11	0 049826
21	3	5	12	0 054967
21	3	5	13	0 058433
21	3	5	14	0 058019
21	3	5	15	0 063976
21	3	5	16	0 073011
21	3	5	17	0 07853
21	3	5	18	0 081166
21	3	5	19	0 063868
21	3	5	20	0 043018
21	3	5	21	0 033831
21	3	5	22	0 027454
21	3	5	23	0 017909
21	3	5	24	0 010705
21	4	5	1	0 009807
21	4	5	2	0 006923
21	4	5	3	0 00651
21	4	5	4	0 007961
21	4	5	5	0 017302
21	4	5	6	0 042783
21	4	5	7	0 060321
21	4	5	8	0 059377
21	4	5	9	0 057361
21	4	5	10	0 055026
21	4	5	11	0 052104
21	4	5	12	0 05478
21	4	5	13	0 05683
21	4	5	14	0 059985
21	4	5	15	0 065538
21	4	5	16	0 065523
21	4	5	17	0 061668
21	4	5	18	0 059173
21	4	5	19	0 054281
21	4	5	20	0 040837
21	4	5	21	0 033031
21	4	5	22	0 030836
21	4	5	23	0 024921
21	4	5	24	0 017121
21	5	5	1	0 006081
21	5	5	2	0 003952
21	5	5	3	0 003413
21	5	5	4	0 004039
21	5	5	5	0 009578
21	5	5	6	0 025656
21	5	5	7	0 04895
21	5	5	8	0 07002
21	5	5	9	0 063264
21	5	5	10	0 050335
21	5	5	11	0 049826
21	5	5	12	0 054967
21	5	5	13	0 058433
21	5	5	14	0 058019
21	5	5	15	0 063976
21	5	5	16	0 073011
21	5	5	17	0 07853
21	5	5	18	0 081166
21	5	5	19	0 063868
21	5	5	20	0 043018
21	5	5	21	0 033831
21	5	5	22	0 027454
21	5	5	23	0 017909
21	5	5	24	0 010705
21	1	2	1	0 020872
21	1	2	2	0 014804
21	1	2	3	0 013016
21	1	2	4	0 010079
21	1	2	5	0 011715
21	1	2	6	0 018691
21	1	2	7	0 027033
21	1	2	8	0 033174
21	1	2	9	0 040089
21	1	2	10	0 048519
21	1	2	11	0 05524
21	1	2	12	0 060009
21	1	2	13	0 064796
21	1	2	14	0 06555
21	1	2	15	0 064719
21	1	2	16	0 064355
21	1	2	17	0 064852
21	1	2	18	0 064713
21	1	2	19	0 061678
21	1	2	20	0 050477
21	1	2	21	0 043519
21	1	2	22	0 040777
21	1	2	23	0 035718
21	1	2	24	0 025605
21	2	2	1	0 020431
21	2	2	2	0 014508
21	2	2	3	0 012577
21	2	2	4	0 009828
21	2	2	5	0 011013
21	2	2	6	0 01751
21	2	2	7	0 025995
21	2	2	8	0 031456
21	2	2	9	0 038799
21	2	2	10	0 047714
21	2	2	11	0 054712
21	2	2	12	0 060251
21	2	2	13	0 065575
21	2	2	14	0 066506
21	2	2	15	0 065746
21	2	2	16	0 065312
21	2	2	17	0 065948
21	2	2	18	0 066767
21	2	2	19	0 064137
21	2	2	20	0 050196
21	2	2	21	0 042573
21	2	2	22	0 040589
21	2	2	23	0 036012
21	2	2	24	0 025845
21	3	2	1	0 021315
21	3	2	2	0 015101
21	3	2	3	0 013457
21	3	2	4	0 010331
21	3	2	5	0 01242
21	3	2	6	0 019876
21	3	2	7	0 028075
21	3	2	8	0 034899
21	3	2	9	0 041383
21	3	2	10	0 049326
21	3	2	11	0 05577
21	3	2	12	0 059766
21	3	2	13	0 064014
21	3	2	14	0 064591
21	3	2	15	0 063689
21	3	2	16	0 063394
21	3	2	17	0 063753
21	3	2	18	0 062652
21	3	2	19	0 05921
21	3	2	20	0 050759
21	3	2	21	0 044469
21	3	2	22	0 040966
21	3	2	23	0 035423
21	3	2	24	0 025364
21	4	2	1	0 020431
21	4	2	2	0 014508
21	4	2	3	0 012577
21	4	2	4	0 009828
21	4	2	5	0 011013
21	4	2	6	0 01751
21	4	2	7	0 025995
21	4	2	8	0 031456
21	4	2	9	0 038799
21	4	2	10	0 047714
21	4	2	11	0 054712
21	4	2	12	0 060251
21	4	2	13	0 065575
21	4	2	14	0 066506
21	4	2	15	0 065746
21	4	2	16	0 065312
21	4	2	17	0 065948
21	4	2	18	0 066767
21	4	2	19	0 064137
21	4	2	20	0 050196
21	4	2	21	0 042573
21	4	2	22	0 040589
21	4	2	23	0 036012
21	4	2	24	0 025845
21	5	2	1	0 021315
21	5	2	2	0 015101
21	5	2	3	0 013457
21	5	2	4	0 010331
21	5	2	5	0 01242
21	5	2	6	0 019876
21	5	2	7	0 028075
21	5	2	8	0 034899
21	5	2	9	0 041383
21	5	2	10	0 049326
21	5	2	11	0 05577
21	5	2	12	0 059766
21	5	2	13	0 064014
21	5	2	14	0 064591
21	5	2	15	0 063689
21	5	2	16	0 063394
21	5	2	17	0 063753
21	5	2	18	0 062652
21	5	2	19	0 05921
21	5	2	20	0 050759
21	5	2	21	0 044469
21	5	2	22	0 040966
21	5	2	23	0 035423
21	5	2	24	0 025364

[AvgSpeedDistribution] (SourceTypeID 21: Passenger Car and RoadTypeID 2: Rural Restricted Access)

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	2	15	1	0
21	2	15	2	0
21	2	15	3	0
21	2	15	4	0
21	2	15	5	0
21	2	15	6	0 01422
21	2	15	7	0 053944
21	2	15	8	0 132021
21	2	15	9	0 214344
21	2	15	10	0 212627
21	2	15	11	0 017683
21	2	15	12	0 090462
21	2	15	13	0 057688
21	2	15	14	0 062161
21	2	15	15	0 062758
21	2	15	16	0 082091
21	2	25	1	0
21	2	25	2	0
21	2	25	3	0
21	2	25	4	0
21	2	25	5	0
21	2	25	6	0 01422
21	2	25	7	0 053944
21	2	25	8	0 132021
21	2	25	9	0 214344
21	2	25	10	0 212627
21	2	25	11	0 017683
21	2	25	12	0 090462
21	2	25	13	0 057688
21	2	25	14	0 062161
21	2	25	15	0 062758
21	2	25	16	0 082091
21	2	35	1	0
21	2	35	2	0
21	2	35	3	0
21	2	35	4	0
21	2	35	5	0
21	2	35	6	0 01422
21	2	35	7	0 053944
21	2	35	8	0 132021
21	2	35	9	0 214344
21	2	35	10	0 212627
21	2	35	11	0 017683
21	2	35	12	0 090462
21	2	35	13	0 057688
21	2	35	14	0 062161
21	2	35	15	0 062758
21	2	35	16	0 082091
21	2	45	1	0
21	2	45	2	0
21	2	45	3	0
21	2	45	4	0
21	2	45	5	0
21	2	45	6	0 01422
21	2	45	7	0 053944
21	2	45	8	0 132021
21	2	45	9	0 214344
21	2	45	10	0 212627
21	2	45	11	0 017683
21	2	45	12	0 090462
21	2	45	13	0 057688
21	2	45	14	0 062161
21	2	45	15	0 062758
21	2	45	16	0 082091
21	2	55	1	0
21	2	55	2	0
21	2	55	3	0
21	2	55	4	0
21	2	55	5	0
21	2	55	6	0 01422
21	2	55	7	0 053944
21	2	55	8	0 132021
21	2	55	9	0 214344
21	2	55	10	0 212627
21	2	55	11	0 017683
21	2	55	12	0 090462
21	2	55	13	0 057688
21	2	55	14	0 062161
21	2	55	15	0 062758
21	2	55	16	0 082091

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	2	65	1	0
21	2	65	2	0
21	2	65	3	0
21	2	65	4	0
21	2	65	5	0
21	2	65	6	0 01422
21	2	65	7	0 053944
21	2	65	8	0 132021
21	2	65	9	0 214344
21	2	65	10	0 212627
21	2	65	11	0 017683
21	2	65	12	0 090462
21	2	65	13	0 057688
21	2	65	14	0 062161
21	2	65	15	0 062758
21	2	65	16	0 082091
21	2	75	1	0
21	2	75	2	0
21	2	75	3	0
21	2	75	4	0
21	2	75	5	0
21	2	75	6	0 001175
21	2	75	7	0 024471
21	2	75	8	0
21	2	75	9	0 028037
21	2	75	10	0 157024
21	2	75	11	0 229013
21	2	75	12	0 175926
21	2	75	13	0 121128
21	2	75	14	0 0313
21	2	75	15	0 098442
21	2	75	16	0 133484
21	2	85	1	0
21	2	85	2	0
21	2	85	3	0
21	2	85	4	0
21	2	85	5	0
21	2	85	6	0 001175
21	2	85	7	0 024471
21	2	85	8	0
21	2	85	9	0 028037
21	2	85	10	0 157024
21	2	85	11	0 229013
21	2	85	12	0 175926
21	2	85	13	0 121128
21	2	85	14	0 0313
21	2	85	15	0 098442
21	2	85	16	0 133484
21	2	95	1	0
21	2	95	2	0
21	2	95	3	0
21	2	95	4	0
21	2	95	5	0
21	2	95	6	0 001175
21	2	95	7	0 024471
21	2	95	8	0
21	2	95	9	0 028037
21	2	95	10	0 157024
21	2	95	11	0 229013
21	2	95	12	0 175926
21	2	95	13	0 121128
21	2	95	14	0 0313
21	2	95	15	0 098442
21	2	95	16	0 133484
21	2	105	1	0
21	2	105	2	0
21	2	105	3	0
21	2	105	4	0
21	2	105	5	0
21	2	105	6	0
21	2	105	7	0
21	2	105	8	0 031691
21	2	105	9	0 07915
21	2	105	10	0 241444
21	2	105	11	0 173603
21	2	105	12	0 036762
21	2	105	13	0 09423
21	2	105	14	0 147891
21	2	105	15	0 079495
21	2	105	16	0 115733

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	2	115	1	0
21	2	115	2	0
21	2	115	3	0
21	2	115	4	0
21	2	115	5	0
21	2	115	6	0
21	2	115	7	0
21	2	115	8	0 031691
21	2	115	9	0 07915
21	2	115	10	0 241444
21	2	115	11	0 173603
21	2	115	12	0 036762
21	2	115	13	0 09423
21	2	115	14	0 147891
21	2	115	15	0 079495
21	2	115	16	0 115733
21	2	125	1	0
21	2	125	2	0
21	2	125	3	0
21	2	125	4	0
21	2	125	5	0
21	2	125	6	0
21	2	125	7	0
21	2	125	8	0 031691
21	2	125	9	0 07915
21	2	125	10	0 241444
21	2	125	11	0 173603
21	2	125	12	0 036762
21	2	125	13	0 09423
21	2	125	14	0 147891
21	2	125	15	0 079495
21	2	125	16	0 115733
21	2	135	1	0
21	2	135	2	0
21	2	135	3	0
21	2	135	4	0
21	2	135	5	0
21	2	135	6	0
21	2	135	7	0
21	2	135	8	0 031691
21	2	135	9	0 07915
21	2	135	10	0 241444
21	2	135	11	0 173603
21	2	135	12	0 036762
21	2	135	13	0 09423
21	2	135	14	0 147891
21	2	135	15	0 079495
21	2	135	16	0 115733
21	2	145	1	0
21	2	145	2	0
21	2	145	3	0
21	2	145	4	0
21	2	145	5	0
21	2	145	6	0
21	2	145	7	0
21	2	145	8	0 031691
21	2	145	9	0 07915
21	2	145	10	0 241444
21	2	145	11	0 173603
21	2	145	12	0 036762
21	2	145	13	0 09423
21	2	145	14	0 147891
21	2	145	15	0 079495
21	2	145	16	0 115733
21	2	155	1	0
21	2	155	2	0
21	2	155	3	0
21	2	155	4	0
21	2	155	5	0
21	2	155	6	0
21	2	155	7	0
21	2	155	8	0 031691
21	2	155	9	0 07915
21	2	155	10	0 241444
21	2	155	11	0 173603
21	2	155	12	0 036762
21	2	155	13	0 09423
21	2	155	14	0 147891
21	2	155	15	0 079495
21	2	155	16	0 115733

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	2	165	1	0
21	2	165	2	0
21	2	165	3	0
21	2	165	4	0
21	2	165	5	0
21	2	165	6	0
21	2	165	7	0
21	2	165	8	0
21	2	165	9	0
21	2	165	10	0
21	2	165	11	0
21	2	165	12	0 03945
21	2	165	13	0 172863
21	2	165	14	0 286538
21	2	165	15	0 263991
21	2	165	16	0 237157
21	2	175	1	0
21	2	175	2	0
21	2	175	3	0
21	2	175	4	0
21	2	175	5	0
21	2	175	6	0
21	2	175	7	0
21	2	175	8	0
21	2	175	9	0
21	2	175	10	0
21	2	175	11	0
21	2	175	12	0 03945
21	2	175	13	0 172863
21	2	175	14	0 286538
21	2	175	15	0 263991
21	2	175	16	0 237157
21	2	185	1	0
21	2	185	2	0
21	2	185	3	0
21	2	185	4	0
21	2	185	5	0
21	2	185	6	0
21	2	185	7	0
21	2	185	8	0
21	2	185	9	0
21	2	185	10	0
21	2	185	11	0
21	2	185	12	0 03945
21	2	185	13	0 172863
21	2	185	14	0 286538
21	2	185	15	0 263991
21	2	185	16	0 237157
21	2	195	1	0
21	2	195	2	0
21	2	195	3	0
21	2	195	4	0
21	2	195	5	0
21	2	195	6	0 01422
21	2	195	7	0 053944
21	2	195	8	0 132021
21	2	195	9	0 214344
21	2	195	10	0 212627
21	2	195	11	0 017683
21	2	195	12	0 090462
21	2	195	13	0 057688
21	2	195	14	0 062161
21	2	195	15	0 062758
21	2	195	16	0 082091
21	2	205	1	0
21	2	205	2	0
21	2	205	3	0
21	2	205	4	0
21	2	205	5	0
21	2	205	6	0 01422
21	2	205	7	0 053944
21	2	205	8	0 132021
21	2	205	9	0 214344
21	2	205	10	0 212627
21	2	205	11	0 017683
21	2	205	12	0 090462
21	2	205	13	0 057688
21	2	205	14	0 062161
21	2	205	15	0 062758
21	2	205	16	0 082091
21	2	215	1	0
21	2	215	2	0
21	2	215	3	0
21	2	215	4	0
21	2	215	5	0
21	2	215	6	0 01422
21	2	215	7	0 053944
21	2	215	8	0 132021
21	2	215	9	0 214344
21	2	215	10	0 212627
21	2	215	11	0 017683
21	2	215	12	0 090462
21	2	215	13	0 057688
21	2	215	14	0 062161
21	2	215	15	0 062758
21	2	215	16	0 082091
21	2	225	1	0
21	2	225	2	0
21	2	225	3	0
21	2	225	4	0
21	2	225	5	0
21	2	225	6	0 01422
21	2	225	7	0 053944
21	2	225	8	0 132021
21	2	225	9	0 214344
21	2	225	10	0 212627
21	2	225	11	0 017683
21	2	225	12	0 090462
21	2	225	13	0 057688
21	2	225	14	0 062161
21	2	225	15	0 062758
21	2	225	16	0 082091
21	2	235	1	0
21	2	235	2	0
21	2	235	3	0
21	2	235	4	0
21	2	235	5	0
21	2	235	6	0 01422
21	2	235	7	0 053944
21	2	235	8	0 132021
21	2	235	9	0 214344
21	2	235	10	0 212627
21	2	235	11	0 017683
21	2	235	12	0 090462
21	2	235	13	0 057688
21	2	235	14	0 062161
21	2	235	15	0 062758
21	2	235	16	0 082091
21	2	245	1	0
21	2	245	2	0
21	2	245	3	0
21	2	245	4	0
21	2	245	5	0
21	2	245	6	0 01422
21	2	245	7	0 053944
21	2	245	8	0 132021
21	2	245	9	0 214344
21	2	245	10	0 212627
21	2	245	11	0 017683
21	2	245	12	0 090462
21	2	245	13	0 057688
21	2	245	14	0 062161
21	2	245	15	0 062758
21	2	245	16	0 082091
21	2	12	1	0
21	2	12	2	0
21	2	12	3	0
21	2	12	4	0
21	2	12	5	0
21	2	12	6	0 01422
21	2	12	7	0 053944
21	2	12	8	0 132021
21	2	12	9	0 214344
21	2	12	10	0 212627
21	2	12	11	0 017683
21	2	12	12	0 090462
21	2	12	13	0 057688
21	2	12	14	0 062161
21	2	12	15	0 062758
21	2	12	16	0 082091
21	2	22	1	0
21	2	22	2	0
21	2	22	3	0
21	2	22	4	0
21	2	22	5	0
21	2	22	6	0 01422
21	2	22	7	0 053944
21	2	22	8	0 132021
21	2	22	9	0 214344
21	2	22	10	0 212627
21	2	22	11	0 017683
21	2	22	12	0 090462
21	2	22	13	0 057688
21	2	22	14	0 062161
21	2	22	15	0 062758
21	2	22	16	0 082091
21	2	32	1	0
21	2	32	2	0
21	2	32	3	0
21	2	32	4	0
21	2	32	5	0
21	2	32	6	0 01422
21	2	32	7	0 053944
21	2	32	8	0 132021
21	2	32	9	0 214344
21	2	32	10	0 212627
21	2	32	11	0 017683
21	2	32	12	0 090462
21	2	32	13	0 057688
21	2	32	14	0 062161
21	2	32	15	0 062758
21	2	32	16	0 082091
21	2	42	1	0
21	2	42	2	0
21	2	42	3	0
21	2	42	4	0
21	2	42	5	0
21	2	42	6	0 01422
21	2	42	7	0 053944
21	2	42	8	0 132021
21	2	42	9	0 214344
21	2	42	10	0 212627
21	2	42	11	0 017683
21	2	42	12	0 090462
21	2	42	13	0 057688
21	2	42	14	0 062161
21	2	42	15	0 062758
21	2	42	16	0 082091
21	2	52	1	0
21	2	52	2	0
21	2	52	3	0
21	2	52	4	0
21	2	52	5	0
21	2	52	6	0 01422
21	2	52	7	0 053944
21	2	52	8	0 132021
21	2	52	9	0 214344
21	2	52	10	0 212627
21	2	52	11	0 017683
21	2	52	12	0 090462
21	2	52	13	0 057688
21	2	52	14	0 062161
21	2	52	15	0 062758
21	2	52	16	0 082091
21	2	62	1	0
21	2	62	2	0
21	2	62	3	0
21	2	62	4	0
21	2	62	5	0
21	2	62	6	0 01422
21	2	62	7	0 053944
21	2	62	8	0 132021
21	2	62	9	0 214344
21	2	62	10	0 212627
21	2	62	11	0 017683
21	2	62	12	0 090462
21	2	62	13	0 057688
21	2	62	14	0 062161
21	2	62	15	0 062758
21	2	62	16	0 082091
21	2	72	1	0
21	2	72	2	0
21	2	72	3	0
21	2	72	4	0
21	2	72	5	0
21	2	72	6	0 01422

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
21	2	72	7	0 053944
21	2	72	8	0 132021
21	2	72	9	0 214344
21	2	72	10	0 212627
21	2	72	11	0 017683
21	2	72	12	0 090462
21	2	72	13	0 057688
21	2	72	14	0 062161
21	2	72	15	0 062758
21	2	72	16	0 082091
21	2	82	1	0
21	2	82	2	0
21	2	82	3	0
21	2	82	4	0
21	2	82	5	0
21	2	82	6	0 01422
21	2	82	7	0 053944
21	2	82	8	0 132021
21	2	82	9	0 214344
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21	2	82	11	0 017683
21	2	82	12	0 090462
21	2	82	13	0 057688
21	2	82	14	0 062161
21	2	82	15	0 062758
21	2	82	16	0 082091
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21	2	92	4	0
21	2	92	5	0
21	2	92	6	0 01422
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21	2	92	10	0 212627
21	2	92	11	0 017683
21	2	92	12	0 090462
21	2	92	13	0 057688
21	2	92	14	0 062161
21	2	92	15	0 062758
21	2	92	16	0 082091
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21	2	102	6	0 01422
21	2	102	7	0 053944
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21	2	102	9	0 214344
21	2	102	10	0 212627
21	2	102	11	0 017683
21	2	102	12	0 090462
21	2	102	13	0 057688
21	2	102	14	0 062161
21	2	102	15	0 062758
21	2	102	16	0 082091
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21	2	112	2	0
21	2	112	3	0
21	2	112	4	0
21	2	112	5	0
21	2	112	6	0 01422
21	2	112	7	0 053944
21	2	112	8	0 132021
21	2	112	9	0 214344
21	2	112	10	0 212627
21	2	112	11	0 017683
21	2	112	12	0 090462
21	2	112	13	0 057688
21	2	112	14	0 062161
21	2	112	15	0 062758
21	2	112	16	0 082091
21	2	122	1	0
21	2	122	2	0
21	2	122	3	0
21	2	122	4	0
21	2	122	5	0
21	2	122	6	0 01422
21	2	122	7	0 053944
21	2	122	8	0 132021

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
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21	2	122	11	0 017683
21	2	122	12	0 090462
21	2	122	13	0 057688
21	2	122	14	0 062161
21	2	122	15	0 062758
21	2	122	16	0 082091
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21	2	132	2	0
21	2	132	3	0
21	2	132	4	0
21	2	132	5	0
21	2	132	6	0 01422
21	2	132	7	0 053944
21	2	132	8	0 132021
21	2	132	9	0 214344
21	2	132	10	0 212627
21	2	132	11	0 017683
21	2	132	12	0 090462
21	2	132	13	0 057688
21	2	132	14	0 062161
21	2	132	15	0 062758
21	2	132	16	0 082091
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21	2	142	3	0
21	2	142	4	0
21	2	142	5	0
21	2	142	6	0 01422
21	2	142	7	0 053944
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21	2	142	10	0 212627
21	2	142	11	0 017683
21	2	142	12	0 090462
21	2	142	13	0 057688
21	2	142	14	0 062161
21	2	142	15	0 062758
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21	2	152	3	0
21	2	152	4	0
21	2	152	5	0
21	2	152	6	0 01422
21	2	152	7	0 053944
21	2	152	8	0 132021
21	2	152	9	0 214344
21	2	152	10	0 212627
21	2	152	11	0 017683
21	2	152	12	0 090462
21	2	152	13	0 057688
21	2	152	14	0 062161
21	2	152	15	0 062758
21	2	152	16	0 082091
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21	2	162	2	0
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21	2	162	4	0
21	2	162	5	0
21	2	162	6	0 01422
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21	2	162	13	0 057688
21	2	162	14	0 062161
21	2	162	15	0 062758
21	2	162	16	0 082091
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21	2	172	4	0
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21	2	172	6	0 01422
21	2	172	7	0 053944
21	2	172	8	0 132021
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21	2	172	10	0 212627

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
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21	2	172	15	0 062758
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21	2	182	5	0
21	2	182	6	0 01422
21	2	182	7	0 053944
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21	2	182	14	0 062161
21	2	182	15	0 062758
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21	2	192	5	0
21	2	192	6	0 01422
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21	2	192	11	0 017683
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21	2	192	14	0 062161
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21	2	202	5	0
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21	2	202	10	0 212627
21	2	202	11	0 017683
21	2	202	12	0 090462
21	2	202	13	0 057688
21	2	202	14	0 062161
21	2	202	15	0 062758
21	2	202	16	0 082091
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21	2	212	4	0
21	2	212	5	0
21	2	212	6	0 01422
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21	2	212	14	0 062161
21	2	212	15	0 062758
21	2	212	16	0 082091
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21	2	222	2	0
21	2	222	3	0
21	2	222	4	0
21	2	222	5	0
21	2	222	6	0 01422
21	2	222	7	0 053944
21	2	222	8	0 132021
21	2	222	9	0 214344
21	2	222	10	0 212627
21	2	222	11	0 017683
21	2	222	12	0 090462

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
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21	2	222	14	0 062161
21	2	222	15	0 062758
21	2	222	16	0 082091
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21	2	232	3	0
21	2	232	4	0
21	2	232	5	0
21	2	232	6	0 01422
21	2	232	7	0 053944
21	2	232	8	0 132021

Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
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21	2	232	11	0 017683
21	2	232	12	0 090462
21	2	232	13	0 057688
21	2	232	14	0 062161
21	2	232	15	0 062758
21	2	232	16	0 082091
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21	2	242	2	0
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Source TypeID	Road TypeID	Hour DayID	avgSpeed BinID	avgSpeed Fraction
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21	2	242	6	0 01422
21	2	242	7	0 053944
21	2	242	8	0 132021
21	2	242	9	0 214344
21	2	242	10	0 212627
21	2	242	11	0 017683
21	2	242	12	0 090462
21	2	242	13	0 057688
21	2	242	14	0 062161
21	2	242	15	0 062758
21	2	242	16	0 082091

[AVFT] (SourceTypeID 42: Transit Bus)

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42	1962	2	1	1
42	1963	2	1	1
42	1964	2	1	1
42	1965	2	1	1
42	1966	2	1	1
42	1967	2	1	1
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42	1990	2	1	0 993
42	1990	3	1	0 007
42	1991	2	1	0 982
42	1991	3	1	0 018
42	1992	1	1	0 01
42	1992	2	1	0 944
42	1992	3	1	0 046
42	1993	1	1	0 01
42	1993	2	1	0 914
42	1993	3	1	0 076
42	1994	1	1	0 01
42	1994	2	1	0 905
42	1994	3	1	0 085
42	1995	1	1	0 01
42	1995	2	1	0 837
42	1995	3	1	0 153
42	1996	1	1	0 01
42	1996	2	1	0 892
42	1996	3	1	0 098
42	1997	1	1	0
42	1997	2	1	1
42	1997	3	1	0
42	1998	1	1	0
42	1998	2	1	0
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42	2002	1	1	0
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42	2003	1	1	0
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42	2003	3	1	0 92
42	2004	1	1	0
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42	2004	3	1	0 602941
42	2005	1	1	0
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42	2005	3	1	0
42	2006	1	1	0 089744
42	2006	2	1	0 128205
42	2006	3	1	0 782051
42	2007	1	1	0 149533
42	2007	2	1	0 850467
42	2007	3	1	0
42	2008	1	1	0
42	2008	2	1	0 479592
42	2008	3	1	0 520408
42	2009	1	1	0 121212
42	2009	2	1	0 030303
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42	2018	1	1	0
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42	2022	3	1	0
42	2023	1	1	0
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42	2023	3	1	0
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42	2028	2	1	1
42	2028	3	1	0
42	2029	1	1	0
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42	2036	3	1	0
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42	2038	2	1	1
42	2038	3	1	0
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42	2040	2	1	1
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42	2045	2	1	1
42	2045	3	1	0
42	2046	1	1	0
42	2046	2	1	1
42	2046	3	1	0
42	2047	1	1	0
42	2047	2	1	1
42	2047	3	1	0
42	2048	1	1	0
42	2048	2	1	1
42	2048	3	1	0
42	2049	1	1	0
42	2049	2	1	1
42	2049	3	1	0
42	2050	1	1	0
42	2050	2	1	1
42	2050	3	1	0

APPENDIX A

EXHIBIT 2

Technical Support Document in Support of the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. March 2013.

TECHNICAL SUPPORT DOCUMENT

IN SUPPORT OF

THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

MARCH 2013

Maricopa Association of Governments
302 North 1st Avenue, Suite 300
Phoenix, Arizona 85003

MARICOPA ASSOCIATION of GOVERNMENTS

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ACRONYMS AND ABBREVIATIONS

Acronyms

AC	Air Commercial
ADOT	Arizona Department of Transportation
ADEQ	Arizona Department of Environmental Quality
AERMET	AERMOD Meteorological Preprocessor
AERR	Annual Emissions Reporting Requirements
AFB	Air Force Base
APM	Aviation Performance Metrics
APU	Auxiliary Power Unit
AQS	Air Quality System
ASOS	Automated Surface Observing System
AT	Air Taxi
ATADS	Air Traffic Activity Data System
AVFT	Alternative Vehicle and Fuel Technologies
BNSF	Burlington Northern/Santa Fe Railway
CAAA	Clean Air Act Amendments
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CTOC	Cap and Trade Oversight Committee
EDMS	Emissions and Dispersion Modeling System
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESRL	Earth System Research Laboratory
ETMSC	Enhanced Traffic Management System Counts
FAA	Federal Aviation Administration
FR	Federal Register
GA	General Aviation
GSE	Ground Support Equipment
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
KPHX	Phoenix Sky Harbor International Airport
LOS	Level-of-Service
LTO	Landing and Takeoff
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Department
ML	Military
MOVES	Motor Vehicle Emission Simulator
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PEI	Periodic Emissions Inventory

PTE	Potential To Emit
RVP	Reid Vapor Pressure
SCC	Standard Classification Code
SIC	Standard Industrial Classification
SIP	State Implementation Plan
TAF	Terminal Area Forecast
TDM	Travel Demand Model
UAM	Urban Airshed Model
UP	Union Pacific Railway
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
WOE	Weight Of Evidence

Abbreviations

cm	centimeter
CO	Carbon Monoxide
CO2	Carbon Dioxide
m	meter
mph	miles per hour
ppm	parts per million

I. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) redesignated the Maricopa County Area from a serious nonattainment area to attainment for the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO) and approved the Carbon Monoxide Redesignation Request and Maintenance Plan for the Maricopa County Nonattainment Area (MAG, 2003) effective April 8, 2005 (EPA, 2005). The MAG 2003 CO Maintenance Plan demonstrated maintenance of the CO standards through 2015.

Section 175A(b) of the Clean Air Act Amendments (CAAA) states that *"8 years after redesignation of any area as an attainment area under section 107(d), the State shall submit to the Administrator an additional revision of the applicable State implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the initial 10-year period".* Thus, a second CO maintenance plan for the years 2016 through 2025 for the Maricopa county area is required for submittal to EPA by April 8, 2013.

The second CO maintenance plan (hereafter referred to as the MAG 2013 CO Maintenance Plan) demonstrates maintenance of the CO NAAQS in the Maricopa County Area through 2025, and establishes the 2025 conformity budget for onroad mobile source emissions using the latest version of EPA's Motor Vehicle Emission Simulator (MOVES) model, MOVES2010b.

I-1. Background

Carbon monoxide is a colorless, odorless, and poisonous gas emitted from combustion processes. It is highly toxic to humans and animals when encountered in higher concentrations. In the atmosphere, it is short-lived and combines with oxygen to form carbon dioxide (CO_2). Since the principal source of CO in urban areas is motor vehicle exhaust, CO concentrations are closely related to vehicular traffic volume (Seinfeld, 1986). CO problems generally occur in localized areas in association with cold, stagnant weather conditions during the winter (CARB, 2004).

To protect public health from this air pollutant, the 1990 CAAA required that all areas of the nation attain and maintain the NAAQS for CO. The federal standards for CO provide two primary standards: 9 parts per million (ppm) averaged over an eight-hour period and 35 ppm averaged over a one-hour period. To demonstrate attainment, all monitors in a nonattainment area must not exceed either standard more than once per year during two consecutive years. The one-hour CO standard of 35 ppm has not been violated in the Maricopa County area since 1984.

In accordance with the 1990 CAAA, EPA designated the Maricopa County area as a moderate nonattainment area for the eight-hour CO standard. Since the area had not attained the eight-hour CO standard by December 31, 1995, the area was re-designated as a serious nonattainment area in 1996. The attainment date for serious nonattainment areas is December 31, 2000 under the CAAA.

The MAG 1999 Serious Area Carbon Monoxide Plan (MAG, 1999) demonstrated attainment of the eight-hour CO standard by December 31, 2000 and was submitted to EPA in July 1999. Since the Arizona Legislature repealed the remote sensing program in 2000, the 1999 CO plan was revised to reflect the discontinuation of the remote sensing program. The Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG, 2001) submitted to EPA in March 2001 confirmed attainment of the standard without the remote sensing program.

Since no violation of the eight-hour CO standard has occurred at any monitor in the area since 1996 and the EPA clean data requirement was satisfied for the re-designation from nonattainment to attainment, the MAG 2003 CO Redesignation Request and Maintenance Plan was submitted to EPA in May 2003. The plan demonstrated maintenance of the standard through 2015. On March 9, 2005, EPA re-designated the area to attainment for the eight-hour CO standard and approved the MAG 2003 CO Maintenance Plan, effective on April 8, 2005.

In accordance with Section 175A(b) of the 1990 CAAA, this second CO maintenance plan is developed to provide for maintenance of the standard for an additional 10-year period for the Maricopa County area.

I-2. Overview of Study

The main objective of the modeling analysis is to estimate the effects of growth and emission reduction strategies on the future CO air quality in the Maricopa County area. The results of the modeling analysis are intended to provide a quantitative assessment of the potential for continued compliance with the federal CO standards.

A modeling protocol (see Appendix I-I) was developed to detail the technical approaches and assumptions used to demonstrate maintenance of the ambient air quality standards for CO in the Maricopa County area. The modeling work follows the modeling details outlined in the protocol.

For the CO maintenance modeling demonstration, two sets of CO emissions inventories were developed: (1) emissions inventories for the CO modeling domain for the years 2006, 2008, 2015, and 2025 and (2) emissions inventories for the CO maintenance area for the years 2008 and 2025. The CO modeling domain and maintenance area are presented in Figure I-1. The 2008 base year emissions inventory is used to back-cast the 2006 emissions inventory, and to project the 2015 and 2025 future emissions inventories with emission control measures in place. The emission control measures include all committed control measures from the MAG 2003 CO Maintenance Plan (MAG, 2003). The maintenance demonstration assumes that the committed control measures in the MAG 2003 CO Maintenance Plan will continue to be implemented through 2025.

The maintenance modeling demonstration was conducted using three approaches: (1) an emissions inventory comparison, (2) scaling the Urban Airshed Model (UAM)/CAL3QHC maximum concentration, and (3) a CAL3QHC intersection hotspot analysis. The first approach demonstrates maintenance of the standard by showing a continuing decrease in emissions levels in 2015 and 2025 compared with emissions levels in 2006 and 2008. The second approach scales the UAM/CAL3QHC maximum eight-hour concentrations for 2006 and 2015 derived from the MAG 2003 CO Maintenance Plan based on the ratio of future year to base year anthropogenic emissions inventories. The scaled UAM/CAL3QHC maximum concentration in the maintenance year 2025 was used to demonstrate maintenance of the eight-hour CO standard. In the third approach, a CAL3QHC modeling analysis was conducted for six intersections which are likely to experience heavy traffic volumes or traffic congestion in 2025. The CAL3QHC maximum eight-hour CO concentration predicted for each intersection in 2025 was combined with an estimated background concentration for 2025. The combined background and CAL3QHC maximum eight-hour concentration at each intersection was also used to demonstrate maintenance of the eight-hour standard.

In addition to the three analyses described above, two weight of evidence analyses were performed to demonstrate maintenance through 2025. These include an evaluation of historical one-hour and eight-hour CO concentration trends for monitoring sites and a regional meteorological analysis. For the first weight of evidence analysis, historical CO concentration trends for each monitoring site were developed, and the trend was extended through 2015 to 2025 using regression analysis. For the second weight of evidence approach, a meteorological analysis was performed to demonstrate that the historical improvements in CO concentrations in the Maricopa County area are not due to unusually favorable meteorological conditions.

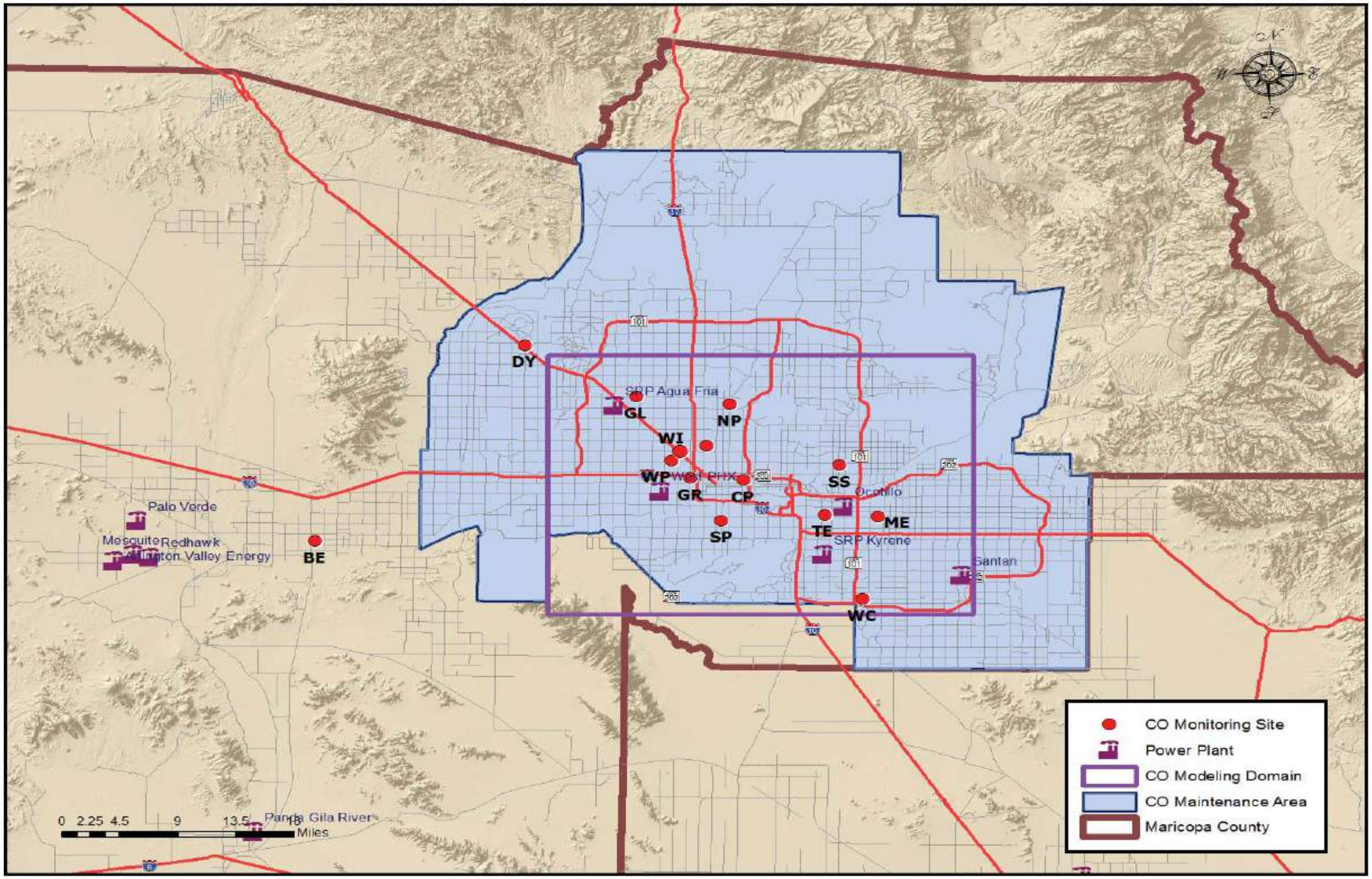


Figure I-1. Carbon monoxide modeling domain and maintenance area

I-3. Data Access Procedure

According to the EPA Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze (EPA, 2007), all modeling input and output files used in the MAG 2013 CO Maintenance Plan have been archived onto a DVD disk. A list of the computer files used in the modeling analyses is contained in Appendix II. The file and model descriptions are grouped by computer program or model and are presented in logical order from emission rate estimates through the final output from CAL3QHC. As a result, the file summary also provides a sequential outline of the overall modeling chain.

Files have been placed in the DVD directory structure by model or program. It is important to note that the directory structure on the DVD is not identical to the directory structure on the MAG computer. As a result, file paths in the modeling job files may not be identical for those file paths on the DVD data disk, although the file paths are correctly used in the job files. Editing or moving files may be necessary to reproduce MAG results using job files found on the DVD disk. Contact Person: Taejoo Shin, MAG, (602-254-6300).

II. EMISSIONS INVENTORIES

The CO emission inventories were developed for all anthropogenic source categories including point, area, onroad, and nonroad sources for the years 2006, 2008, 2015, and 2025. Emissions preparation and estimated emissions for each source category are described in this section. Emissions from biogenic sources are included in the 2008 Periodic Emissions Inventory (PEI) for CO contained in Appendix IV of the MAG 2013 CO Maintenance Plan, but were not included in the maintenance demonstration technical analyses since biogenic source emissions can not be controlled and remain relatively constant from year to year in the Maricopa County area.

In order to estimate future year emissions for point and area source categories, the growth factors based on changes in population and employment between the base year 2008 and the other years were developed using the following equation:

$$\text{Growth factor} = \frac{\text{Growth indicator in projection year}}{\text{Growth indicator in base year}}$$

The population and employment estimates for 2006, 2008, 2015, and 2025 shown in Table II-1 were derived from the MAG Socioeconomic Projections of Population, Housing and Employment by Municipal Planning Area and Regional Analysis Zone in Maricopa County (MAG, 2007). These projections were approved by the MAG Regional Council in May 2007. In accordance with EPA guidance (EPA, 1999b), growth factors relative to the year 2008 were calculated by using the growth indicators shown in Table II-2. Onroad network and off-network future emissions were projected using the MOVES2010b model and traffic assignment data produced by the MAG TransCAD Travel Demand Model (TDM). Nonroad equipment emissions were developed by using the EPA NONROAD2008a model and NONROAD2008a default activity growth for Maricopa County. The Emissions and Dispersion Modeling System (EDMS) model and Federal Aviation Administration (FAA) Terminal Area Forecast system database were used to estimate future airport emissions.

II-1. Point Sources

Point sources in Maricopa County were defined in accordance with the EPA Annual Emissions Reporting Requirements (AERR) Rule (EPA, 2008). Point sources include major stationary sources that emit substantial amounts of air pollution and are required to obtain a Title V permit to operate under 40 CFR Part 70. Point source emissions for a typical winter season weekday in the years 2006 and 2008 were obtained from the Maricopa County Air Quality Department (MCAQD). According to the 2008 PEI for CO (MCAQD, 2012), twenty-one stationary sources are located in Maricopa County, while fourteen and sixteen of these stationary sources reside in the CO modeling domain and the CO maintenance area, respectively.

The point source CO emissions for the years 2015 and 2025 for the CO modeling domain and maintenance area were estimated by applying the growth factors to the emissions in the 2008 PEI for CO. Growth factors for specific emissions source categories were selected by considering the most appropriate growth indicator shown in Table II-2. For future power plants emissions, the Potential to Emit (PTE) emissions were conservatively assumed, as shown in Table II-3. Table II-4 presents actual 2006 and 2008 and projected 2015 and 2025 emissions for the CO modeling domain. Table II-5 presents the 2008 point source emissions and the projected 2025 emissions for the CO maintenance area.

Table II-1. Population and employment for Maricopa County in 2006, 2008, 2015, and 2025

Category	Population and Employment			
	2006	**2008**	**2015**	**2025**
Total Population	3,793,000	3,988,000	4,732,000	5,697,000
Retail Employment	515,000	513,000	674,000	852,000
Office Employment	425,000	388,000	563,000	740,000
Industrial Employment	395,000	376,000	490,000	576,000
Public Employment	269,000	308,000	334,000	406,000
Other Employment	247,000	246,000	323,000	414,000
Construction Employment	75,000	64,000	94,000	103,000
Total Employment	1,926,000	1,895,000	2,478,000	3,091,000

Table II-2. Growth factors for the years 2006, 2015, and 2025

Growth Indicator	Growth Factor Relative to 2008			
	2006	**2008**	**2015**	**2025**
Population	0.95	1.00	1.19	1.43
Retail Employment	1.00	1.00	1.31	1.66
Office Employment	1.10	1.00	1.45	1.91
Industrial Employment	1.05	1.00	1.30	1.53
Public Employment	0.87	1.00	1.08	1.32
Other Employment	1.00	1.00	1.31	1.68
Construction Employment	1.17	1.00	1.47	1.61
Total Employment	1.02	1.00	1.31	1.63

Table II-3. Power plant CO emissions for 2006, 2008, and Potential to Emit (PTE) (unit: metric tons/day)

Business Name	SIC	2006*	2008*	PTE
APS West PHX Power Plant	4911	0.06	0.17	2.75
Ocotillo Power Plant	4911	0.00	0.01	2.29
Santan Generating Station	4911	0.11	0.29	0.76
SRP Agua Fria Generating Station	4911	0.00	0.04	5.83
SRP Kyrene Generating Station	4911	0.05	0.03	4.65
Glendale Waste to Energy	4911	0.00	0.00	1.55
Total		**0.22**	**0.54**	**17.83**

* Actual emissions

Table II-4. Point source CO emissions for the CO modeling domain

Business Name	SIC	Growth Factor		CO Emissions (metric tons/day)			
		2008 to 2015	2008 to 2025	2006*	2008*	2015**	2025**
AF Lorts Manufacturing Co	2511	1.30	1.53	0.00	0.00	0.00	0.00
APS West Phx Power Plant***	4911	1.30	1.53	0.00	0.00	0.00	0.00
Goodrich Aircraft Interior Products	3069	1.30	1.53	0.00	0.00	0.00	0.00
Honeywell-Engines Systems & Services	3724	1.30	1.53	0.07	0.05	0.07	0.08
Mastercraft Cabinets Inc	2434	1.30	1.53	0.00	0.00	0.00	0.00
New Wincup Holdings Inc	3086	1.30	1.53	0.03	0.03	0.04	0.05
Ocotillo Power Plant***	4911	1.30	1.53	0.03	0.00	0.00	0.00
Penn Racquet Sports Inc	3949	1.30	1.53	0.01	0.01	0.01	0.02
Rexam Beverage Can Co	3411	1.30	1.53	0.01	0.01	0.01	0.02
SFPP LP Phoenix Terminal	5171	1.30	1.53	0.02	0.02	0.03	0.03
SRP Agua Fria Generating Station***	4911	1.30	1.53	0.00	0.00	0.00	0.00
Thornwood Furniture Mfg	2511	1.30	1.53	0.01	0.00	0.00	0.00
Total				**0.18**	**0.12**	**0.16**	**0.20**

* Actual emissions
** Projected emissions
*** Fugitive emissions

Table II-5. Point source CO emissions in 2008 and 2025 for the CO maintenance area

Business Name	SIC	Growth Factor	CO Emissions (metric tons/day)	
		2008 to 2025	2008	2025
AF Lorts Manufacturing Co	2511	1.53	0.00	0.00
APS West Phx Power Plant*	4911	1.53	0.00	0.00
CMC Steel Arizona**	3312	1.53	0.00	1.73
Goodrich Aircraft Interior Products	3069	1.53	0.00	0.00
Honeywell-Engines Systems & Services	3724	1.53	0.05	0.08
Luke AFB – 56th Fighter Wing	9711	1.53	0.02	0.03
Mastercraft Cabinets Inc	2434	1.53	0.00	0.00
New Wincup Holdings Inc	3086	1.53	0.03	0.05
Ocotillo Power Plant*	4911	1.53	0.00	0.00
Penn Racquet Sports Inc	3949	1.53	0.01	0.02
Rexam Beverage Can Co	3411	1.53	0.01	0.02
SFPP LP Phoenix Terminal	5171	1.53	0.02	0.03
SRP Agua Fria Generating Station*	4911	1.53	0.00	0.00
Thornwood Furniture Mfg	2511	1.53	0.00	0.00
W R Meadows of AZ Inc	2899	1.53	0.00	0.00
Total			**0.14**	**1.96**

* Fugitive emissions
** 2011 emissions were considered as the 2025 emissions.

II-2. Area Sources

Area sources are facilities or activities that are not qualified as point sources in terms of the volume of pollution emitted but collectively release significant amounts of air pollutants (EPA, 2001). For example, small-scale industries, residential wood burning, commercial cooking, waste incineration, residential sources, and wildfires are defined as area sources. There are twenty-three area source categories according to the Maricopa County 2008 PEI for CO.

The area source CO emissions for a typical winter season weekday in 2008 for Maricopa County and the CO maintenance area were obtained from the 2008 PEI for CO. To derive emissions for the CO modeling domain from the county total emissions, surrogate factors were applied to the area source CO emissions in 2008 for Maricopa County. The surrogate factors are the ratios of land use acreage, population, and employment in the CO modeling domain versus those in Maricopa County, as presented in Table II-6. The selection of an appropriate surrogate factor was based on how well the surrogate represents the emissions level of a source category for a given area. Table II-7 provides the county-level emissions and the CO modeling domain emissions derived using the surrogate factors.

To estimate area source emissions in 2006, 2015, and 2025, the growth factors in Table II-2 were applied to the 2008 base-year emissions. Table II-8 presents the 2008 base-year area source emissions and the derived 2006, 2015, and 2025 emissions for the CO modeling domain. Table II-9 displays the 2008 base-year emissions and the projected 2025 emissions for the CO maintenance area.

Table II-6. Surrogate factors used to derive area source emissions for the CO modeling domain

Surrogate Category	Population or Acreage		Surrogate Factor
	Maricopa County	CO Modeling Domain	
Population	3,988,000	2,476,000	0.62
Retail, Office, Public and Other Employment	1,455,000	1,093,000	0.75
Industrial Employment	376,000	304,000	0.81
Agriculture & Vacant Land Use in Acres	2,321,603	67,339	0.03
Landfill Land Use in Acres	32,666	6,467	0.20
Crematories Land Use in Acres	1,175	728	0.62

Table II-7. Area source CO emissions for the CO modeling domain in 2008

Source Category	SCC	Surrogate Indicator	Surrogate Factor	CO Emissions (metric tons/day)	
				Maricopa County	Modeling Domain
Industrial Fuel Oil	2102004000	Industrial Employment	0.81	3.98	3.22
Industrial Natural Gas	2102006000	Industrial Employment	0.81	1.14	0.92
Commercial/Institutional Fuel Oil	2103004000	Retail, Office, Public, and Other Employment	0.75	2.18	1.64
Commercial/Institutional Natural Gas	2103006000	Retail, Office, Public, and Other Employment	0.75	3.29	2.47
Residential Fuel Oil	2104004000	Population	0.62	0.00	0.00
Residential Natural Gas	2104006000	Population	0.62	1.63	1.01
Residential Wood	2104008000	Population	0.62	23.73	14.71
Chemical Manufacturing	2301010000	Industrial Employment	0.81	0.00	0.00
Commercial Cooking	2302002000	Population	0.62	0.95	0.59
Secondary Metal Production	2304000000	Industrial Employment	0.81	0.32	0.26
ADEQ Portable Permits: Mining	2305000000	Industrial Employment	0.81	0.55	0.45
Industrial Processes NEC	2399000000	Industrial Employment	0.81	0.05	0.01*
Electrical Equipment Manufacturing	2312000000	Industrial Employment	0.81	0.01	0.01
On-site Incineration	2601000000	Industrial Employment	0.81	0.00	0.00
Open Burning	2610000000	Agriculture & Vacant Land Use	0.03	7.51	0.23
Landfills	2620000000	Landfill Land Use	0.20	0.10	0.02
Other Industrial Waste Disposal	2650000000	Population	0.62	0.11	0.07
Prescribed Fires	2810014000	Prescribed fire locations	-	0.56	0.00
Structure Fires	2810030000	Population	0.62	0.23	0.14
Vehicle Fires	2810050000	Population	0.62	0.09	0.06
Aircraft Engine Testing	2810040000	Industrial Employment	0.81	0.01	0.01
Crematories	2810060000	Crematories Land Use	0.62	0.00	0.00
Total				**46.44**	**25.82**

* Based on the emissions in the CO maintenance area

Table II-8. Area source CO emissions for the CO modeling domain in 2006, 2015 and 2025

Source Category	SCC	Growth Factor			CO Emissions (metric tons/day)		
		2008 to 2006	2008 to 2015	2008 to 2025	2006	2015	2025
Industrial Fuel Oil	2102004000	1.05	1.30	1.53	3.38	4.19	4.93
Industrial Natural Gas	2102006000	1.05	1.30	1.53	0.97	1.20	1.41
Commercial/Institutional Fuel Oil	2103004000	1.10	1.45	1.91	1.80	2.38	3.13
Commercial/Institutional Natural Gas	2103006000	1.10	1.45	1.91	2.72	3.58	4.72
Residential Fuel Oil	2104004000	0.95	1.19	1.43	0.00	0.00	0.00
Residential Natural Gas	2104006000	0.95	1.19	1.43	0.96	1.20	1.44
Residential Wood	2104008000	1.00	1.00	1.00	14.71	14.71	14.71
Chemical Manufacturing	2301010000	1.05	1.30	1.53	0.00	0.00	0.00
Commercial Cooking	2302002000	1.00	1.31	1.66	0.59	0.77	0.98
Secondary Metal Production	2304000000	1.05	1.30	1.53	0.27	0.34	0.40
ADEQ Portable Permits: Mining	2305000000	1.05	1.30	1.53	0.47	0.59	0.69
Industrial Processes NEC	2399000000	1.05	1.30	1.53	0.01	0.01	0.02
Electrical Equipment Manufacturing	2312000000	1.05	1.30	1.53	0.01	0.01	0.02
On-site Incineration	2601000000	1.05	1.30	1.53	0.00	0.00	0.00
Open Burning	2610000000	1.00	1.00	1.00	0.23	0.23	0.23
Landfills	2620000000	0.95	1.19	1.43	0.02	0.02	0.03
Other Industrial Waste Disposal	2650000000	0.95	1.19	1.43	0.07	0.08	0.10
Prescribed Fires	2810014000	1.00	1.00	1.00	0.00	0.00	0.00
Structure Fires	2810030000	0.95	1.19	1.43	0.13	0.17	0.20
Vehicle Fires	2810050000	0.95	1.19	1.43	0.06	0.07	0.09
Aircraft Engine Testing	2810040000	1.05	1.30	1.53	0.01	0.01	0.02
Crematories	2810060000	0.95	1.19	1.43	0.00	0.00	0.00
Total					**26.41**	**29.56**	**33.12**

Table II-9. Area source CO emissions for the CO maintenance area in 2025

Source Category	SCC	Growth Indicator	Growth Factor	CO Emissions (metric tons/day)	
			2008 to 2025	2008	2025
Industrial Fuel Oil	2102004000	Industrial Employment	1.53	3.92	6.00
Industrial Natural Gas	2102006000	Industrial Employment	1.53	1.12	1.71
Commercial/Institutional Fuel Oil	2103004000	Office Employment	1.91	2.13	4.07
Commercial/Institutional Natural Gas	2103006000	Office Employment	1.91	3.22	6.15
Residential Fuel Oil	2104004000	Population	1.43	0.00	0.00
Residential Natural Gas	2104006000	Population	1.43	1.58	2.26
Residential Wood	2104008000	No Growth	1.00	22.98	22.98
Chemical Manufacturing	2301010000	Industrial Employment	1.53	0.00	0.00
Commercial Cooking	2302002000	Retail Employment	1.66	0.92	1.53
Secondary Metal Production	2304000000	Industrial Employment	1.53	0.32	0.49
ADEQ Portable Permits: Mining	2305000000	Industrial Employment	1.53	0.55	0.84
Industrial Processes NEC	2399000000	Industrial Employment	1.53	0.01	0.02
Electrical Equipment Manufacturing	2312000000	Industrial Employment	1.53	0.01	0.02
On-site Incineration	2601000000	Industrial Employment	1.53	0.00	0.00
Open Burning	2610000000	No Growth	1.00	0.58	0.58
Landfills	2620000000	Population	1.43	0.05	0.07
Other Industrial Waste Disposal	2650000000	Population	1.43	0.11	0.16
Prescribed Fires	2810014000	No Growth	1.00	0.00	0.00
Structure Fires	2810030000	Population	1.43	0.22	0.31
Vehicle Fires	2810050000	Population	1.43	0.09	0.13
Aircraft Engine Testing	2810040000	Industrial Employment	1.53	0.01	0.02
Crematories	2810060000	Population	1.43	0.00	0.00
Total				**37.82**	**47.34**

II-3. Onroad Sources

Onroad mobile source emissions were calculated using the latest version of the EPA Motor Vehicle Emission Simulator (MOVES2010b) and MAG MOVESLink. MOVES2010b estimates emissions factors for off-network and network (rural restricted access, rural unrestricted access, urban restricted access, and urban unrestricted access) road types. Off-network, which is a newly introduced road type in MOVES, includes locations such as parking lots, truck stops, rest areas, and freight or bus terminals, where the predominant activities are vehicle starts, parking, and idling. As required in the MOVES guidance (EPA, 2012a), onroad emissions inventories should include off-network emissions to account for emissions from vehicle starts and extended idling activity. MOVESLink is a tool designed and developed by MAG to process link data from the TransCAD TDM and emissions factors from MOVES2010b in order to develop onroad mobile source emissions inventories for regional transportation conformity, photochemical air quality modeling and other technical analyses.

II-3-1. MOVES2010b

MOVES2010b is the EPA state-of-the-art regulatory emissions model, which replaces the previous mobile source emissions model, MOBILE6.2. MOVES2010b estimates national, state, and county level emissions from motor vehicles. Each MOVES2010b model run requires as input the specification of vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types for a particular scenario in a Run Specification (RunSpec).

In order to calculate onroad vehicle emissions for calendar years 2006, 2008, 2015 and 2025, MOVES2010b was executed using local input data for three months (January, November, and December) for the selected calendar years and for geographical areas of the CO modeling domain and maintenance area using the County Domain/Scale and the Inventory Calculation Type options. An example of the MOVES2010b model RunSpec summaries can be found in Appendix II-I.

II-3-2. MOVESLink

MOVESLink is a motor vehicle emissions processing model developed by MAG to estimate onroad mobile source emissions inventories using MOVES2010b and link level activity data output by the MAG TransCAD TDM. MOVESLink is used to perform regional transportation conformity analyses, develop periodic emissions inventories and evaluate transportation projects and emissions control measures in support of State Implementation Plans (SIPs).

MOVESLink was developed in the Python programming language using state-of-the-art GIS technology. This model is used to (1) read link-level activity data from the MAG TransCAD traffic assignment, (2) prepare MOVES2010b input data, (3) execute MOVES2010b, and (4) post-process MOVES2010b results.

II-3-3. Local Input Data

MOVES2010b requires detailed local data including fuel data, Inspection and Maintenance (I/M) programs, meteorological data, vehicle population, source type age distribution, annual vehicle miles traveled (VMT), monthly/daily/hourly VMT fractions, road type distribution, average speed distribution, ramp fraction, and Alternative Vehicle and Fuel Technologies (AVFT). Local input data for MOVES2010b were prepared in accordance with EPA guidance (EPA, 2012a).

Fuel Data

The fuel data for each month were derived from the fuel inspection results in Maricopa County provided by the Arizona Department of Weights and Measures. The fuel data for Maricopa County were applied to both the CO modeling domain and maintenance area. For the future year modeling, the 2011 fuel data were used. The specific MOVES tables for fuel data, which are [fuelsupply] and [fuelformulation], are presented on page App. II-7 of Appendix II.

I/M Programs

The I/M program data in [IMCoverage] table were converted from the MOBILE6.2 inputs used for the latest transportation conformity analysis, conducted in May 2012. This table reflects the actual proportions of vehicles subject to the specified levels of inspection. The term "I/M vehicles" denotes vehicles which are required to undergo an emissions test and inspection under the Arizona Vehicle Inspection/Maintenance Program. Since participation in the I/M program is required for all vehicles registered in Area A (MCAQD, 2008), with the exception of certain model years and vehicle classes, it is assumed that 91.6 percent of the vehicles operating within Area A participate in the I/M program and the rest do not participate in the program (MAG, 2004). This percentage reflects the control measures "Tougher Enforcement of Vehicle Registration and Emissions Test Compliance" and "Expansion of Area A Boundaries," described in the MAG Eight-Hour Ozone Redesignation Request and Maintenance Plan for the Maricopa Nonattainment Area (MAG, 2009). This percentage is directly applied to the Compliance Factor in the [IMCoverage] table. The same I/M programs were applied for the CO modeling domain and the CO maintenance area. The specific MOVES table for I/M programs is presented on pages App. II-9 through App. II-11 of Appendix II.

Meteorological Data

As a representative of local meteorological conditions, meteorological data for the Phoenix Sky Harbor International Airport were obtained from the National Climatic Data Center (NCDC) for the selected CO seasons. For future year modeling, the average of the most recent three years of data (2009-2011) was applied. The same hourly average temperature and relative humidity data for each month were used for the CO modeling domain and maintenance area. The specific MOVES table [ZoneMonthHour] for meteorological data is presented on page App. II-8 of Appendix II.

Vehicle Population

The vehicle population data in Maricopa County for the years 2006 and 2008 were obtained from July 1, 2011 and July 1, 2012 vehicle registration data provided by the Arizona Department of Transportation (ADOT). The vehicle registration data for these two years were allocated to the twenty-eight MOBILE6.2 vehicle types based on MOBILE6.2 VMT fractions. Then the vehicle population data were assigned to the thirteen MOVES source types using the match-up table (Table A.1) in the EPA technical guidance (EPA, 2010b). The vehicle populations in the CO modeling domain and maintenance area were estimated by multiplying the vehicle population in Maricopa County by the residential population ratios of these two areas to Maricopa County. For future year modeling, the vehicle population data were adjusted by applying the ratios of the projected population differences between Maricopa County, the CO modeling domain and the CO maintenance area. The specific MOVES table [SourceTypeYear] for vehicle population is presented on page App. II-7 of Appendix II.

Source Type Age Distribution

MOVES2010b categorizes vehicles according to vehicle classes and model years. The source type age distribution was prepared using EPA's data converter (registrationdistributionconverter_veh16.xls) that takes the registration distribution input file of MOBILE6.2 and converts it to the appropriate MOVES age distribution input table [SourceTypeAgeDistribution]. The source type age distribution for Maricopa County was applied to both the CO modeling domain and maintenance area. The specific MOVES table for source type age distribution is presented on page App. II-8 of Appendix II.

Annual VMT

The 2008 VMT distributions by facility type for the CO modeling domain and maintenance area were obtained from the 2008 Maricopa County Estimates of Daily Vehicle Travel by Highway Functional Classification provided by ADOT. The 2008 VMT distributions were multiplied by the 2008 Highway Performance Monitoring System (HPMS) VMT for the CO modeling domain and maintenance area.

Since MOVES2010b requires annual VMTs by HPMS vehicle type as a local input, the daily VMTs by HPMS vehicle type were derived from (1) the 2008 traffic assignment data provided by the MAG Transportation Division in May 2012, (2) the MOVES default VMT fraction for Maricopa County, and (3) the daily VMTs by facility type and the estimated percentages of daily vehicle travel by vehicle type and highway functional classification provided by ADOT. The daily VMTs by HPMS vehicle type were multiplied by 366 days to obtain the annual VMTs by HPMS vehicle type. The specific MOVES table [HPMSvTypeYear] for annual VMT is presented on page App. II-7 of Appendix II.

Road Type Distribution

The road type distribution by HPMS vehicle type was derived from the 2008 traffic assignment data provided by the MAG Transportation Division in May 2012 and the MOVES default VMT fraction for Maricopa County. As suggested in EPA technical guidance (EPA, 2010a), the same road type distribution by HPMS vehicle type was used for all MOVES source types within an HPMS vehicle class. The specific MOVES table [RoadTypeDistribution] for road type distribution is presented on page App. II-12 of Appendix II.

VMT Fraction

The month/day/hour VMT fractions for Maricopa County were developed from data recorded by continuous traffic counters on freeways (ADOT Freeway Management System) and arterials (Phoenix Automatic Traffic Recorders) during the year 2007. The month/day/hour VMT fractions for Maricopa County were applied to both the CO modeling domain and maintenance area. The specific MOVES tables [MonthVMTFraction], [DayVMTFraction], and [HourVMTFraction] for VMT fractions are presented on page App. II-13 of Appendix II.

Average Speed Distribution

In MOVES2010b, vehicle power, speed, and acceleration have a significant effect on vehicle emissions for all pollutants. MOVES2010b estimates those emissions effects by assigning activity to operating mode distributions, which are determined by the distribution of vehicle hours traveled (VHT) by average speed. As recommended in EPA technical guidance (EPA, 2010b), estimates of local average speeds were derived by MOVESLink using the 2008 traffic assignment data provided by the MAG Transportation Division in May 2012. To develop the average speed distribution, VHTs in sixteen speed bins were accumulated separately for each hour of the day, source type, and road type in the CO modeling domain. Then, the average speed distribution was calculated by normalizing VHTs in sixteen speed bins for each hour of the day, source type, and road type. The same methodology was applied to develop the speed estimates for the CO maintenance area. The specific MOVES table [AvgSpeedDistribution] for the average speed distribution is presented on pages App. II-14 and App. II-15 of Appendix II.

Ramp Fraction

The ramp fraction represents the percent of VHT on ramps on both rural restricted roads (road type 2) and urban restricted roads (road type 4). The fraction of VHT on ramps was derived by dividing the total VHTs on ramps by the total VHTs for each restricted road type. The VHTs were estimated from the 2008 traffic assignment data provided by the MAG Transportation Division in May 2012. The specific MOVES table [RoadType] for ramp fraction is presented on page App. II-11 of Appendix II.

AVFT Strategy

MOVES2010b allows users to modify the fuel engine fraction using different fuels and technologies in each model year in order to reflect local conditions. The fleet information for transit buses for the model years 1997 through 2010 provided by Valley Metro was used to prepare the AVFT input file. Since the fleet data are available only for specific model years, MOVES2010b default values were obtained from the [fuelEngFraction] table in the MOVES default database and used for the rest of the model years. The specific MOVES table [AVFT] is presented on pages App. II-15 and App. II-16 of Appendix II.

II-3-4. MOVES2010b Results

To calculate the CO season-weekday vehicle emissions for the selected years, MOVES2010b was executed using local input data for each month of the peak CO season and for each geographical area (the CO modeling domain and maintenance area). MOVES2010b generated monthly emissions including weekday emissions for a given month by specifying the output time aggregated level as month. The CO season-weekday emissions were calculated by dividing the three-month peak CO season emissions from November through January by the number of weekdays. Each scenario was created using the County Domain/Scale and the Inventory Calculation Type for all road types including off-network. The CO season-weekday onroad emissions for the CO modeling domain and the CO maintenance area for the selected years are presented in Tables II-10 and II-11, respectively.

Table II-10. CO season-weekday onroad emissions for the CO modeling domain

Source Type	CO Emissions (metric tons/day)			
	2006	**2008**	**2015**	**2025**
Onroad	319.7	227.3	177.9	137.1
Off-network	229.4	182.6	120.0	86.3
Total	**549.1**	**410.0**	**297.9**	**223.4**

Table II-11. CO season-weekday onroad emissions for the CO maintenance area

Source Type	CO Emissions (metric tons/day)	
	2008	**2025**
Onroad	322.4	217.6
Off-network	259.2	141.9
Total	**581.6**	**359.4**

II-4. Nonroad Sources

Nonroad mobile sources are defined as engines, equipment, and vehicles that are not certified as highway vehicles. Nonroad mobile sources consist of agricultural equipment, aircraft, construction equipment, industrial equipment, residential and commercial lawn and garden equipment, recreational vehicles, pleasure craft, and locomotive equipment.

II-4-1. Nonroad Equipment Emissions

The EPA NONROAD2008a model was executed to estimate emissions for nonroad equipment categories, excluding airport and locomotive emissions, in the CO season months of November through January for a typical weekday. Weekday emissions were used for all nonroad equipment categories. The monthly typical weekday nonroad source emissions were estimated by applying default temporal allocation factors to each nonroad equipment category in accordance with the EPA guidance (EPA, 1999a). Weekday emissions for the three months were averaged to derive the average season day emissions.

Nonroad source emissions were estimated for the CO modeling domain for the years 2006, 2008, 2015, and 2025 and the CO maintenance area for the years 2008 and 2025. Monthly local fuel parameters (i.e., Reid Vapor Pressure (RVP), gasoline and diesel sulfur, and ethanol content) required by NONROAD2008a were obtained from the Arizona Department of Weights and Measures (ADWM) for the years 2006 and 2008. The model runs for the future years were based on the 2011 fuel inspection data for Maricopa County provided by ADWM. The monthly temperatures were consistent with the 2008 PEI for CO (MCAQD, 2012). Table II-12 summarizes the monthly average temperatures that were used for developing the nonroad emissions. Tables II-13 and II-14 summarize the monthly local fuel inputs used to develop the nonroad emissions. An example of the NONROAD2008a model RunSpecs can be found in Appendix II-ii.

NONROAD2008a model inputs, including equipment population, activity levels of equipment, and growth factors, were based on default values derived from national averages, with the exception of commercial lawn and garden equipment. Equipment population and activity levels for commercial lawn and garden equipment were based on the results of a survey performed by ENVIRON as a part of the Cap and Trade Oversight Committee (CTOC) work (ENVIRON, 2003). The survey results indicated that the population of commercial lawn and garden equipment in Maricopa County is significantly lower than the default values in NONROAD2008a, while average annual operating hours for the equipment are slightly higher than the default values.

The Maricopa County nonroad emissions derived from NONROAD2008a were scaled to the CO modeling domain and maintenance area by applying surrogate factors for land use acreage, population, and employment. Tables II-15 and II-16 summarize the surrogates by nonroad source category that were applied to convert county-level emissions to the CO modeling domain and the CO maintenance area, respectively.

Table II-12. Temperatures applied to NONROAD2008a runs

Month	Temperatures (°F)		
	Maximum	Minimum	Average
January	64	45	54.90
November	81	56	68.67
December	65	46	56.03

Table II-13. 2008 Fuel specifications applied to NONROAD2008a runs for 2008

Month	Fuel RVP (psi)	Diesel Sulfur (ppm)	Gasoline Sulfur (ppm)	Ethanol (EtOH) Blend		
				EtOH (Vol %)	Market Share (%)	Total Oxygen (wt %)
January	8.76	6	35	9.47	100	3.49
November	8.41	7	15	8.78	100	3.27
December	8.28	7	28	8.17	100	3.03

Table II-14. 2011 Fuel specifications applied to NONROAD2008a runs for the future years

Month	Fuel RVP (psi)	Diesel Sulfur (ppm)	Gasoline Sulfur (ppm)	Ethanol (EtOH) Blend		
				EtOH (Vol %)	Market Share (%)	Total Oxygen (wt %)
January	8.65	9	15	9.72	100	3.66
November	8.39	6	14	10.17	100	3.80
December	8.45	16	12	9.02	100	3.41

Table II-15. Surrogates applied for nonroad source categories for the CO modeling domain

Source Classification	Surrogate Factor				Surrogate Reference
	2006	2008	2015	2025	
Agricultural Equipment	0.03	0.03	0.03	0.03	Agricultural Land Use Area
Commercial Equipment	0.81	0.81	0.75	0.70	Industrial Employment
Construction and Mining Equipment	0.51	0.52	0.41	0.31	Construction Employment
Industrial Equipment	0.81	0.81	0.75	0.70	Industrial Employment
Lawn and Garden Equipment	0.66	0.62	0.59	0.52	Population
Pleasure Craft	0.15	0.15	0.15	0.15	Water Surface Area
Railroad Equipment	0.23	0.23	0.23	0.23	Railroad Land Use Area
Recreational Equipment	0.03	0.03	0.03	0.03	Active & Passive Open Space Land Use Area
Locomotive Equipment	0.23	0.23	0.23	0.23	Railroad Length

Table II-16. Surrogates applied for nonroad source categories for the CO maintenance area

Source Classification	Surrogate Factor		Surrogate Reference
	2008	2025	
Agricultural Equipment	0.04	0.04	Agricultural Land Use Area
Commercial Equipment	0.90	0.97	Industrial Employment
Construction and Mining Equipment	0.94	0.69	Construction Employment
Industrial Equipment	0.99	0.97	Industrial Employment
Lawn and Garden Equipment	0.97	0.87	Population
Pleasure Craft	0.26	0.26	Water Surface Area
Railroad Equipment	0.38	0.38	Railroad Land Use Area
Recreational Equipment	0.09	0.09	Active & Passive Open Space Land Use Area
Locomotive Equipment	0.38	0.38	Railroad Length

II-4-2. Airport Emissions

Airport emissions were developed using EDMS version 5.1.3. EDMS is specifically designed to assess airport emissions sources, which consist of aircraft, auxiliary power units (APU), and ground support equipment (GSE). EDMS estimates emissions for NOx, CO, VOC, particulate matter and other pollutants.

Twelve medium and large size airports are located in the CO maintenance area, while four of them are in the CO modeling domain. The detailed information for those airports is presented in Table II-17. EDMS was simulated to calculate all airport emissions except Luke Air Force Base (AFB), which is dealt with separately in Section II-4-2-2.

II-4-2-1. EDMS Inputs

To calculate airport emissions, EDMS requires the following four inputs for each airport: 1) Number of Landing-Takeoff Cycles (LTOs), 2) Aircraft Fleet Mix, 3) Operational Profiles, and 4) Mixing Height.

Number of LTOs

Aircrafts are classified in four categories as air commercial (AC), air taxi (AT), general aviation (GA), and military (ML). The CO seasonal LTOs for the years 2006, 2008, 2015, and 2025 were derived from three sources: (1) Airport Operations database in the FAA Air Traffic Activity Data System (ATADS) (FAA, 2012a), (2) 2009 MAG survey data, and (3) FAA's latest 2011 Terminal Area Forecast (TAF) system (FAA, 2012b). Table II-18 summarizes the CO seasonal LTOs by aircraft category for eleven airports within the CO maintenance area in 2006, 2008, 2015, and 2025.

Aircraft Fleet Mix

The CO seasonal LTOs by aircraft category were assigned to individual aircraft types. Following the methodology described in the 2008 PM-10 PEI (MCAQD, 2011), the aircraft fleet mix for each aircraft category at each airport was calculated using the "sampled" aircraft-specific operational data in the base year 2008, which were extracted from FAA's Enhanced Traffic Management System Counts (ETMSC) database. The top 10 aircraft-specific operational weighting factors from this ETMSC database characterize those for the total aircraft operations in a given category.

Operational Profiles

To calculate hourly LTOs, the monthly, weekly, and hourly operational profiles were applied to the CO seasonal LTOs by aircraft category. The monthly and weekly operational profiles were derived from the 2008 monthly and weekly operations reported in the FAA ATADS and the 2009 MAG survey data, while the hourly operational profile was extracted from the 2009 MAG survey data and the FAA Aviation Performance Metrics (APM) database (FAA, 2012c). The monthly, weekly, and hourly operational profiles for 2008 were assumed to be the same for 2006, 2015, and 2025 for a given aircraft category and airport.

Table II-17. Airports in the CO modeling domain and maintenance area

No.	Airport	Abbreviation	Longitude	Latitude	Within the CO modeling domain?
1	Glendale Municipal	GEU	-112.295	33.527	YES
2	Phoenix Sky Harbor Intl	PHX	-112.008	33.434	YES
3	Scottsdale	SDL	-111.911	33.623	YES
4	Stellar Airpark	P19	-111.916	33.299	YES
5	Chandler Municipal	CHD	-111.811	33.269	NO
6	Phoenix Deer Valley	DVT	-112.083	33.688	NO
7	Falcon Field	FFZ	-111.728	33.461	NO
8	Phoenix Goodyear	GYR	-112.376	33.423	NO
9	Williams Gateway	IWA	-111.655	33.308	NO
10	Pleasant Valley	P48	-112.251	33.801	NO
11	Sky Ranch At Carefree	18AZ	-111.898	33.818	NO
12	Luke Air Force Base	LUF	-112.383	33.535	NO

Table II-18. CO seasonal LTOs by aircraft category at each airport in 2006, 2008, 2015, and 2025

Air Carrier				
Airport	**2006**	**2008**	**2015**	**2025**
GEU	0	0	0	0
PHX	50,734	48,220	50,073	60,762
SDL	0	0	0	0
P19	0	0	0	0
CHD	0	0	0	0
DVT	0	0	0	0
FFZ	2	2	1	1
GYR	31	23	22	22
IWA	156	541	1,140	1,445
P48	0	0	0	0
18AZ	0	0	0	0
Total	**50,934**	**48,785**	**51,135**	**62,101**

Air Taxi				
Airport	**2006**	**2008**	**2015**	**2025**
GEU	159	232	129	129
PHX	10,144	8,983	8,188	10,178
SDL	1,595	1,446	1,673	1,673
P19	0	0	0	0
CHD	370	294	221	221
DVT	463	552	326	326
FFZ	763	460	341	341
GYR	643	320	51	51
IWA	1,118	724	1,133	1,133
P48	0	0	0	0
18AZ	0	0	0	0
Total	**15,118**	**13,010**	**12,022**	**14,025**

General Aviation				
Airport	**2006**	**2008**	**2015**	**2025**
GEU	16,523	14,854	11,837	11,934
PHX	5,167	3,600	2,155	2,155
SDL	22,118	21,646	14,661	14,707
P19	4,850	4,715	3,490	3,645
CHD	32,385	28,551	18,126	18,702
DVT	53,786	49,601	42,229	44,996
FFZ	29,186	38,223	25,233	26,910
GYR	17,204	20,197	16,183	16,447
IWA	31,777	25,839	19,683	21,212
P48	771	751	555	580
18AZ	480	460	340	360
Total	**214,247**	**208,437**	**154,492**	**161,648**

Military				
Airport	**2006**	**2008**	**2015**	**2025**
GEU	24	12	12	12
PHX	335	316	291	291
SDL	13	20	20	20
P19	0	0	0	0
CHD	50	37	72	72
DVT	10	18	10	10
FFZ	361	227	278	278
GYR	709	434	364	364
IWA	1,190	699	797	797
P48	0	0	0	0
18AZ	0	0	0	0
Total	**2,689**	**1,762**	**1,781**	**1,781**

Mixing Height

One of the required meteorological inputs for EDMS is an atmospheric mixing height, which is defined as the height (or depth) above ground where relatively vigorous vertical mixing occurs due to convection. To calculate the time-varying mixing height, the latest version of the EPA AERMOD Meteorological Preprocessor (AERMET version 11059) has been employed.

Both the 2008 hourly surface meteorological data and the 2008 one-minute Automated Surface Observing System (ASOS) wind data from the National Weather Service (NWS) station at the Phoenix Sky Harbor were used (NCDC, 2012). Complete 2008 upper air data at the Tucson station (station number 23160) were obtained from the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) Radiosonde Database (ESRL, 2012).

These databases indicate that the average mixing heights during the winter CO season are approximately 200 meters at night and in the early morning, increasing to a peak value of 1,200 meters around 4:00 p.m. Emissions from all aircraft activities occurring within the mixing height are counted as ground level emissions by EDMS. Ultimately, a single mixing height dataset in 2008 is used for all eleven airports (except Luke AFB) in the CO maintenance area for the years 2006, 2008, 2015, and 2025.

II-4-2-2. Emissions at Luke AFB

According to the 2008 PEI for CO (MCAQD, 2012) and the 2008 Mobile Source Air Emissions Inventory for Luke AFB (Weston, 2010), the total annual CO emissions from the aircraft and GSE at Luke AFB are 605.5 metric tons in 2008. For 2025, the maximum potential emissions from aircraft and GSE at Luke AFB were estimated using Scenario L6 in the F-35A Training Basing Environmental Impact Statement (EIS) (US Air Force, 2012) to be 700.3 metric tons per year. This estimate assumes that a maximum of 144 F-35A aircraft will be based at Luke Air Force Base in 2025.

Since flight operations at Luke AFB are typically conducted from Monday through Friday (Luke AFB, 2011), the annual emissions are distributed evenly for 260 weekdays. Table II-19 shows the annual and weekday emissions in 2008 and 2025, respectively.

II-4-2-3. Summary of Airport Emissions

Table II-20 summarizes weekday emissions for the four airports (GEU, PHX, SDL, and P19) in the CO modeling domain in the years 2006, 2008, 2015, and 2025. Table II-21 presents weekday emissions in the years 2008 and 2025 for the twelve airports in the CO maintenance area.

Table II-19. Annual and weekday CO emissions from Luke AFB in 2008 and 2025 (unit: metric tons)

Sources	2008		2025	
	Annual	Weekday	Annual	Weekday
Aircraft & GSE *	605.5	2.3	700.3	2.7

* APU emissions are insignificant and not included (Weston 2010 and Luke AFB 2012).

Table II-20. Weekday airport emissions within the CO modeling domain (unit: metric tons/day)

Airport	Aircraft				APU & GSE				Total			
	2006	2008	2015	2025	2006	2008	2015	2025	2006	2008	2015	2025
Glendale	2.81	2.54	2.02	2.03	0.19	0.15	0.06	0.02	3.00	2.69	2.08	2.05
PHX Sky Harbor	6.16	5.70	5.70	6.88	10.58	8.15	3.24	1.66	16.74	13.86	8.94	8.53
Scottsdale	2.19	2.13	1.51	1.52	1.52	1.28	0.47	0.17	3.71	3.41	1.98	1.69
Stellar Airpark	0.47	0.46	0.34	0.36	0.12	0.10	0.03	0.01	0.59	0.56	0.37	0.36
Total	**11.63**	**10.83**	**9.57**	**10.79**	**12.41**	**9.68**	**3.80**	**1.86**	**24.04**	**20.52**	**13.37**	**12.63**

Table II-21. Weekday airport emissions within the CO maintenance area (unit: metric tons/day)

Airport	Aircraft		APU & GSE		Total	
	2008	2025	2008	2025	2008	2025
Glendale Municipal	2.54	2.03	0.15	0.02	2.69	2.05
Phoenix Sky Harbor Intl.	5.70	6.88	8.15	1.66	13.86	8.53
Scottsdale	2.13	1.52	1.28	0.17	3.41	1.69
Stellar Airpark	0.46	0.36	0.10	0.01	0.56	0.36
Chandler Municipal	4.03	2.66	0.52	0.05	4.55	2.71
Phoenix Deer Valley	8.09	7.32	0.47	0.07	8.56	7.39
Falcon Field	5.48	3.87	0.34	0.03	5.82	3.90
Phoenix Goodyear	3.67	2.95	0.20	0.03	3.87	2.98
Williams Gateway	2.02	1.84	0.94	0.17	2.96	2.00
Pleasant Valley	0.01	0.01	0.00	0.00	0.01	0.01
Sky Ranch at Carefree	0.05	0.04	0.01	0.00	0.06	0.04
Luke Air Force Base *	2.33	2.69	-	-	2.33	2.69
Total	**36.51**	**32.17**	**12.16**	**2.21**	**48.68**	**34.35**

*Aircraft emissions at Luke Air Force Base include emissions from GSE.

II-4-3. Locomotive Emissions

Maricopa County Air Quality Department (MCAQD) calculated locomotive CO emissions based on the annual surveys of the three railroad companies (Burlington Northern/Santa Fe Railway (BNSF), Union Pacific Railway (UP), and Amtrak) that have operations, such as Class I haul lines and yard/switching operations. To estimate the locomotive CO emissions for the CO modeling domain and maintenance area, the locomotive CO emissions for Maricopa County were obtained for a winter season weekday in 2008 from the 2008 PEI for CO. The locomotive CO emissions for the CO modeling domain and maintenance area were calculated by applying the surrogate factor for locomotives presented in Tables II-15 and II-16 to the county total locomotive CO emissions. The locomotive CO emissions for 2006 were calculated by interpolating the 2005 and 2008 locomotive emissions from the 2005 and 2008 PEIs for CO. Based on the recommendation from MCAQD, future locomotive emissions were assumed at the same level as 2008. Table II-22 summarizes the locomotive emissions.

II-4-4. Summary of Nonroad Emissions

Table II-23 summarizes nonroad emissions for each source category for the CO modeling domain and maintenance area.

II-5. Summary of Emissions Inventories

The CO emissions by source category (point, area, onroad, nonroad) for the CO modeling domain and maintenance area are summarized in Tables II-24 and II-25, respectively. Figures II-1 and II-2 illustrate the contributions of CO emissions by source type to total CO emissions for the CO modeling domain and the CO maintenance area, respectively.

For both the CO modeling domain and maintenance area, the onroad emissions are the major emissions source category, contributing more than half of the total CO emissions, although the proportion of the onroad emissions continues to decrease over time. The second highest contributor is nonroad sources which account for more than one-quarter of the total CO emissions.

Both Tables II-24 and II-25 demonstrate a decreasing trend in CO emissions between 2006 and 2025 in both the CO modeling domain and maintenance area. The total CO emissions decrease by 35.5% and 29.3% from the base year 2008 to the future year 2025 for the CO modeling domain and maintenance area, respectively.

Table II-22. Summary of locomotive emissions (unit: metric tons/day)

Locomotive Type	CO Modeling Domain				CO Maintenance Area	
	2006	2008	2015	2025	2008	2025
Line Haul	0.14	0.14	0.14	0.14	0.24	0.24
Yard Operations	0.02	0.01	0.01	0.01	0.06	0.06

Table II-23. Summary of nonroad source CO emissions (unit: metric tons/day)

Source Classification	CO Modeling Domain				CO Maintenance Area	
	2006	2008	2015	2025	2008	2025
Agricultural Equipment	0.02	0.02	0.01	0.01	0.02	0.01
Aircraft	11.63	10.83	9.57	10.78	36.51	32.17
Airport GSE & APU	12.41	9.68	3.80	1.86	12.16	2.21
Commercial Equipment	88.94	75.03	62.01	67.89	92.06	94.17
Construction and Mining Equipment	24.33	21.87	13.12	7.08	39.76	15.72
Industrial Equipment	29.28	23.70	6.82	3.50	29.08	4.85
Lawn and Garden Equipment	59.92	45.31	37.26	37.74	70.66	62.73
Locomotive Equipment	0.16	0.15	0.15	0.15	0.30	0.30
Pleasure Craft	0.12	0.10	0.08	0.07	0.18	0.12
Railroad Equipment	0.01	0.01	0.01	0.01	0.02	0.02
Recreational Equipment	0.27	0.25	0.26	0.27	0.72	0.76
Total	**227.08**	**186.95**	**133.09**	**129.36**	**281.47**	**213.05**

Table II-24. Average weekday CO emissions during the winter CO season for the CO modeling domain

Source Category	CO Emissions (metric tons/day)			
	2006	**2008**	**2015**	**2025**
Point	0.4	0.7	18.0	18.0
Area	26.4	25.8	29.6	33.1
Nonroad	227.1	187.0	133.1	129.4
Onroad	549.1	410.0	297.9	223.4
Total	**803.0**	**623.5**	**478.6**	**403.9**

Table II-25. Average weekday CO emissions during the winter CO season for the CO maintenance area

Source Category	CO Emissions (metric tons/day)	
	2008	**2025**
Point	0.7	19.8
Area	37.8	47.3
Nonroad	281.5	213.1
Onroad	581.6	359.4
Total	**901.6**	**639.6**

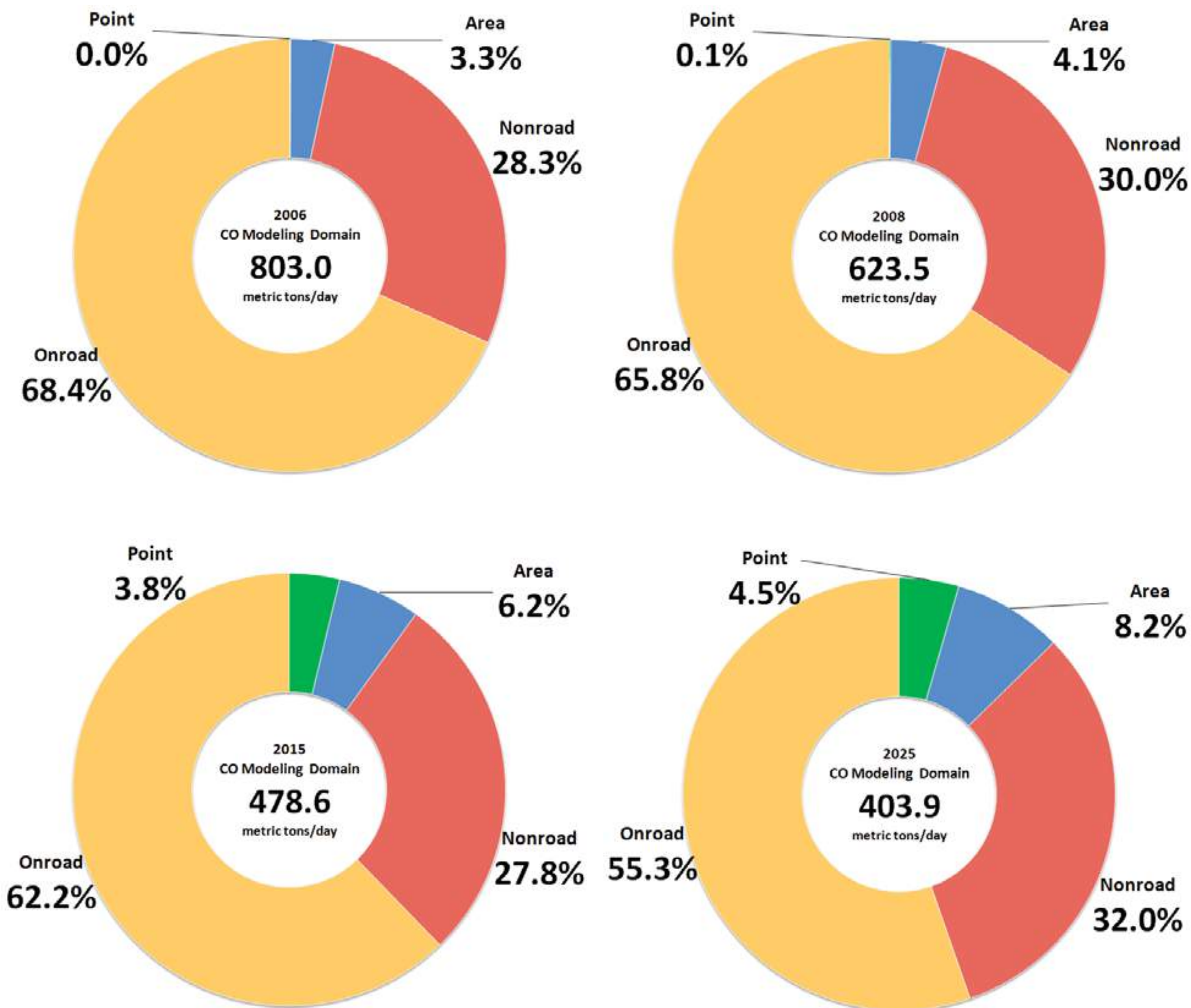


Figure II-1. Contribution of CO emissions by source type for the CO modeling domain

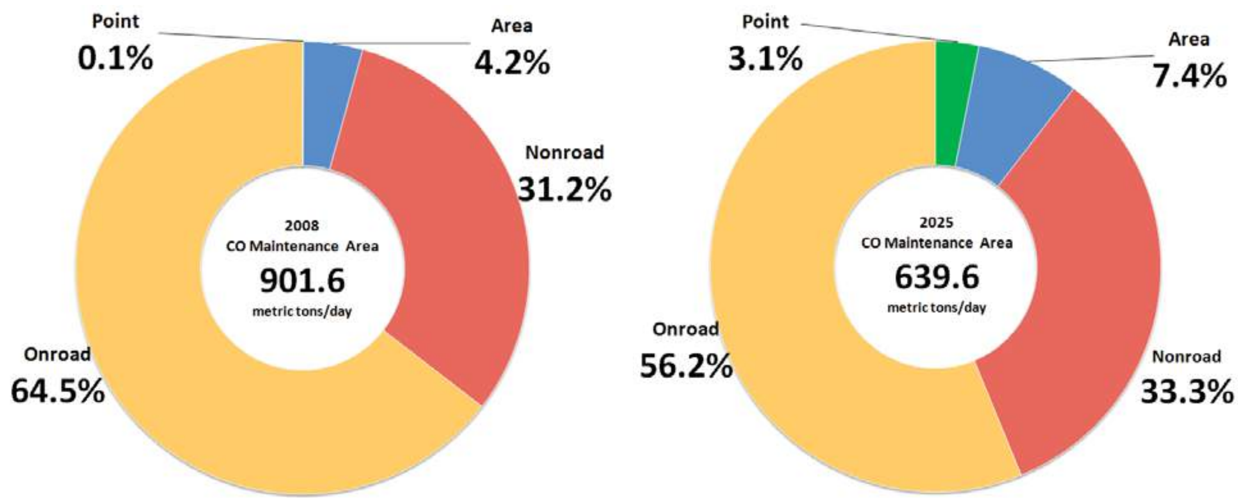


Figure II-2. Contribution of CO emissions by source type for the CO maintenance area

III. MICROSCALE ANALYSIS

The "hotspot" CO concentrations were estimated using CAL3QHC (EPA, 1992, 1995, and 2004) for six intersections having potentially high traffic volumes or heavy congestion in the maintenance year 2025. This analysis assures that potentially high traffic and congested intersections identified in the region for 2025 will not contribute to exceedance of the standards.

III-1. Intersection Geometry

In accordance with EPA's intersection selection procedure guidance (EPA, 1992), the top three high traffic volume intersections and the three worst Level-of-Service (LOS) intersections having the longest average delay times were selected for the PM peak period in 2025. These six were selected from the arterial intersections which were projected to have either the highest traffic volumes or worst traffic congestion in a 2025 traffic assignment produced by the MAG TransCAD TDM. The following six intersections were selected for this analysis:

- 16th St & Camelback Rd
- 107th Ave & Grand Ave
- Priest Dr & Southern Ave
- 7th Ave & Van Buren St
- Germann Rd & Gilbert Rd
- Thomas Rd & 27th Ave

To describe the intersection geometry, the following parameters for both free flow and queue links were developed for each intersection:

- Start and end point of link coordinates
- Source height
- Mixing width
- Link type
- Number of lanes

Geometric layouts for the intersections in Figures III-1 through III-6 were developed using ArcGIS and the October 2011 aerial imagery from the Flood Control District of Maricopa County.

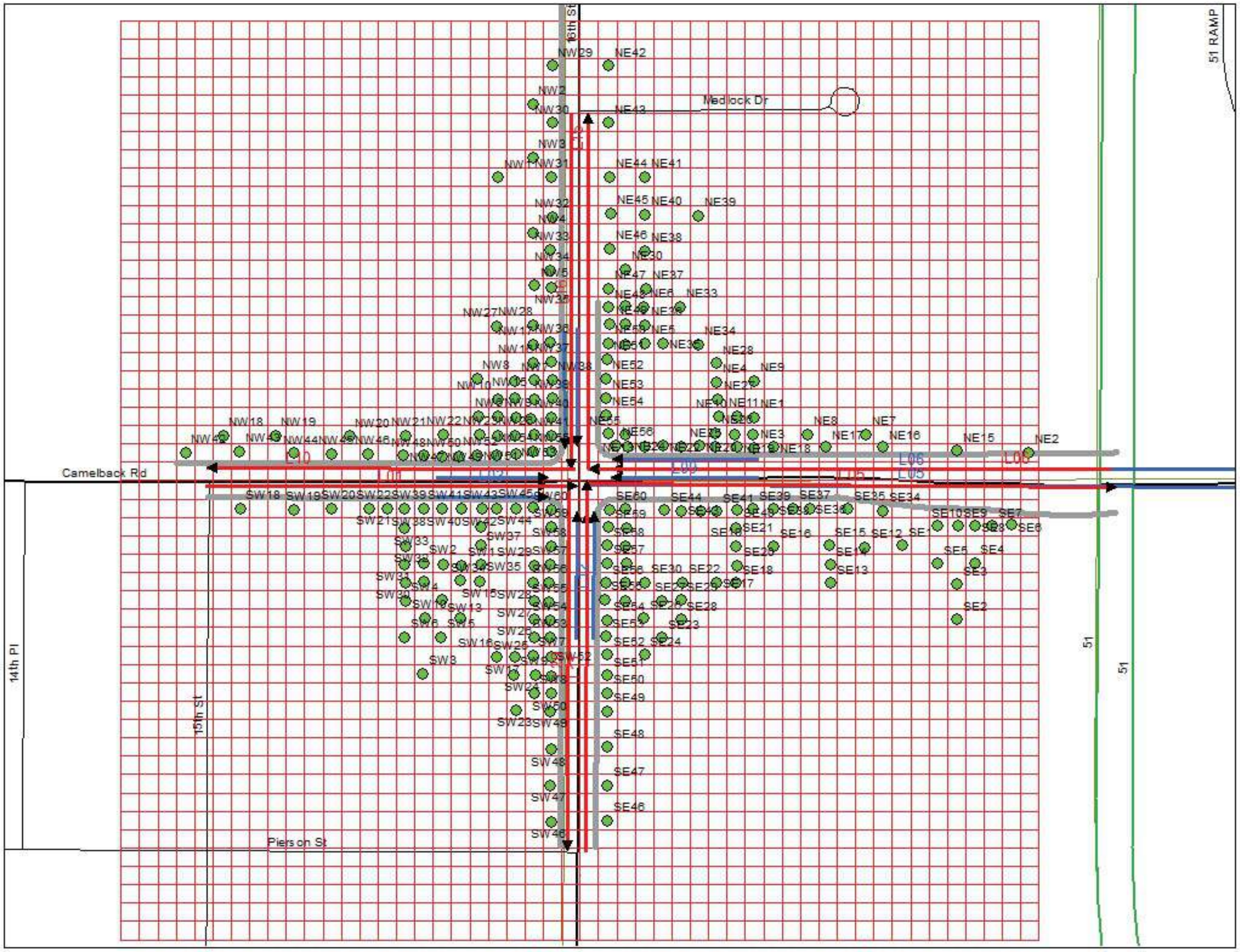


Figure III-1. Geometric layout of 16th St & Camelback Rd intersection in 2025

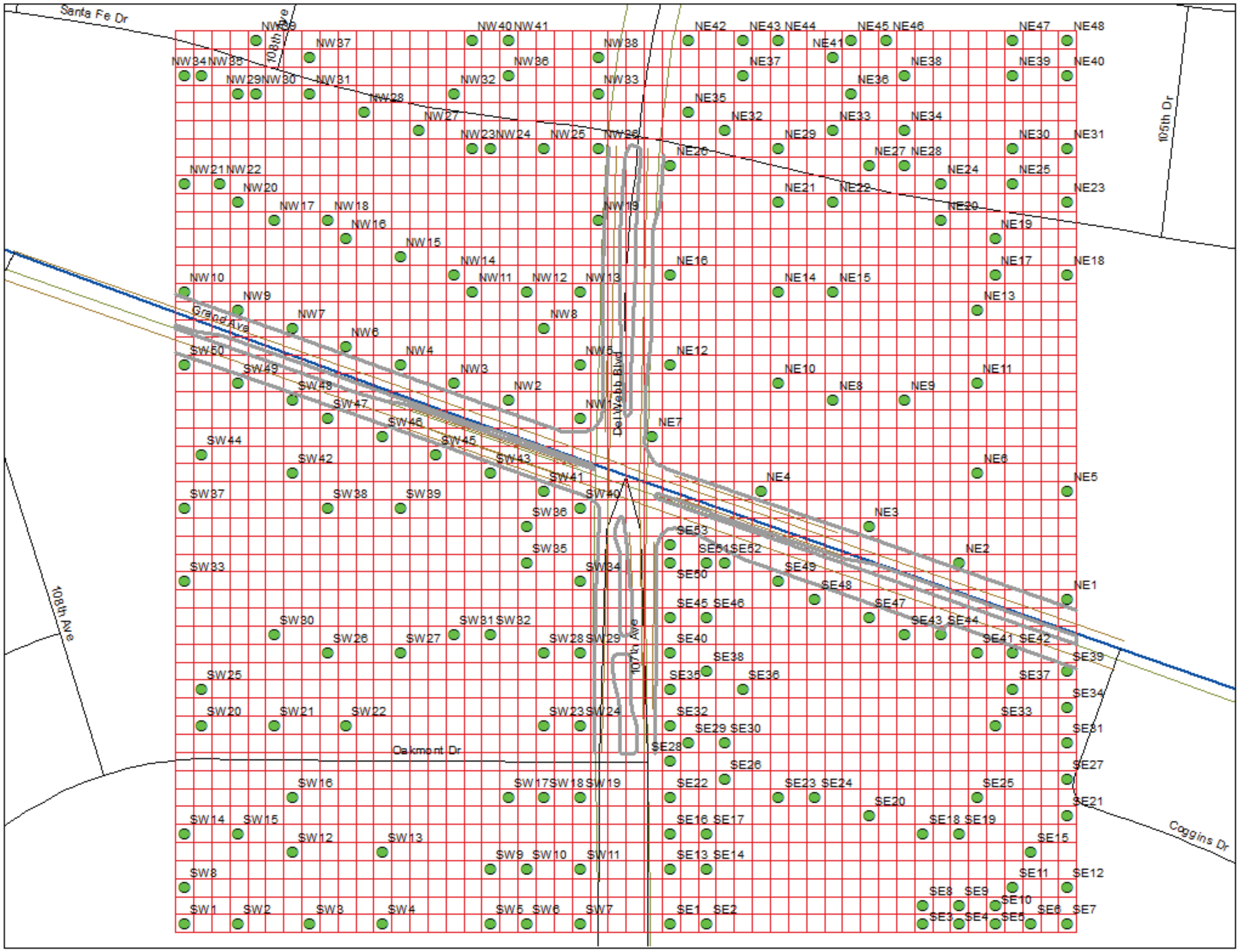


Figure III-2. Geometric layout of 107th Ave & Grand Ave intersection in 2025

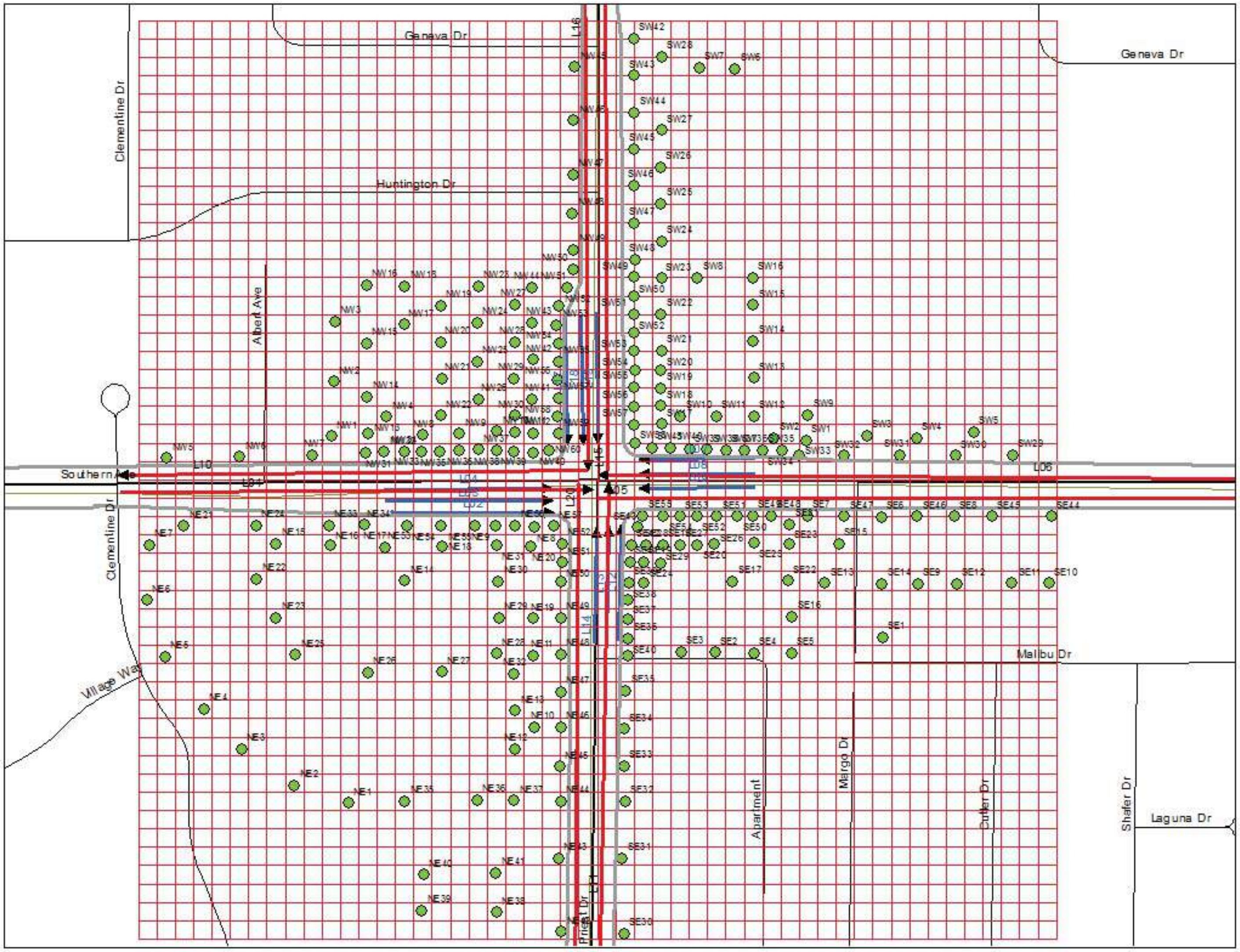


Figure III-3. Geometric layout of Priest Dr. & Southern Ave intersection in 2025

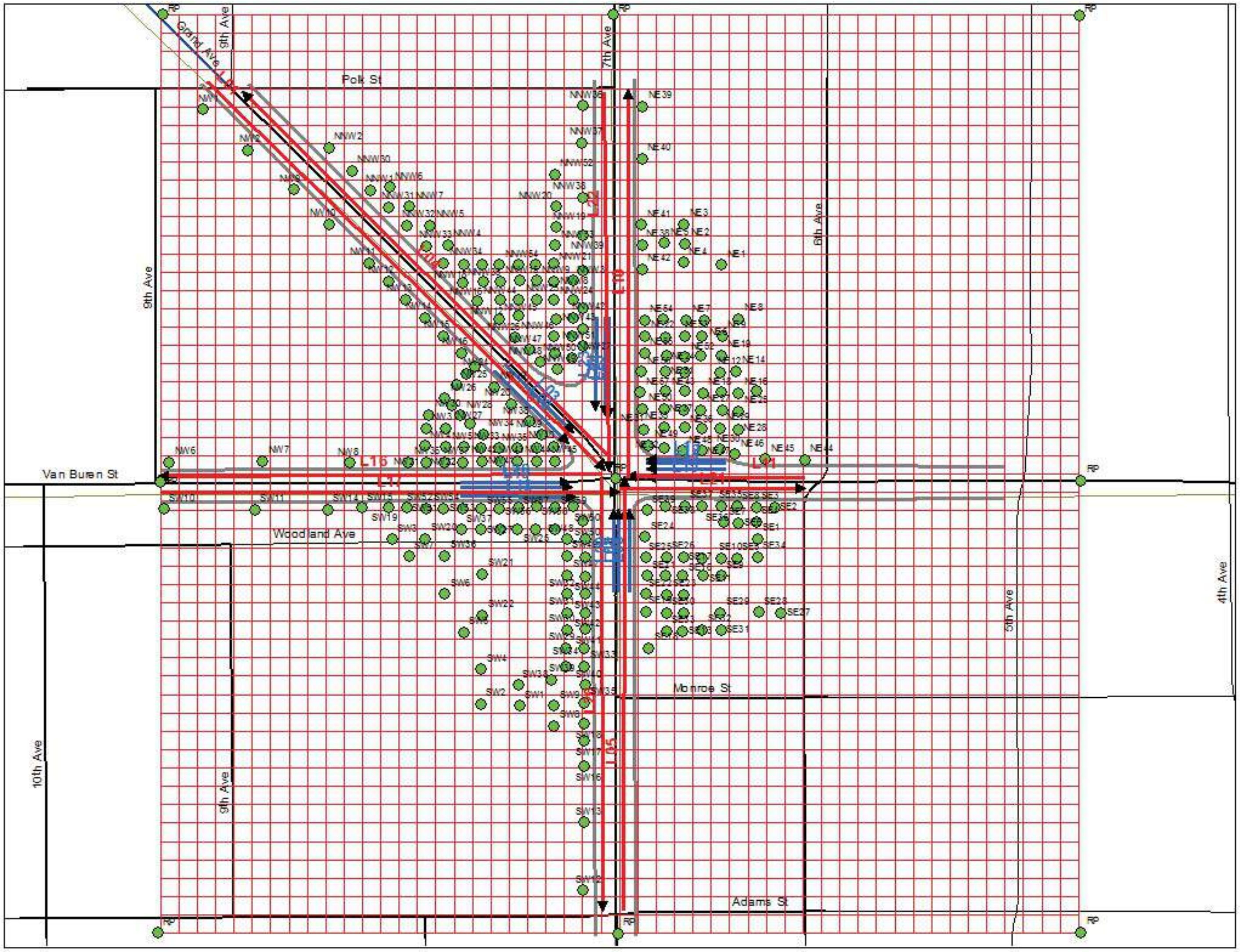


Figure III-4. Geometric layout of 7th Ave & Van Buren St intersection in 2025

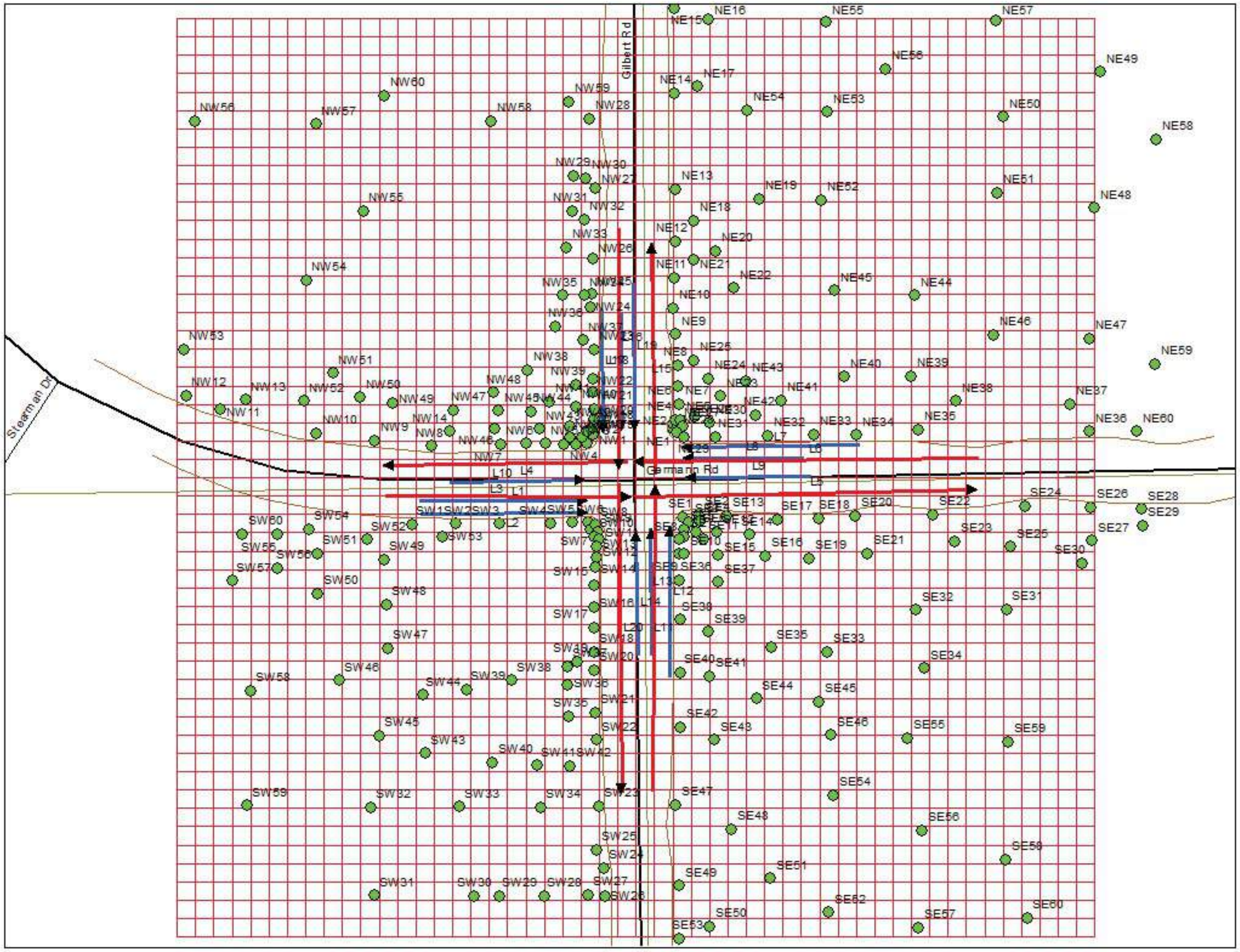


Figure III-5. Geometric layout of Germann Rd & Gilbert Rd intersection in 2025

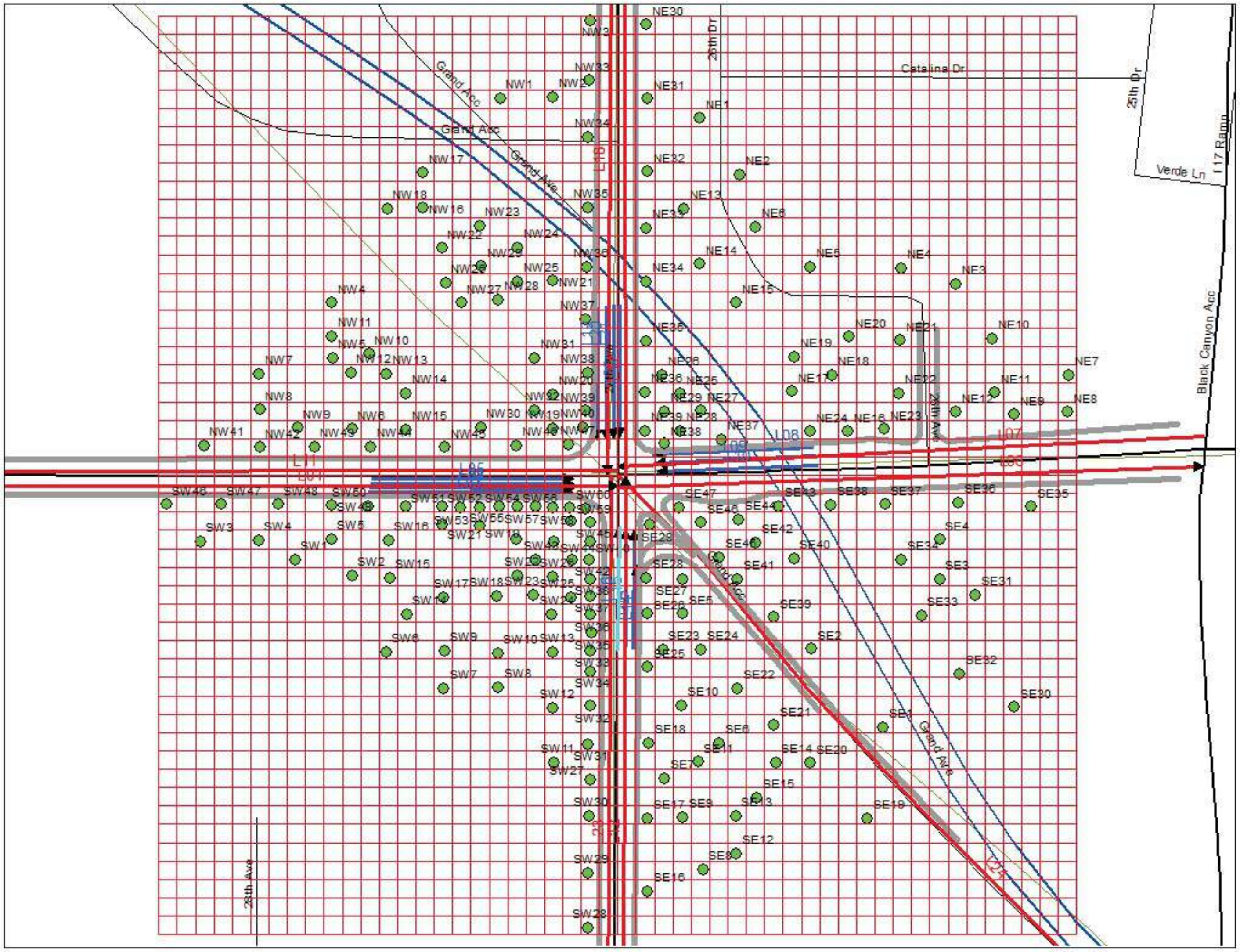


Figure III-6. Geometric layout of Thomas Rd & 27th Ave intersection in 2025

III-2. Receptor Location

The locations of receptors around each intersection are critical to determining the maximum concentration. For all six intersections, the receptors were densely arrayed (approximately 10 meters apart) in each quadrant or corner around the intersection in order to capture the hotspot. Since CAL3QHC can process up to 60 receptors in a single run, CAL3QHC runs were performed for each quadrant of an intersection. Receptors were mainly set at those areas where pedestrians may be exposed to high CO concentrations near the intersection. Receptor heights were set at an assumed breathing height of 1.8 meters (6.0 feet).

III-3. Intersection Traffic and Signal Data

To simulate traffic conditions for a given intersection, CAL3QHC requires the free flow and approach traffic volumes, as well as traffic signal data:

- Approach volume
- Total signal cycle length
- Red total signal cycle length
- Clearance lost time

The free flow traffic volumes were obtained from the MAG 2025 traffic assignment data, while approach traffic volume and signal data were provided by the MAG Transportation Division. Tables III-1 to III-6 present traffic volume and signal data for the six intersections.

III-4. MOVES2010b Emissions Rates

As required parameters for CAL3QHC, running emission rates for free flow links and idling emission rates for queue links were estimated for the selected six intersections using (1) MOVES2010b, which is the latest version of the EPA-approved onroad mobile source emissions model, and (2) the PM peak traffic volume, which represents the worst-case condition. Based on EPA guidance (EPA, 2010b), MOVES2010b RunSpecs and local input data were prepared for each intersection as described below.

The MOVES2010b RunSpecs for a project level analysis were developed as follows:

- Scale: To accept detailed activity input at the link level, MOVES2010b was executed using the Project domain. Since CAL3QHC requires emission rates in terms of grams/vehicle-mile for free-flow links and grams/hour for queue links, the inventory option was selected as output.
- Time Spans: To describe the PM peak traffic scenario, a PM peak hour in terms of traffic volume was set to December 2025. Time aggregation and the day selection was set to “hour” and “weekday”, respectively.
- Geographic Bounds: Maricopa County was selected at the project level.
- Vehicles/Equipment: All source types and fuel types were selected for all

intersections.

- Road Type: Based on the Highway Performance Monitoring System (HPMS) functional classification of the road type, Urban Unrestricted Access (roadTypeID 5) was used for all intersections.
- Pollutants and Processes: Since CAL3QHC requires CO emission rates for both free flow and queue links, Running Exhaust and Crankcase Running Exhaust were selected as processes.
- Output: Under the General Output panel, “grams” and “miles” were selected for the output units, and “Distance Traveled” and “Population” were selected for the activity. For the Output Emissions Detail panel, only “Emission Process” was selected along with the default selection of emissions by hour and link.

Also, local input data for each intersection were prepared as follows:

- Meteorology: The temperature and humidity data corresponding to each of the ten highest non-overlapping eight-hour CO concentrations for the last three years (2009, 2010, and 2011) were retrieved from the NCDC database for the NWS station at the Phoenix Sky Harbor International Airport (KPHX). The raw data for the identified 8 hours were averaged as shown in Table III-7. The same three-year averaged values were applied to all six intersections.
- Age Distribution: The latest available local age distribution assumptions were applied. A MOVES age distribution table was derived from EPA’s registration distribution converter and the July 2012 vehicle registration data for Maricopa County provided by ADOT.
- Fuel Supply and Formulation: The MOVES default fuel formulation and fuel supply data were revised based on local volumetric fuel property information provided by the Arizona Department of Weights and Measures.
- I/M Program: The default I/M programs in MOVES2010b were modified to represent characteristics of the local I/M programs in Maricopa County.
- Link Source Type: Assuming that the distribution of a regional fleet for a given road type represents the source type distribution for selected intersections, the source type distribution used for the onroad emissions inventory in Section II-3 was adopted.
- Links: The number of links and the length of each link for a given intersection were obtained from the intersection geometry described in Section III-1. Traffic volume and average speed for each link were assigned to each intersection based on the intersection traffic data in Section III-3.

For each intersection, MOVES generated a grams/vehicle-mile running emission rate for the free flow link and a grams/vehicle-hour idling emission rate for the queue link. Those emission rates were used to perform the CAL3QHC intersection analysis.

Table III-1. Traffic and signal data at 16th St & Camelback Rd intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Camelback Rd EB Approach	40	2,295	3	n/a	n/a	n/a
L2	Camelback Rd EB Queue Right Turn	n/a	393	1	90	58	5.0
L3	Camelback Rd EB Queue	n/a	1,471	3	90	58	5.0
L4	Camelback Rd EB Queue Left Turn	n/a	430	1	90	78	3.0
L5	Camelback Rd EB Departure	40	2,056	3	n/a	n/a	n/a
L6	Camelback Rd WB Approach	40	2,036	3	n/a	n/a	n/a
L7	Camelback Rd WB Queue Right Turn	n/a	645	1	90	58	5.0
L8	Camelback Rd WB Queue	n/a	1,070	3	90	58	5.0
L9	Camelback Rd WB Queue Left Turn	n/a	321	1	90	78	3.0
L10	Camelback Rd WB Departure	40	1,911	3	n/a	n/a	n/a
L11	16th St NB Approach	40	2,165	3	n/a	n/a	n/a
L12	16th St NB Queue Right Turn	n/a	581	1	90	55	5.2
L13	16th St NB Queue	n/a	1,298	3	90	55	5.2
L14	16th St NB Queue Left Turn	n/a	286	1	90	89	3.0
L15	16th St NB Departure	40	2,373	3	n/a	n/a	n/a
L16	16th St SB Approach	40	1,610	2	n/a	n/a	n/a
L17	16th St SB Queue Right Turn	n/a	554	1	90	55	5.2
L18	16th St SB Queue	n/a	1,052	2	90	55	5.2
L19	16th St SB Queue Left Turn	n/a	3	1	90	11	3.0
L20	16th St SB Departure	40	1,766	2	n/a	n/a	n/a

Table III-2. Traffic and signal data at 107th Ave & Grand Ave intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Grand Ave EB Approach	45	2,739	3	n/a	n/a	n/a
L2	Grand Ave EB Queue Right Turn	n/a	383	1	130	76	6.0
L3	Grand Ave EB Queue	n/a	1,451	3	130	76	6.0
L4	Grand Ave EB Queue Left Turn	n/a	904	1	130	114	4.5
L5	Grand Ave EB Departure	45	1,693	3	n/a	n/a	n/a
L6	Grand Ave WB Approach	45	2,146	3	n/a	n/a	n/a
L7	Grand Ave WB Queue Right Turn	n/a	278	1	130	76	6.0
L8	Grand Ave WB Queue	n/a	1,859	3	130	76	6.0
L9	Grand Ave WB Queue Left Turn	n/a	9	1	130	114	4.5
L10	Grand Ave WB Departure	45	3,084	3	n/a	n/a	n/a
L11	107th Ave NB Approach	30	1,108	2	n/a	n/a	n/a
L12	107th Ave NB Queue Right Turn	n/a	8	1	130	82	5.5
L13	107th Ave NB Queue	n/a	841	2	130	82	5.5
L14	107th Ave NB Queue Left Turn	n/a	260	1	130	98	4.5
L15	107th Ave NB Departure	30	2,023	2	n/a	n/a	n/a
L16	107th Ave SB Approach	30	1,821	2	n/a	n/a	n/a
L17	107th Ave SB Queue Right Turn	n/a	965	1	130	102	5.5
L18	107th Ave SB Queue	n/a	622	2	130	102	5.5
L19	107th Ave SB Queue Left Turn	n/a	234	1	130	118	4.5
L20	107th Ave SB Departure	30	1,014	2	n/a	n/a	n/a

Table III-3. Traffic and signal data at Priest Dr & Southern Ave intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Southern Ave EB Approach	45	2,197	2	n/a	n/a	n/a
L2	Southern Ave EB Queue Right Turn	n/a	1,148	1	94	64	6.0
L3	Southern Ave EB Queue	n/a	1,000	2	94	64	6.0
L4	Southern Ave EB Queue Left Turn	n/a	49	2	94	78	4.0
L5	Southern Ave EB Departure	45	1,637	2	n/a	n/a	n/a
L6	Southern Ave WB Approach	45	1,174	3	n/a	n/a	n/a
L7	Southern Ave WB Queue Right Turn	n/a	259	1	94	64	6.0
L8	Southern Ave WB Queue	n/a	789	3	94	64	6.0
L9	Southern Ave WB Queue Left Turn	n/a	125	2	94	78	4.0
L10	Southern Ave WB Departure	45	1,614	3	n/a	n/a	n/a
L11	Priest Dr NB Approach	45	1,719	2	n/a	n/a	n/a
L12	Priest Dr NB Queue Right Turn	n/a	178	1	94	62	6.0
L13	Priest Dr NB Queue	n/a	888	2	94	62	6.0
L14	Priest Dr NB Queue Left Turn	n/a	652	2	94	78	4.0
L15	Priest Dr NB Departure	45	1,197	2	n/a	n/a	n/a
L16	Priest Dr SB Approach	45	2,271	2	n/a	n/a	n/a
L17	Priest Dr SB Queue Right Turn	n/a	174	1	94	62	6.0
L18	Priest Dr SB Queue	n/a	1,639	3	94	62	6.0
L19	Priest Dr SB Queue Left Turn	n/a	459	2	94	78	4.0
L20	Priest Dr SB Departure	45	2,912	3	n/a	n/a	n/a

Table III-4. Traffic and signal data at 7th Ave & Van Buren St intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Grand Ave SEB Approach	35	1,079	2	n/a	n/a	n/a
L2	Grand Ave SEB Queue Right Turn	n/a	548	2	135	108	6.3
L3	Grand Ave SEB Queue Left Turn	n/a	531	2	135	108	6.3
L4	Grand Ave NWB Departure	35	1,437	2	n/a	n/a	n/a
L5	7th Ave NB Approach	35	1,846	3	n/a	n/a	n/a
L6	7th Ave NB Queue Right Turn	n/a	115	1	135	62	7.1
L7	7th Ave NB Queue	n/a	1,081	3	135	62	7.1
L8	7th Ave NB Queue Left Turn 1	n/a	584	2	135	100	4.0
L9	7th Ave NB Queue Left Turn 2	n/a	67	1	135	100	4.0
L10	7th Ave NB Departure	35	1,415	3	n/a	n/a	n/a
L11	Van Buren St WB Approach	35	1,605	2	n/a	n/a	n/a
L12	Van Buren St WB Queue Right Turn 1	n/a	853	2	135	100	6.9
L13	Van Buren St WB Queue Right Turn 2	n/a	244	1	135	100	6.9
L14	Van Buren St WB Queue	n/a	443	2	135	100	6.9
L15	Van Buren St WB Queue Left Turn	n/a	64	1	135	100	6.9
L16	Van Buren St WB Departure	35	907	2	n/a	n/a	n/a
L17	Van Buren St EB Approach	35	575	2	n/a	n/a	n/a
L18	Van Buren St EB Queue Right Turn	n/a	41	1	135	100	6.9
L19	Van Buren St EB Queue	n/a	444	2	135	100	6.9
L20	Van Buren St EB Queue Left Turn	n/a	90	1	135	100	6.9
L21	Van Buren St EB Departure	35	1,263	2	n/a	n/a	n/a
L22	7th Ave SB Approach	35	1,135	3	n/a	n/a	n/a
L23	7th Ave SB Queue Right Turn	n/a	397	1	135	97	7.1
L24	7th Ave SB Queue	n/a	565	3	135	97	7.1
L25	7th Ave SB Queue Left Turn	n/a	173	1	135	97	7.1
L26	7th Ave SB Departure	35	1,218	3	n/a	n/a	n/a

Table III-5. Traffic and signal data at Germann Rd & Gilbert Rd intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Germann Rd EB Approach	45	2,100	3	n/a	n/a	n/a
L2	Germann Rd EB Queue Right Turn	n/a	594	1	94	68	7.0
L3	Germann Rd EB Queue	n/a	1,184	3	94	68	7.0
L4	Germann Rd EB Queue Left Turn	n/a	322	2	94	81	5.0
L5	Germann Rd EB Departure	45	2,203	3	n/a	n/a	n/a
L6	Germann Rd WB Approach	45	1,197	3	n/a	n/a	n/a
L7	Germann Rd WB Queue Right Turn	n/a	708	1	94	65	7.0
L8	Germann Rd WB Queue	n/a	370	3	94	65	7.0
L9	Germann Rd WB Queue Left Turn	n/a	119	2	94	78	5.0
L10	Germann Rd WB Departure	45	676	3	n/a	n/a	n/a
L11	Gilbert Rd NB Approach	45	1,560	3	n/a	n/a	n/a
L12	Gilbert Rd NB Queue Right Turn	n/a	122	1	94	56	7.0
L13	Gilbert Rd NB Queue	n/a	1,339	3	94	56	7.0
L14	Gilbert Rd NB Queue Left Turn	n/a	99	2	94	80	5.0
L15	Gilbert Rd NB Departure	45	2,369	3	n/a	n/a	n/a
L16	Gilbert Rd SB Approach	45	2,785	3	n/a	n/a	n/a
L17	Gilbert Rd SB Queue Right Turn	n/a	206	1	94	56	7.0
L18	Gilbert Rd SB Queue	n/a	1,681	3	94	56	7.0
L19	Gilbert Rd SB Queue Left Turn	n/a	898	2	94	80	5.0
L20	Gilbert Rd SB Departure	45	2,394	3	n/a	n/a	n/a

Table III-6. Traffic and signal data at Thomas Rd & 27th Ave intersection

Link ID	Link Type	Free Flow Speed (mph)	Traffic Volume (veh/hr)	Number of Lanes	Average Total Signal Cycle Length (s)	Average Red Total Signal Cycle Length (s)	Clearance Lost Time (s)
L1	Thomas Rd EB Approach	40	1,261	3	n/a	n/a	n/a
L2	Thomas Rd EB Queue Right Turn 1	n/a	196	1	90	55	5.5
L3	Thomas Rd EB Queue Right Turn 2	n/a	39	1	90	55	5.5
L4	Thomas Rd EB Queue	n/a	811	3	90	55	5.5
L5	Thomas Rd EB Queue Left Turn	n/a	215	1	90	71	4.0
L6	Thomas Rd EB Departure	40	1,818	3	n/a	n/a	n/a
L7	Thomas Rd WB Approach	35	2,871	3	n/a	n/a	n/a
L8	Thomas Rd WB Queue Right Turn	n/a	673	1	90	55	5.5
L9	Thomas Rd WB Queue	n/a	1,727	3	90	55	5.5
L10	Thomas Rd WB Queue Left Turn	n/a	471	1	90	71	4.0
L11	Thomas Rd WB Departure	40	2,051	3	n/a	n/a	n/a
L12	27th Ave NB Approach	40	1,413	3	n/a	n/a	n/a
L13	27th Ave NB Queue Right Turn 1	n/a	533	1	90	54	5.9
L14	27th Ave NB Queue Right Turn 2	n/a	16	1	90	54	5.9
L15	27th Ave NB Queue	n/a	783	2	90	54	5.9
L16	27th Ave NB Queue Left Turn	n/a	82	1	90	71	4.0
L17	27th Ave NB Departure	40	1,671	2	n/a	n/a	n/a
L18	27th Ave SB Approach	40	1,504	2	n/a	n/a	n/a
L19	27th Ave SB Queue Right Turn	n/a	242	1	90	54	5.9
L20	27th Ave SB Queue	n/a	582	2	90	54	5.9
L21	27th Ave SB Queue Left Turn 1	n/a	206	1	90	71	4.0
L22	27th Ave SB Queue Left Turn 2	n/a	474	2	90	71	4.0
L23	27th Ave SB Departure	40	1,092	2	n/a	n/a	n/a
L24	Ramp to Grand Ave SEB Departure	40	417	2	n/a	n/a	n/a

Table III-7. Meteorological input data for MOVES2010b

Rank	2009		2010		2011	
	Temperature (°F)	Relative Humidity (%)	Temperature (°F)	Relative Humidity (%)	Temperature (°F)	Relative Humidity (%)
1	49.9	60	62.2	47	57.8	27
2	49.9	60	63.1	36	58.9	30
3	51.2	22	55.9	41	54.1	44
4	54.1	19	55.9	41	44.2	62
5	70.1	37	62.2	53	55.9	48
6	61.1	33	56.9	36	58.9	37
7	73.0	28	55.9	41	55.0	39
8	66.8	41	54.1	52	48.8	79
9	58.9	31	57.8	55	67.9	22
10	70.1	29	55.9	56	52.1	71
Mean	**60.5**	**36**	**58.0**	**46**	**55.3**	**46**
Three-Year Average					**57.9**	**42.6**

III-5. CAL3QHC Modeling Analysis

The meteorological inputs to the CAL3QHC model recommended in the User's Guide to CAL3QHC Version 2.0 (EPA, 1995) are summarized in Table III-8.

Based on traffic volumes, traffic signal data, and MOVES2010b emission rates for the six intersections, the CAL3QHC model predicted the maximum one-hour CO concentrations at receptors in 2025 under the meteorological conditions given in Table III-8. The maximum one-hour CO concentration at each intersection estimated by the CAL3QHC model was multiplied by a persistence factor of 0.76 to derive the maximum eight-hour concentration. EPA's guideline (EPA, 1992) specifies use of the persistence factor in estimating eight-hour concentrations from one-hour concentrations. The persistence factor should represent the variability in both traffic and meteorological conditions. By following the EPA guidance (EPA, 1992), persistence factors for thirteen monitoring sites were calculated using the ten highest non-overlapping eight-hour average CO concentrations and the highest one-hour CO concentration for each eight-hour period during the winter CO season for the years 2009 through 2011. As shown in Table III-9, the thirteen persistence factors were averaged for the regional average persistence factor of 0.76.

In addition to the maximum CO concentration for each intersection, the background CO concentration for the base year 2008 was determined to be 1.9 ppm by averaging the highest eight-hour CO measurements for the years 2007 through 2009 for twelve monitoring sites, excluding the West Indian School and West Phoenix sites. The CO measurements at these monitors are not appropriate for representing the background concentrations, because the West Indian School and West Phoenix sites are located in areas typically influenced by heavy local traffic and congestion. Since the background CO concentration for the future year will be affected by the regional CO emissions change, the background CO concentration in 2025 was derived by multiplying the 2008 background concentration of 1.9 ppm by the ratio of the 2025 projected total CO emissions to the base year 2008 total CO emissions. The ratios of the 2025 emissions to the 2008 emissions are 0.65 (i.e., 402.2/623.5) for the CO modeling domain and 0.71 (i.e., 637.8/901.6) for the CO maintenance area. The background CO concentration of 1.3 ppm for 2025 was determined by multiplying 1.9 ppm by 0.71 as the most conservative ratio. Table III-10 presents total maximum eight-hour CO concentrations, which combine the maximum eight-hour CO concentrations for each intersection and background CO concentration, for the six intersections in 2025.

Table III-8. Meteorological parameters used for CAL3QHC

Meteorological Parameters	Value	Notes
Settling Velocity	0 cm/s	Default value for CAL3QHC
Deposition Velocity	0 cm/s	Default value for CAL3QHC
Mean Wind Speed	1 m/s	Minimum wind speed for CAL3QHC
Stability Class	D	Stability class for urban area
Roughness Length	108~321 cm	Values depending on city land use type
Mixing Height	1,000 m	EPA recommended value for CAL3QHC
Wind Direction	0~360°	All directions in 10 degree increments

Table III-9. Persistence factors

Site ID	Site Name	Abbr	Persistence Factor	Regional Average Persistence Factor
04-013-0019	West Phoenix	WP	0.81	0.76
04-013-1003	Mesa	ME	0.74	
04-013-1004	North Phoenix	NP	0.74	
04-013-2001	Glendale	GL	0.76	
04-013-3002	Central Phoenix	CP	0.73	
04-013-3003	South Scottsdale	SS	0.77	
04-013-3010	Greenwood	GR	0.80	
04-013-4003	South Phoenix	SP	0.71	
04-013-4004	West Chandler	WC	0.82	
04-013-4005	Tempe	TE	0.82	
04-013-4010	Dysart	DY	0.66	
04-013-4011	Buckeye	BE	0.66	
04-013-9997	Super Site	SUPR	0.83	

Table III-10. Predicted maximum eight-hour CO concentration for 2025 (unit: ppm)

Intersection	CAL3QHC Maximum One-Hour CO Concentration	Maximum Eight-Hour CO Concentration	Background CO Concentration	Total Maximum Eight-Hour CO Concentration
16th St & Camelback Rd	0.5	0.4	1.3	1.7
107th Ave & Grand Ave	0.4	0.3		1.6
Priest Dr & Southern Ave	0.5	0.4		1.7
7th Ave & Van Buren St	0.4	0.3		1.6
Germann Rd & Gilbert Rd	0.4	0.3		1.6
Thomas Rd & 27th Ave	0.4	0.3		1.6

IV. MAINTENANCE DEMONSTRATION METHODOLOGY

IV-1. Maintenance Plan Control Measures

The Maricopa County area will continue to implement the committed control measures in the MAG 2003 CO Maintenance Plan (MAG, 2003). The committed control measures used for numeric credit in demonstrating maintenance of the CO standard through 2015 in the MAG 2003 CO Maintenance Plan are as follows:

1. California Phase 2 Reformulated Gasoline with 3.5% Oxygen Content From November 1 Through March 31
2. Off-Road Vehicle and Engine Standards
3. Phased-In Emission Test Cutpoints
4. One-time Waiver from Vehicle Emissions Test
5. Defer Emissions Associated with Government Activities
6. Coordinate Traffic Signal Systems
7. Develop Intelligent Transportation Systems
8. Tougher Enforcement of Vehicle Registration and Emissions Test Compliance
9. Clean Burning Fireplace Ordinances
10. Expansion of Area A Boundaries

A tenth measure, Expansion of Area A Boundaries, has been added to the maintenance measures in the MAG 2013 CO Maintenance Plan. This measure was one of three contingency measures in the MAG 2003 CO Maintenance Plan. The rationale for converting Expansion of Area A Boundaries from a contingency to a maintenance measure is discussed in Chapter Three of the MAG 2013 CO Maintenance Plan. In the MAG 2013 CO Maintenance Plan, numeric credit of 128.9 metric tons per day is taken in 2025 for the first measure, California Phase 2 Reformulated Gasoline, and numeric credit of 15.0 metric tons per day is taken in 2025 for the second measure, Off-Road Vehicle and Engine Standards. For the first measure, the MOVES2010b and NONROAD2008a estimated 109.3 metric tons per day for onroad source emissions credit and 19.6 metric tons per day for nonroad source emissions credit. The numeric credit for the second measure was estimated by using the “Tech Year” option of NONROAD2008a. While the eight other maintenance measures in the 2013 CO Maintenance Plan will continue to be implemented, their collective CO reduction impact in 2025 is anticipated to be less than one percent; therefore, no numeric credit has been quantified for these measures in the 2025 maintenance demonstration. In addition to Phase 2 Reformulated Gasoline, the maintenance demonstration in this plan is dependent upon the benefits of tighter federal emission standards for new onroad and nonroad engines, fuel requirements, and continuing fleet turnover to lower emitting onroad and nonroad vehicles.

IV-2. Maintenance Demonstration

Three approaches were used to demonstrate maintenance of the CO standards through 2025: (1) an emissions inventory comparison, (2) scaling UAM/CAL3QHC eight-hour maximum concentrations, and (3) an intersection hotspot analysis. The underlying assumption in these analyses is that the CO emissions from sources are linearly related to the ambient level of CO concentrations.

The first maintenance demonstration approach compares emission levels of the past years 2006 and 2008 to those for the future years 2015 and 2025. Since the one-hour and eight-hour CO concentrations for the years 2006 and 2008 are considerably lower than the CO standards, a decrease of emissions in 2015 and 2025 confirms maintenance of the CO standards. The second approach scaled the combined UAM/CAL3QHC maximum eight-hour CO concentration estimated for the years 2006 and 2015 to the maintenance year 2025 based on the ratio of the future year emissions to the base year emissions. The scaled maximum eight-hour CO concentration for the year 2025 was used to demonstrate maintenance of the eight-hour CO standard. For the third approach, a CAL3QHC modeling analysis was performed on high volume and congested traffic intersections for the maintenance year 2025. The CAL3QHC maximum CO predictions for receptors around those intersections and the background CO concentration were combined to determine if the eight-hour CO standard would be maintained despite increases in traffic volumes and congestion.

These three approaches provide convincing evidence that the CO standards will be maintained through 2025.

IV-2-1. Emissions Inventory Comparison

Two sets of CO emissions inventories for point, area, nonroad, and onroad sources were developed for an average weekday during the winter CO season for the CO modeling domain and maintenance area. The first set of emissions inventories includes emissions for the years 2006, 2008, 2015, and 2025 for the CO modeling domain. These CO modeling domain emissions were developed for comparison with comparable emissions in the MAG 2003 CO Maintenance Plan. The second set of emissions inventories was developed for the years 2008 and 2025 to demonstrate maintenance of the eight-hour standard for the CO maintenance area. The CO modeling domain covers 792 sq. miles of Maricopa County, while the CO maintenance area is 1,814 sq. miles which is more than twice the size of the CO modeling domain.

The emissions inventories for the CO modeling domain developed in this plan were compared with those in the MAG 2003 CO Maintenance Plan, as shown in Table IV-1. Average weekday anthropogenic CO emissions for the CO modeling domain for the winter season were estimated at 803.0 metric tons per day in 2006, 623.5 metric tons per day in 2008, 478.6 metric tons per day in 2015, and 403.9 metric tons per day in 2025, as indicated in Table II-24. The CO emissions decrease by 22.4% from 2006 to 2008, 23.2% from 2008 to 2015, and 15.6% from 2015 to 2025. Average weekday CO emissions for the CO maintenance area for the winter season were estimated at 901.6 metric tons per day in 2008 and 639.6 metric tons per day in 2025, as provided in Table II-25. The total CO emissions for the area decrease by 29.1% from 2008 to 2025. The emission reductions in both the CO modeling domain and maintenance area are predominantly attributable to declining onroad and nonroad sources emissions.

To project future CO concentrations, the maximum eight-hour CO concentration measurements in 2006 and 2008 were multiplied by the ratio of the future emissions to base year emissions, as shown in Tables IV-2 and IV-3. The maximum eight-hour CO concentration was 5.3 ppm at the West Indian School Road site in 2006 and 3.1 ppm at the West Phoenix site in 2008.

The maximum eight-hour CO concentration for the CO modeling domain in 2025 was calculated as follows:

$$\begin{aligned} \text{Maximum eight-hour CO concentration}_{2025} &= \text{Maximum eight-hour CO concentration}_{2006} \times \frac{\text{CO emissions}_{2025}}{\text{CO emissions}_{2006}} \\ &= 5.3\ ppm \times \frac{403.9\ \text{metric tons/day}}{803.0\ \text{metric tons/day}} \\ &= 2.7\ ppm \end{aligned}$$

The maximum eight-hour CO concentration for the CO maintenance area in 2025 was calculated as follows:

$$\begin{aligned} \text{Maximum eight-hour CO concentration}_{2025} &= \text{Maximum eight-hour CO concentration}_{2008} \times \frac{\text{CO emissions}_{2025}}{\text{CO emissions}_{2008}} \\ &= 3.1\ ppm \times \frac{639.6\ \text{metric tons/day}}{901.6\ \text{metric tons/day}} \\ &= 2.2\ ppm \end{aligned}$$

Since emission levels for both the CO modeling domain and maintenance area are decreasing and the maximum eight-hour CO concentrations in 2025 for both the CO modeling domain and maintenance area are substantially below the CO standard, the continued maintenance of the CO standard through 2025 is demonstrated for the Maricopa County area.

Table IV-1. Total CO emissions for the CO modeling domain estimated in the MAG 2003 and 2013 CO Maintenance Plans

CO Maintenance Plan	Total CO Emissions (metric tons/day)		
	2006	2015	2025
MAG 2003 Plan	912.3	901.2	N/A
MAG 2013 Plan	803.0	478.6	403.9

Table IV-2. Maximum eight-hour CO predictions in 2015 and 2025 for the CO modeling domain (unit ppm)

Base Year	Maximum Eight-Hour CO Concentration	Maximum Eight-Hour CO Prediction		Eight-Hour CO Standard
		2015	2025	
2006	5.3	3.2	2.7	9 ppm
2008	3.1	2.4	2.0	

Table IV-3. Maximum eight-hour CO prediction in 2025 for the CO maintenance area (unit: ppm)

	CO Concentration	CO Prediction	Eight-Hour CO Standard
	2008	2025	
Maximum Eight-Hour CO	3.1	2.2	9 ppm

IV-2-2. Scaling UAM/CAL3QHC Maximum Eight-Hour Concentrations

In the MAG 2003 CO Maintenance Plan, the combined UAM/CAL3QHC eight-hour CO concentrations in the CO modeling domain were estimated for the years 2006 and 2015. Since the UAM/CAL3QHC predictions were derived from the emissions inventories based on older versions of models (e.g., MOBILE6) available at the time of development of the MAG 2003 CO Maintenance Plan, emissions inventories for the years 2006 and 2015, as well as the maintenance year 2025, were newly developed, as shown in Table IV-1, using the latest versions of models and updated model input data. The UAM/CAL3QHC predictions for the years 2006 and 2015 were adjusted by the ratio of the new to old emissions inventory totals. The adjusted UAM/CAL3QHC predictions were scaled for the maintenance year 2025, as shown in Table IV-4.

The scaled UAM/CAL3QHC maximum eight-hour CO concentration for 2025 is calculated as follows:

$$\underset{\text{(based on the 2006 adjusted maximum)}}{\textit{Maximum eight-hour CO concentration}_{2025}} = \textit{Adjusted maximum CO concentration}_{2006} \times \frac{\textit{CO emissions}_{2025}}{\textit{CO emissions}_{2006}}$$

$$= \textit{UAM / CAL3QHC maximum CO}_{2006} \times \frac{\textit{MAG 2013 Plan CO emissions}_{2006}}{\textit{MAG 2003 Plan CO emissions}_{2006}} \times \frac{\textit{CO emissions}_{2025}}{\textit{CO emissions}_{2006}}$$

$$= 8.92\ ppm \times \frac{803.0\ \textit{metric tons / day}}{912.3\ \textit{metric tons / day}} \times \frac{403.9\ \textit{metric tons / day}}{803.0\ \textit{metric tons / day}}$$

$$= 3.95\ ppm$$

$$\underset{\text{(based on the 2015 adjusted maximum)}}{\textit{Maximum eight-hour CO concentration}_{2025}} = \textit{Adjusted maximum CO concentration}_{2015} \times \frac{\textit{CO emissions}_{2025}}{\textit{CO emissions}_{2015}}$$

$$= \textit{UAM / CAL3QHC maximum CO}_{2015} \times \frac{\textit{MAG 2013 Plan CO emissions}_{2015}}{\textit{MAG 2003 Plan CO emissions}_{2015}} \times \frac{\textit{CO emissions}_{2025}}{\textit{CO emissions}_{2015}}$$

$$= 8.06\ ppm \times \frac{478.6\ \textit{metric tons / day}}{901.2\ \textit{metric tons / day}} \times \frac{403.9\ \textit{metric tons / day}}{478.6\ \textit{metric tons / day}}$$

$$= 3.61\ ppm$$

The scaled UAM/CAL3QHC maximum eight-hour CO concentration of 4.0 (3.95) ppm for 2025 is substantially lower than the eight-hour CO standard.

Table IV-4. UAM/CAL3QHC maximum eight-hour concentration adjustments and scaled predictions for 2025 (unit: ppm)

	2006		2015		2025	
	UAM/ CAL3QHC	Adjusted	UAM/ CAL3QHC	Adjusted	Based on 2006	Based on 2015
WI Monitor	7.28	6.41	6.59	3.50	3.22	2.95
WI Receptor #9	8.25	7.26	8.08	4.29	3.65	3.62
WI Receptor #8	8.08	7.11	7.84	4.16	3.58	3.51
WI Receptor #20	7.85	6.91	7.44	3.95	3.48	3.33
PHGA Monitor	N/A	N/A	N/A	N/A	N/A	N/A
PHGA Receptor #30	8.24	7.25	7.81	4.15	3.65	3.50
PHGA Receptor #46	8.08	7.11	7.45	3.96	3.58	3.34
PHGA Receptor #29	8.03	7.07	7.39	3.92	3.56	3.31
UAM/CAL3QHC Max	8.92	7.85	8.06	4.28	3.95	3.61

WI = West Indian School
PHGA = Phoenix Grand Avenue

*The WI Monitor was deactivated on June 30, 2010

**The PHGA monitor values were not available (N/A) for the 1994 episode modeled with UAM/CAL3QHC (MAG, 2001; MAG, 2003), because the monitor was deactivated on March 31, 1993, due to impending reconstruction of the adjacent intersection.

IV-2-3. Intersection Hotspot Analysis

The six intersections having potentially the highest traffic volumes or worst congestion in the maintenance year 2025 were evaluated for the maximum eight-hour CO concentrations using the CAL3QHC model. The modeling input assumptions and processes are provided in detail in Section III. The maximum eight-hour CO concentration in 2025, which is a total of the intersection maximum impact and background concentration, was determined to be 1.7 ppm at two intersections:16th St & Camelback Rd and Priest Dr & Southern Ave, as shown in Table III-10. The results from the CAL3QHC hotspot intersection analysis support the conclusion that the intersections of potentially high traffic volumes and worst congestion in 2025 will not cause exceedances of the eight-hour CO standard through 2025.

IV-3. Weight of Evidence Maintenance Demonstration

This section provides weight of evidence (WOE) to support the three maintenance demonstration analyses discussed in Section IV-2. Monitoring data trends and a meteorological analysis are provided as the weight of evidence support data. The monitoring data trend analysis is based on historical one-hour and eight-hour carbon monoxide measurements at monitors. The meteorological analysis is provided to demonstrate that continuing improvement in CO concentrations at monitors in the Maricopa County area is due to permanent and enforceable CO emission reductions, rather than unusually favorable meteorological conditions.

IV-3-1. Continued Monitored Attainment

To demonstrate attainment of the NAAQS, one-hour and eight-hour CO concentrations for each monitor should not exceed the one-hour standard of 35 ppm and the eight-hour standard of 9 ppm once per year during two consecutive years. Monitoring data from1996 through 2011 for the eighteen monitoring sites operating in Maricopa County are provided for demonstration of the continually decreasing trends in ambient one-hour and eight-hour CO levels in Tables IV-5 through IV-8. The 1st and 2nd highest one-hour CO concentrations at the monitors from 1996 through 2011 are substantially lower than the one-hour CO standard of 35 ppm, as shown in Tables IV-5 and IV-6. The one-hour CO standard has not been violated at any monitor in the Maricopa County area since 1984. The 1st and 2nd highest one-hour CO concentrations for all monitors in 2011 were 4.4 ppm and 3.9 ppm, respectively.

The second highest eight-hour CO concentration of 10.0 ppm was recorded at the Grand Ave site in 1996. Since then, no monitor has violated the eight-hour standard. The eight-hour CO concentrations for all monitors have continued to decrease during the past decade, as shown in Tables IV-7 and IV-8. The1st and 2nd highest eight-hour CO concentrations of all monitors in 2011 were 3.2 ppm and 2.9 ppm, respectively.

To predict future 2015 and 2025 CO concentrations based on the historical CO concentrations at monitors, a regression analysis was applied to the historical 2nd highest one-hour and eight-hour CO concentrations from 1980 to 2011 at the fourteen monitors operating in 2008. Equations derived by the regression model were used to project CO concentrations in 2015 and 2025. The one-hour and eight-hour CO concentrations for the future years 2015 and 2025 for the fourteen individual monitors are presented in Figure IV-1. Figure IV-1also indicates that one-hour and eight-hour CO concentrations for all monitors in the Maricopa County area have continued to decline over the past decades to levels considerably below the one-hour and eight-hour CO standards. The maximum one-hour CO concentrations derived by the regression model were predicted to be 3.6 ppm in 2015 and 2.0 ppm in 2025 at the West Phoenix site. The maximum eight-hour CO concentrations were estimated to be 2.7 ppm in 2015 and 1.6 ppm in 2025 at the West Phoenix site. Thus, historical CO concentration trends at the monitors confirm that the Maricopa County area will continue to maintain the one-hour and eight-hour CO standards through 2025.

Table IV-5. Highest one-hour CO concentrations at monitors in Maricopa County for 1996~2011 (unit: ppm)

Site ID	Site Name	Abbr	The 1st highest 1-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0013	South Phoenix (old)*	SP	10.9	7.3	8.2	7.8												
04-013-0016	W Indian School Rd	WI	12.6	10.8	9.7	11.8	11.9	8.0	7.7	6.8	6.9	6.8	7.8	6.2	3.9	5.6	3.7	
04-013-0019	West Phoenix	WP	11.7	11.7	10.7	12.3	10.6	8.4	8.6	7.5	7.7	7.2	7.2	6.0	4.7	4.9	4.3	4.4
04-013-0022	Grand Ave	GA	15.1	12.6	10.7	18.4	10.5	10.3	7.7									
04-013-1003	Mesa	ME	6.7	7.5	6.5	7.2	6.0	4.6	4.9	3.5	3.0	3.4	4.1	3.9	1.7	2.0	2.0	1.9
04-013-1004	North Phoenix	NP	7.7	8.7	8.0	7.8	6.0	5.2	4.5	4.0	4.1	3.8	3.5	3.4	2.1	5.9	2.9	2.9
04-013-2001	Glendale	GL	8.2	5.4	5.0	5.7	4.6	4.7	4.1	5.7	6.1	3.2	3.8	4.3	2.1	2.0	9.0	1.9
04-013-3002	Central Phoenix	CP	11.1	9.4	9.1	11.3	8.1	6.0	6.0	5.9	5.0	5.2	6.0	4.1	3.6	3.6	3.2	3.8
04-013-3003	South Scottsdale	SS	8.0	6.3	5.5	6.0	5.0	4.5	5.5	4.1	3.4	3.2	5.5	2.7	2.0	2.9	2.1	1.8
04-013-3005	Gilbert	GI		4.6	3.5	3.8	3.7											
04-013-3006	Maryvale	MA		8.3	7.5	9.7	9.3	9.0	8.0	5.8	5.7							
04-013-3009	West Chandler (old)*	WC		3.8	4.1	4.3	5.7											
04-013-3010	Greenwood	GR		9.7	9.4	10.8	8.1	7.0	7.3	6.8	7.6	5.9	6.3	4.6	3.0	3.5	4.3	3.0
04-013-4003	South Phoenix (new)*	SP				7.4	10.0	6.8	6.5	5.8	6.7	5.5	5.2	4.9	3.7	4.1	4.4	3.0
04-013-4004	West Chandler (new)*	WC					3.8	3.3	3.5	3.9	2.9	3.5	2.7	2.7	1.8	2.1	2.0	1.8
04-013-4005	Tempe	TE					5.0	4.3	4.9	3.8	3.1	3.2	3.7	3.2	2.4	4.0	3.4	3.6
04-013-4007	Surprise	SU						2.6	4.2	3.6								
04-013-4010	Dysart	DY								1.8	2.1	1.7	1.3	1.8	1.5	1.0	2.0	1.0
04-013-4011	Buckeye	BE									0.9	1.1	1.2	3.9	0.7	1.2	1.9	1.8
04-013-9997	Super Site	SUPR				8.5	9.1	7.0	5.7	6.7	4.9	5.6	5.3	4.6	3.1	2.9	2.9	2.5
Maximum			**15.1**	**12.6**	**10.7**	**18.4**	**11.9**	**10.3**	**8.6**	**7.5**	**7.7**	**7.2**	**7.8**	**6.2**	**4.7**	**5.9**	**9.0**	**4.4**

* South Phoenix and West Chandler monitors (old) were relocated to the new South Phoenix and West Chandler sites in 1999 and 2000, respectively.

Table IV-6. Second highest one-hour CO concentrations at monitors in Maricopa County for 1996~2011 (unit: ppm)

Site ID	Site Name	Abbr	The 2nd highest 1-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0013	South Phoenix (old)*	SP	10.3	7.2	7.9	7.7												
04-013-0016	W Indian School Rd	WI	11.8	10.3	9.4	11.7	9.6	7.7	7.3	6.8	6.7	6.5	7.7	5.7	3.6	5.0	3.3	
04-013-0019	West Phoenix	WP	11.2	10.3	9.6	11.9	10.4	8.2	7.9	7.3	7.5	7.0	6.5	6.0	4.5	4.8	4.2	3.9
04-013-0022	Grand Ave	GA	14.7	11.7	9.6	13.5	10.5	9.6	7.5									
04-013-1003	Mesa	ME	6.3	7.0	6.1	6.5	5.7	3.8	4.8	3.4	2.6	3.3	3.5	2.5	1.7	1.9	2.0	1.8
04-013-1004	North Phoenix	NP	7.5	7.5	7.3	6.4	5.9	4.7	4.5	4.0	3.7	3.5	3.3	3.0	2.0	2.1	2.4	2.7
04-013-2001	Glendale	GL	6.9	5.2	4.9	5.3	4.6	4.7	3.9	3.5	3.2	3.1	2.9	3.3	2.0	1.9	8.9	1.8
04-013-3002	Central Phoenix	CP	10.3	9.0	8.9	9.3	8.0	5.8	5.8	5.4	4.4	5.1	4.8	4.0	3.5	3.0	3.2	3.5
04-013-3003	South Scottsdale	SS	7.0	6.1	5.2	5.8	4.9	4.4	4.3	4.0	3.1	3.1	3.1	2.6	2.0	1.9	2.0	1.7
04-013-3005	Gilbert	GI		4.6	3.3	3.7	3.4											
04-013-3006	Maryvale	MA		8.3	7.5	9.0	9.1	8.2	6.9	5.7	5.0							
04-013-3009	West Chandler (old)*	WC		3.6	4.0	4.0	4.0											
04-013-3010	Greenwood	GR		8.9	8.9	9.5	8.1	6.9	6.8	6.8	7.3	5.4	5.2	4.6	3.0	3.2	3.9	2.9
04-013-4003	South Phoenix (new)*	SP				7.4	8.4	6.3	6.5	5.5	5.9	5.2	4.7	4.3	3.2	3.4	4.3	2.9
04-013-4004	West Chandler (new)*	WC					3.4	3.3	3.2	3.3	2.7	2.7	2.6	2.4	1.7	2.1	2.0	1.7
04-013-4005	Tempe	TE					4.6	4.2	4.7	3.7	2.6	3.0	3.4	2.8	2.3	3.6	2.4	3.4
04-013-4007	Surprise	SU						2.5	2.4	1.8								
04-013-4010	Dysart	DY								1.6	1.8	1.7	1.3	1.7	1.4	0.9	1.8	0.9
04-013-4011	Buckeye	BE									0.9	1.1	1.2	1.6	0.7	1.1	1.3	1.2
04-013-9997	Super Site	SUPR				8.2	7.9	6.9	5.4	6.0	4.9	5.1	4.5	4.3	3.1	2.8	2.7	2.5
Maximum			**14.7**	**11.7**	**9.6**	**13.5**	**10.5**	**9.6**	**7.9**	**7.3**	**7.5**	**7.0**	**7.7**	**6.0**	**4.5**	**5.0**	**8.9**	**3.9**

* South Phoenix and West Chandler monitors (old) were relocated to the new South Phoenix and West Chandler sites in 1999 and 2000, respectively.

Table IV-7. Highest eight-hour CO concentrations at monitors in Maricopa County for 1996~2011 (unit: ppm)

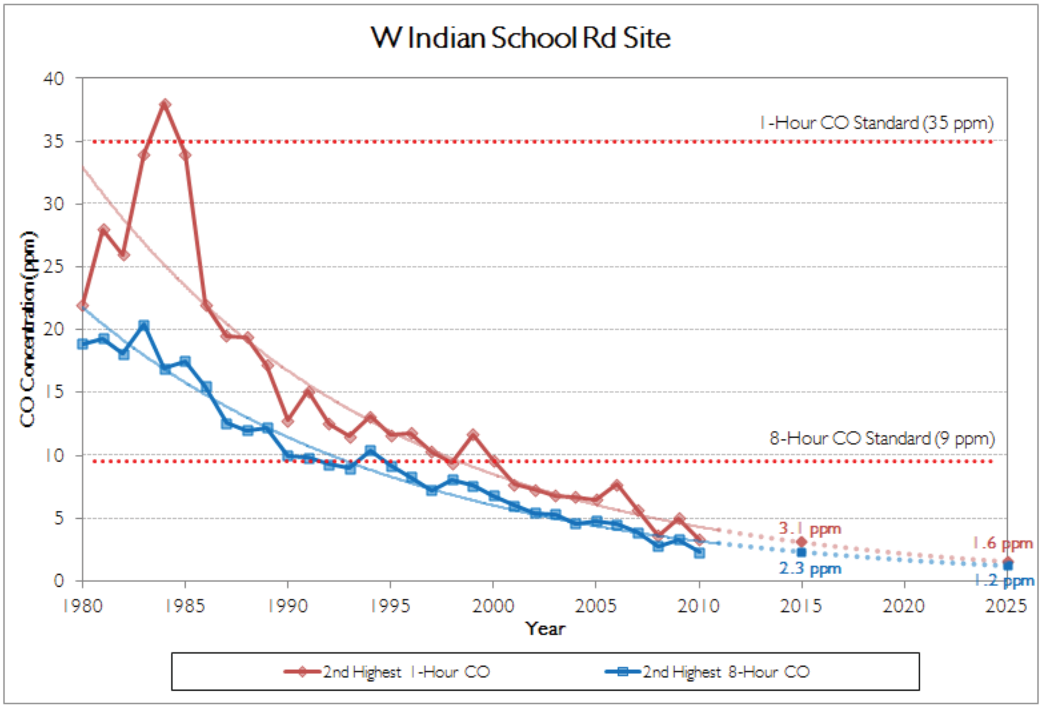
Site ID	Site Name	Abbr	The 1st highest Non-overlapping 8-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0013	South Phoenix (old)*	SP	5.2	4.5	5.4	4.5												
04-013-0016	W Indian School Rd	WI	8.5	8.3	8.2	7.7	6.9	6.6	5.5	5.4	4.7	5.3	5.3	5.0	2.8	4.2	2.3	
04-013-0019	West Phoenix	WP	8.5	7.2	7.8	7.7	7.4	6.7	5.5	6.2	5.2	5.8	5.0	4.6	3.1	4.6	3.3	3.0
04-013-0022	Grand Ave	GA	10.0	9.5	7.3	10.6	6.0	6.6	5.5									
04-013-1003	Mesa	ME	4.5	4.7	4.4	4.5	4.4	2.9	3.5	2.5	1.7	2.4	2.8	2.0	1.4	1.5	1.4	1.5
04-013-1004	North Phoenix	NP	3.9	4.0	6.2	3.5	3.2	2.5	3.3	2.3	2.2	2.3	2.0	1.7	1.3	1.3	1.7	1.6
04-013-2001	Glendale	GL	4.2	4.0	3.4	3.9	3.6	3.1	3.2	2.4	2.4	2.4	1.9	1.8	1.6	1.3	3.0	1.3
04-013-3002	Central Phoenix	CP	8.4	7.2	7.2	6.0	5.3	4.3	4.4	4.6	3.4	4.1	3.8	2.9	2.6	2.2	2.4	2.1
04-013-3003	South Scottsdale	SS	4.9	4.3	3.7	4.3	3.3	3.2	3.0	2.3	2.4	2.4	2.1	1.6	1.5	1.4	1.6	1.4
04-013-3005	Gilbert	GI		2.3	2.8	2.5	2.0											
04-013-3006	Maryvale	MA		6.6	6.1	7.4	7.1	7.5	5.0	4.2	3.5							
04-013-3009	West Chandler (old)*	WC		2.7	3.0	2.8	2.4											
04-013-3010	Greenwood	GR		7.6	7.5	6.7	5.7	4.7	5.4	5.4	4.9	4.2	3.6	4.0	2.7	2.6	3.0	2.5
04-013-4003	South Phoenix (new)*	SP				4.6	5.9	3.4	3.8	3.6	3.5	3.8	3.2	3.1	2.2	2.6	3.1	2.6
04-013-4004	West Chandler (new)*	WC					2.5	2.3	2.2	2.6	2.1	2.4	2.2	1.6	1.4	1.7	1.9	1.4
04-013-4005	Tempe	TE					3.8	3.3	3.4	2.9	1.9	2.6	2.5	1.9	1.8	2.9	1.9	3.2
04-013-4007	Surprise	SU						1.2	1.2	1.2								
04-013-4010	Dysart	DY								1.2	1.1	1.3	0.9	1.3	1.0	0.9	0.9	0.5
04-013-4011	Buckeye	BE									0.5	0.9	0.7	1.0	0.5	0.6	0.6	0.9
04-013-9997	Super Site	SUPR				7.0	6.9	5.7	4.2	4.8	4.2	3.7	3.0	3.1	2.5	2.3	2.1	2.3
Maximum			**10.0**	**9.5**	**8.2**	**10.6**	**7.4**	**6.7**	**5.5**	**6.2**	**5.2**	**5.8**	**5.3**	**5.0**	**3.1**	**4.6**	**3.3**	**3.2**

* South Phoenix and West Chandler monitors (old) were relocated to the new South Phoenix and West Chandler sites in 1999 and 2000, respectively.

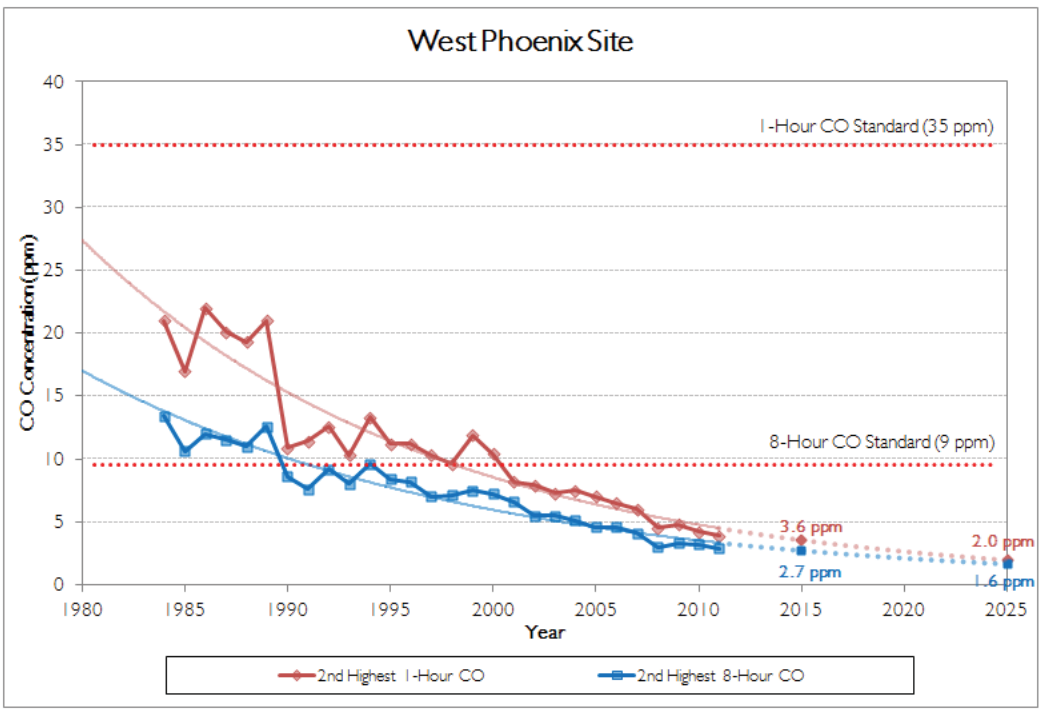
Table IV-8. Second highest eight-hour CO concentrations at monitors in Maricopa County for 1996~2011 (unit: ppm)

Site ID	Site Name	Abbr	The 2nd highest Non-overlapping 8-hour CO Concentrations															
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
04-013-0013	South Phoenix (old)*	SP	5.1	4.4	4.7	4.1												
04-013-0016	W Indian School Rd	WI	8.3	7.2	8.1	7.6	6.8	6.0	5.4	5.3	4.6	4.8	4.5	3.9	2.8	3.3	2.3	
04-013-0019	West Phoenix	WP	8.2	7.0	7.1	7.5	7.2	6.6	5.5	5.5	5.1	4.6	4.6	4.1	3.0	3.3	3.2	2.9
04-013-0022	Grand Ave	GA	10.0	7.8	6.8	8.1	6.0	6.2	5.5									
04-013-1003	Mesa	ME	3.8	4.5	3.7	4.0	3.2	2.7	3.5	2.2	1.7	2.4	2.0	2.0	1.3	1.3	1.4	1.3
04-013-1004	North Phoenix	NP	3.7	3.4	5.6	3.5	3.1	2.5	2.7	2.1	2.0	2.2	1.9	1.6	1.3	1.3	1.6	1.5
04-013-2001	Glendale	GL	3.7	3.0	3.4	3.5	3.2	2.8	2.7	2.3	2.1	2.3	1.8	1.6	1.5	1.2	1.5	1.2
04-013-3002	Central Phoenix	CP	7.5	7.2	6.3	6.0	5.2	4.1	4.1	3.8	3.3	3.8	3.2	2.9	2.2	2.1	2.2	2.1
04-013-3003	South Scottsdale	SS	4.9	4.2	3.5	4.1	3.1	3.1	2.8	2.2	2.4	2.4	1.9	1.6	1.4	1.4	1.6	1.3
04-013-3005	Gilbert	GI		2.2	2.7	2.4	2.0											
04-013-3006	Maryvale	MA		6.3	5.9	6.7	7.0	5.3	5.0	4.1	2.9							
04-013-3009	West Chandler (old)*	WC		2.7	2.7	2.8	2.3											
04-013-3010	Greenwood	GR		6.9	6.8	6.7	5.6	4.6	5.1	5.1	4.3	4.1	3.5	3.0	2.4	2.4	2.3	2.5
04-013-4003	South Phoenix (new)*	SP				4.4	4.8	3.4	3.7	3.3	3.3	3.2	2.7	2.3	2.0	2.2	3.1	2.0
04-013-4004	West Chandler (new)*	WC					2.2	2.1	2.2	2.6	2.1	2.0	2.0	1.5	1.4	1.5	1.6	1.3
04-013-4005	Tempe	TE					3.2	3.1	3.4	2.4	1.7	2.4	2.4	1.9	1.4	2.1	1.6	2.9
04-013-4007	Surprise	SU						1.1	1.1	0.8								
04-013-4010	Dysart	DY								1.1	1.1	1.2	0.8	1.3	1.0	0.8	0.6	0.5
04-013-4011	Buckeye	BE									0.4	0.9	0.6	0.8	0.5	0.5	0.6	0.8
04-013-9997	Super Site	SUPR				6.5	6.5	5.2	4.2	4.2	4.0	3.6	2.9	2.9	2.4	2.3	2.1	2.1
Maximum			**10.0**	**7.8**	**8.1**	**8.1**	**7.2**	**6.6**	**5.5**	**5.5**	**5.1**	**4.8**	**4.6**	**4.1**	**3.0**	**3.3**	**3.2**	**2.9**

* South Phoenix and West Chandler monitors (old) were relocated to the new South Phoenix and West Chandler sites in 1999 and 2000, respectively.

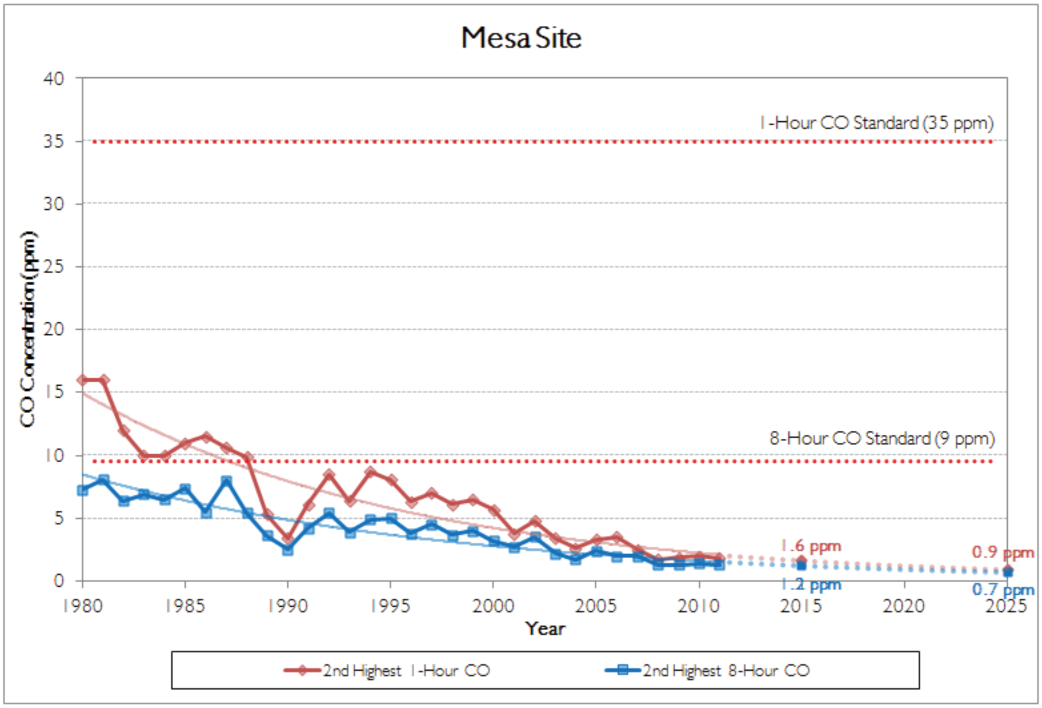


(a) W Indian School Rd

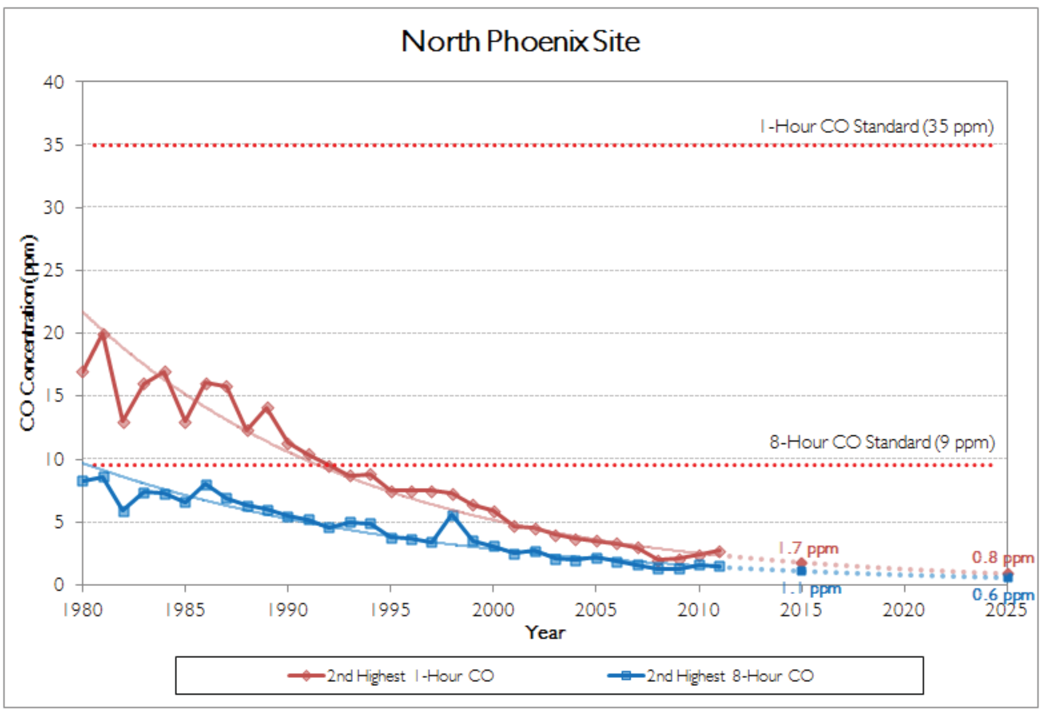


(b) West Phoenix

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites

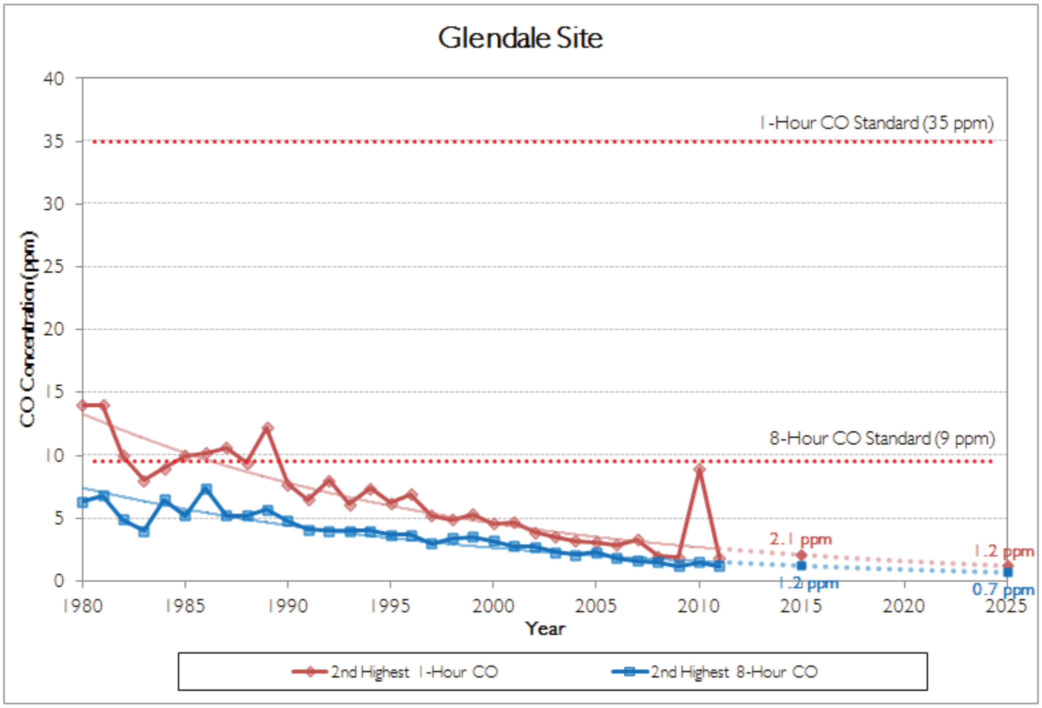


(c) Mesa

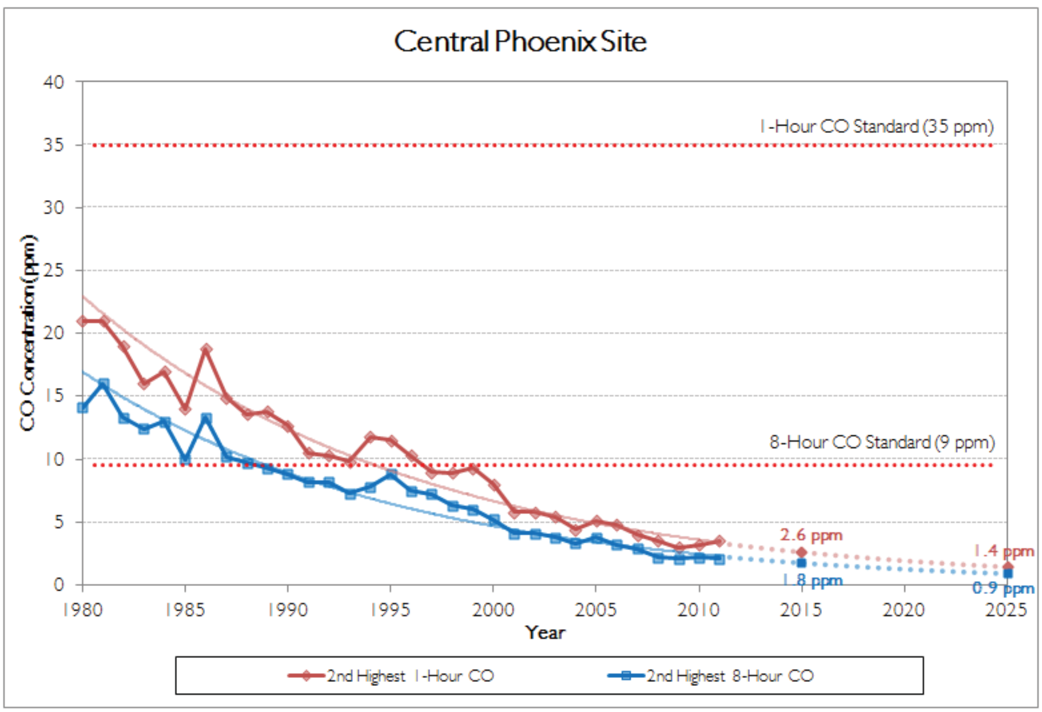


(d) North Phoenix

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)

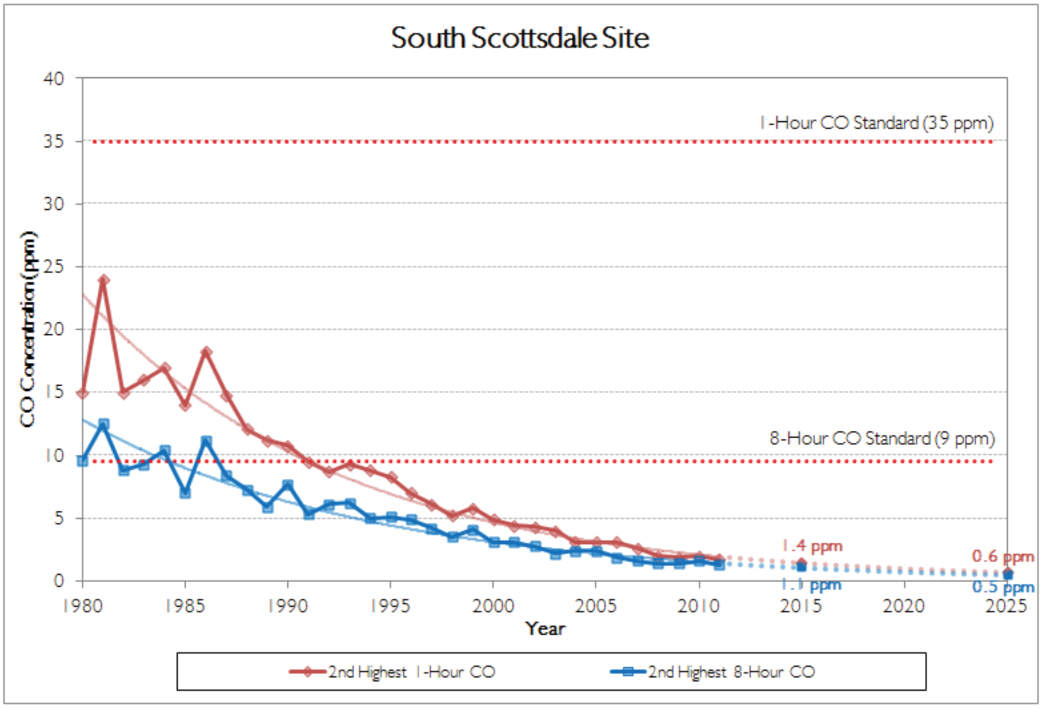


(e) Glendale

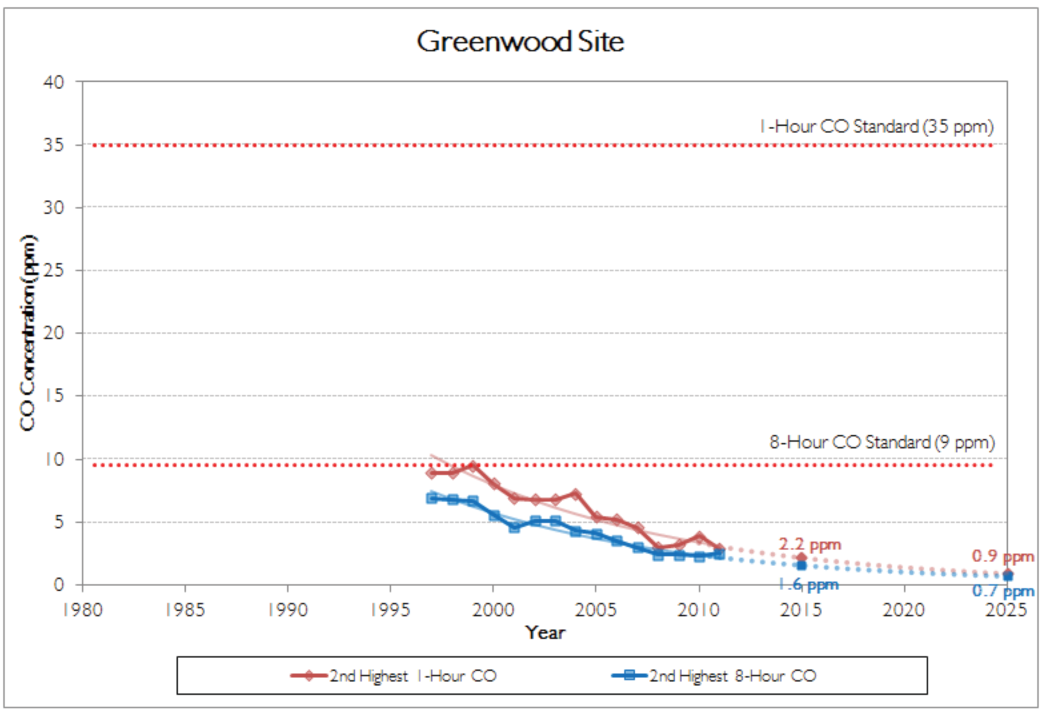


(f) Central Phoenix

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)

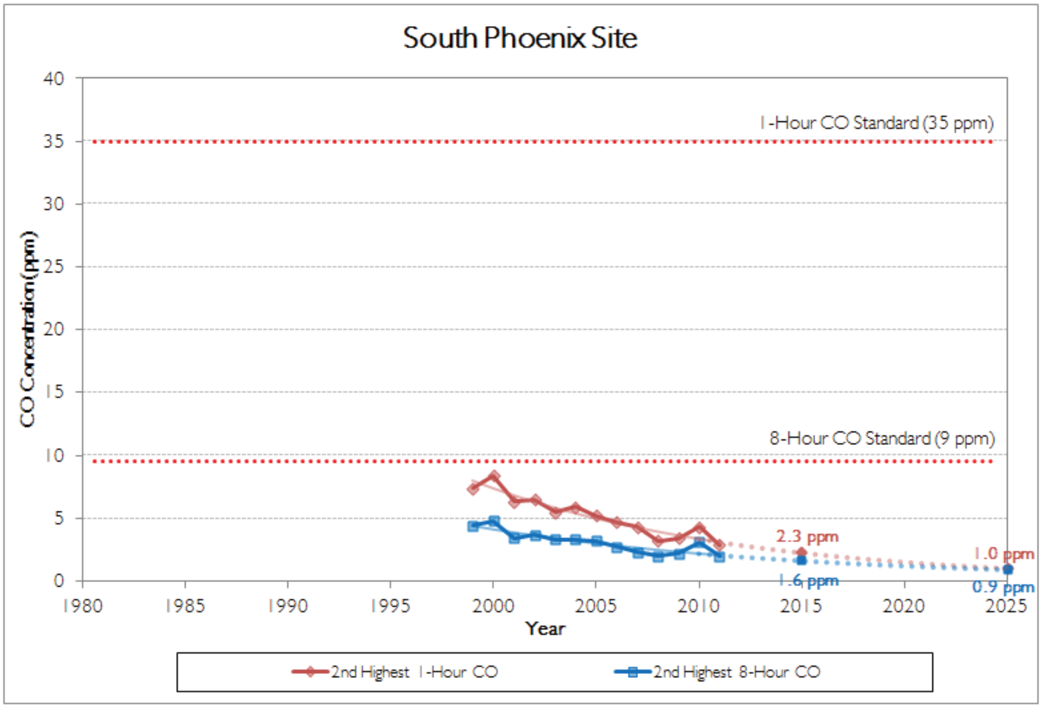


(g) South Scottsdale

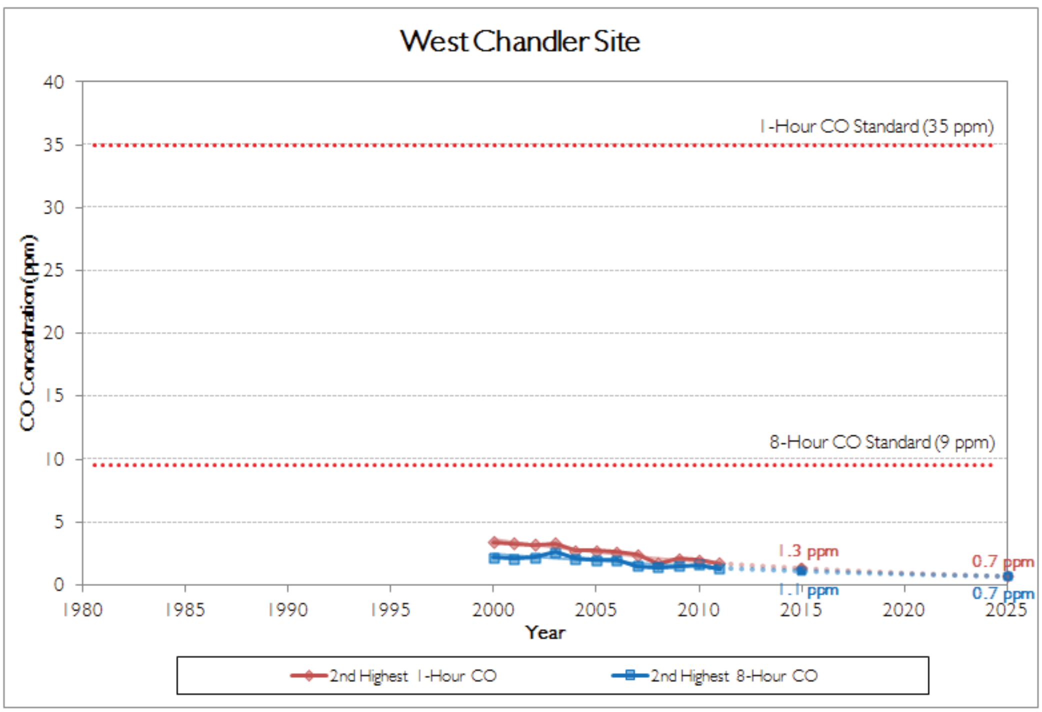


(h) Greenwood

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)

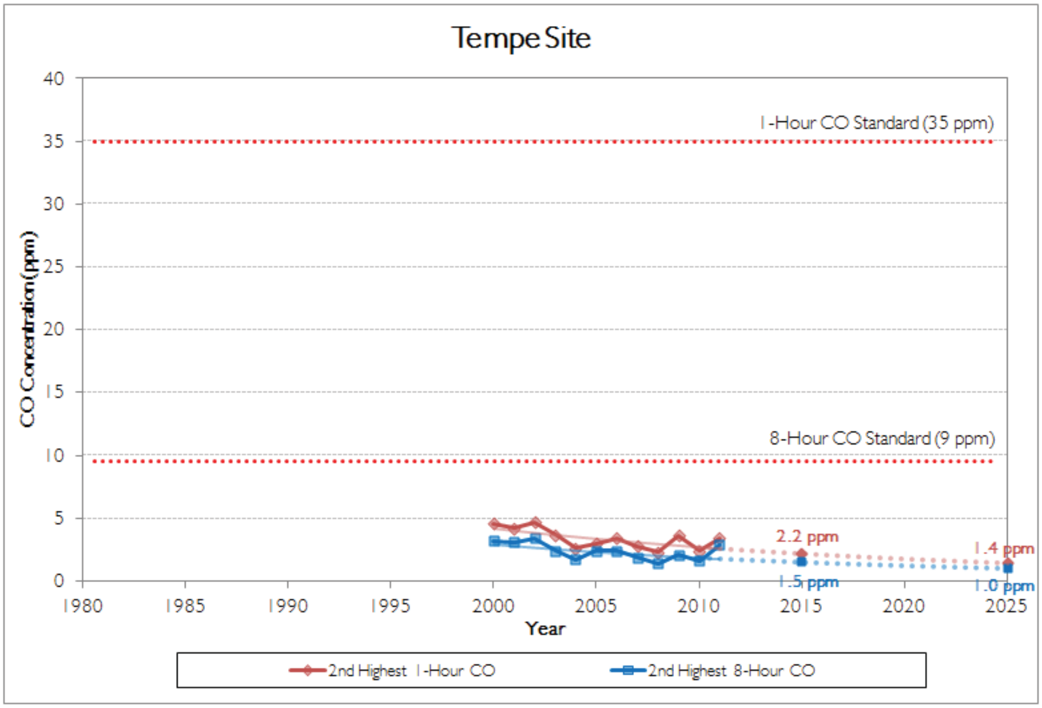


(I) South Phoenix

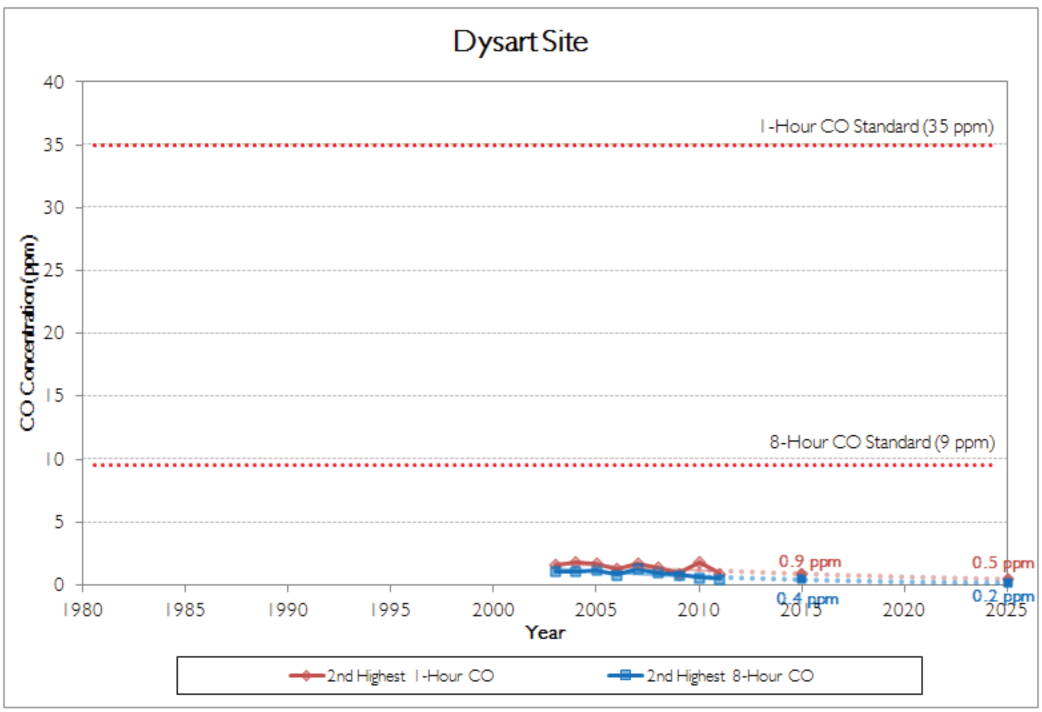


(j) West Chandler

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)

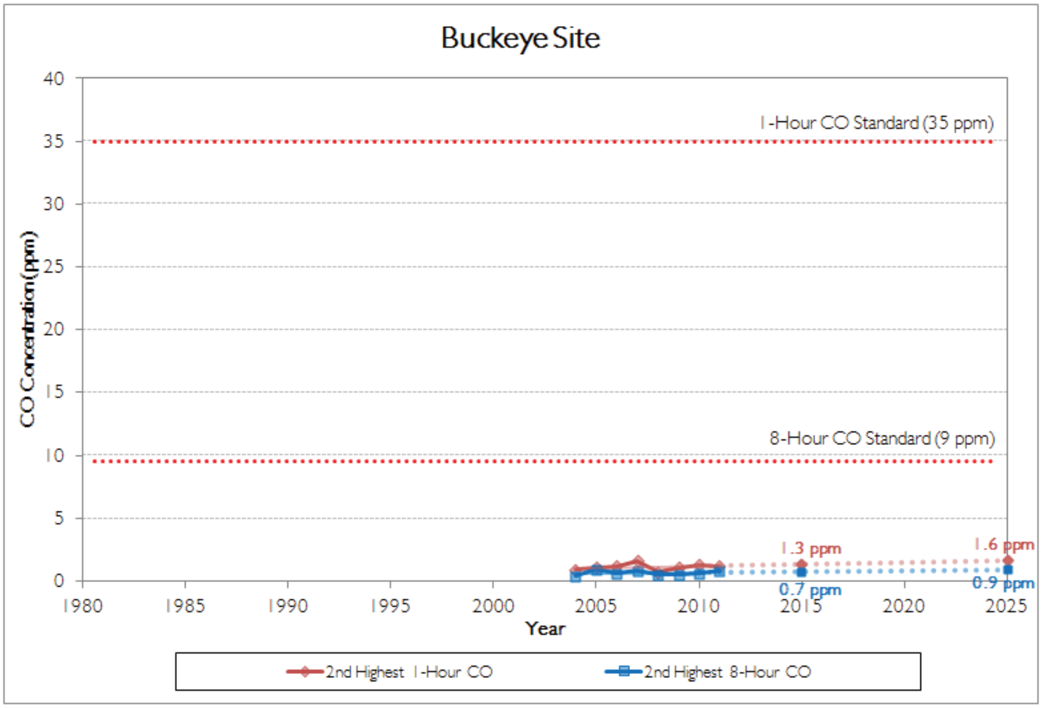


(k) Tempe

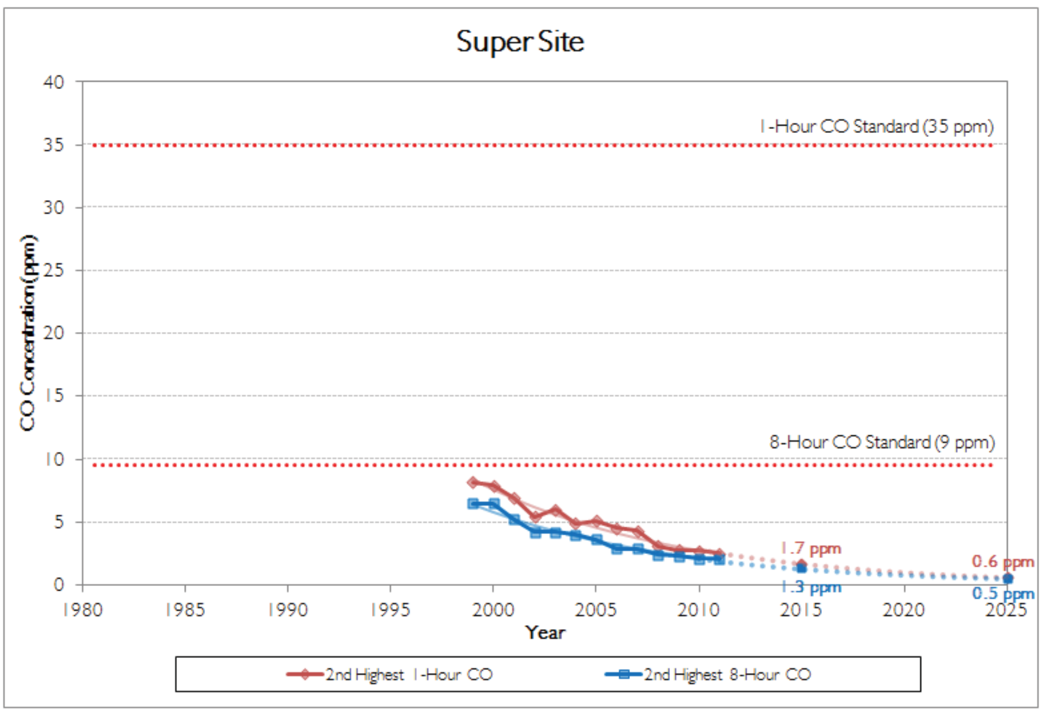


(l) Dysart

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)



(m) Buckeye



(n) Super Site

Figure IV-1. Historical one-hour and eight-hour CO monitoring data and projections for monitoring sites (continued)

IV-3-2. Meteorological Analysis

A meteorological analysis has been performed to support the premise that improvements in CO air quality are due to permanent and enforceable emission reductions, not unusually favorable meteorological conditions. The permanent and enforceable measures that have resulted in continuing reductions in CO emissions, despite increases in population, employment and vehicle travel in the region, are described in the Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG, 2001). For this purpose, long-term historical conditions for the key meteorological parameters, including temperature, wind speed, wind direction, atmospheric stability, and mixing height have been analyzed and compared with those of the CO exceedance episode that occurred on December 16~17, 1994. This was one of the last violations of the eight-hour CO standard in the region.

IV-3-2-1. Sources of Meteorological and Air Quality Data

Raw databases used for the meteorological analysis include hourly surface observations at the Phoenix Sky Harbor International Airport (KPHX) and twice-daily upper soundings from the Tucson (KTUS) station. The two stations are operated by the NWS of the NOAA. To present a typical time cycle for regional climate analyses, data for an 18-year period (1994~2011) were used for the meteorological analysis. All extracted meteorological data were processed on an hourly basis using the latest version (version 11059) of the AERMOD Meteorological Processor (AERMET). The AERMET model utilizes surface and upper sounding data to estimate boundary parameters including mixing height and atmospheric stability. Outputs from AERMET were processed further for the statistical analysis.

Air quality data for the meteorological analysis were retrieved from the EPA Air Quality System (AQS). The hourly CO concentrations for monitoring sites in Maricopa County were extracted from the AQS Extract Raw Data Report - AMP501 (EPA, 2012b). The long-term changes in CO concentrations were analyzed in parallel with changes in meteorological conditions for the same period.

IV-3-2-2. Air Quality and Meteorology on the December 1994 Episode Days

An eight-hour exceedance of the federal standard for CO occurred from the 0:00 hour through the 7:00 hour on December 17, 1994. This exceedance is documented in detail in the Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG, 2001) and the MAG 2003 Carbon Monoxide Redesignation Request and Maintenance Plan (MAG, 2003). The December 1994 CO episode was used for the meteorological analysis. Air quality and meteorology for the 1994 episode are summarized below:

Exceedances of the eight-hour CO standard were observed at three monitors on December 17, 1994: West Indian School Road (WI), West Phoenix (WP), and Central Phoenix (CP). The highest eight-hour CO concentration was 10.5 ppm at West Indian School Road. Figure IV-2 illustrates the variation in eight-hour CO concentrations for the

48 hour period from the 7:00 hour on December 16 through the 6:00 hour on December 18, 1994. The exceedances of the eight-hour CO standard occurred during the hours 0:00 - 7:00 on December 17, 1994. Higher CO concentrations are typically observed during cold weather when there is a shallow boundary layer due to poor vertical mixing. In addition, calm or light wind (i.e., stagnant air) conditions contribute to higher CO concentrations due to poor horizontal dispersion. The typical meteorological conditions for this episode can be characterized as relatively low temperatures and wind speeds, clear sky, high pressure, stable stratification, and low mixing height. Table IV-9 summarizes the meteorological conditions for the 1994 episode. Figure IV-2 illustrates that CO concentrations began to increase at the 16:00 hour on December 16, 1994 due to increasing traffic volumes during the PM peak hours. Temperatures and wind speeds declined rapidly after sunset (sunset time in Phoenix on that day was 17:22 hour). The mixing height was less than 200 meters. The atmospheric boundary layer was stable. Calm or light winds prevailed during the entire night until early morning the next day (December 17, 1994). These meteorological conditions represent the 1994 episode.

IV-3-2-3. Historical CO Levels and Meteorology

Hourly meteorological parameters including wind speed, temperature, stability, and mixing height were identified for the CO episode that occurred on December 16-17, 1994. The number of hours when the same meteorological conditions occurred was then identified for the years 1995 through 2011. The hours of 1994 episode meteorological conditions were calculated for both individual and multiple parameters. Three combinations of meteorological parameters were developed for this analysis: (1) wind speed and temperature, (2) wind speed, temperature, and stability, and (3) wind speed, temperature, stability, and mixing height. Table IV-10 and Figure IV-3 show the number of hours in which the 1994 episode meteorological conditions occurred in 1994 through 2011. Table IV-10 indicates that meteorological conditions during years since 1994 have not differed significantly from those during the 1994 episode, and the 1994 episode meteorological conditions occurred at the highest frequency in 1998. However, the maximum eight-hour CO concentration in 1998 was lower than in 1994. And the maximum eight-hour CO concentrations at the monitoring sites have continued to decline dramatically, even though the 1994 episode meteorological conditions have frequently occurred during those years in Figure IV-3.

IV-3-2-4. Diurnal Cycles of Meteorology and Eight-hour CO Concentrations

Long-term changes in diurnal cycles for meteorological parameter measurements and CO concentrations are presented in Figure IV-4. These diurnal cycles were developed using data extracted from the NWS and EPA AQS databases and averaged for the winter seasons of 1994 through 2011. The diurnal cycles are normalized by the maximum and minimum values in each year. All normalized parameters are non-dimensional, range from 0 to 1, and can be compared in the same coordinate system. Figure IV-4 indicates that the annual normalized diurnal cycles for the meteorological parameters are similar over the 18 years, at the same time CO concentrations are decreasing with smaller amplitudes over time. This supports the fact that the daily maximum CO concentrations have declined, while the daily variations in temperatures, wind speeds, and mixing heights have not changed significantly over the past 18 years.

Table IV-9. Meteorological conditions for the 1994 CO episode

	Wind Speed (m/s)	Wind Direction (degree)	Temperature (°F)	Relative Humidity (%)	Surface Pressure (millibar)	Mixing Height (m)	M-O Length* (m)
Minimum	0.0	0	46.9	29	978	48	7.1
Maximum	2.9	269	62.2	68	979	145	20.5
Average	1.1	92	53.0	49	979	78	11.0

* Monin-Obukhov (M-O) length is a measure of atmospheric stability.

Table IV-10. Hours of similar meteorological conditions by parameter and combination

Year	WS	TM	ST	MH	WS-TM	WS-TM-ST	WS-TM-ST-MH
1994	1,289	1,392	898	595	1,081	536	422
1995	1,391	1,288	896	560	1,061	583	406
1996	1,386	1,225	857	493	1,043	528	340
1997	1,347	1,295	940	498	1,059	585	360
1998	1,374	1,316	912	563	1,126	623	430
1999	1,378	1,176	868	530	987	523	357
2000	1,267	1,351	966	474	1,033	581	352
2001	1,122	1,202	1,059	418	825	493	271
2002	1,168	1,227	1,006	429	899	495	286
2003	1,175	1,190	998	433	861	479	290
2004	1,107	1,315	1,056	450	917	534	330
2005	1,203	1,171	995	445	870	491	313
2006	1,100	1,188	1,022	399	780	439	252
2007	1,212	1,174	954	460	846	438	290
2008	1,213	1,237	954	426	911	488	300
2009	1,287	1,160	817	436	924	391	249
2010	1,182	1,239	916	403	883	439	261
2011	1,247	1,300	905	434	1,006	499	309

Notes: WS: Wind speed; TM: Temperature; ST: Stability; MH: Mixing height.

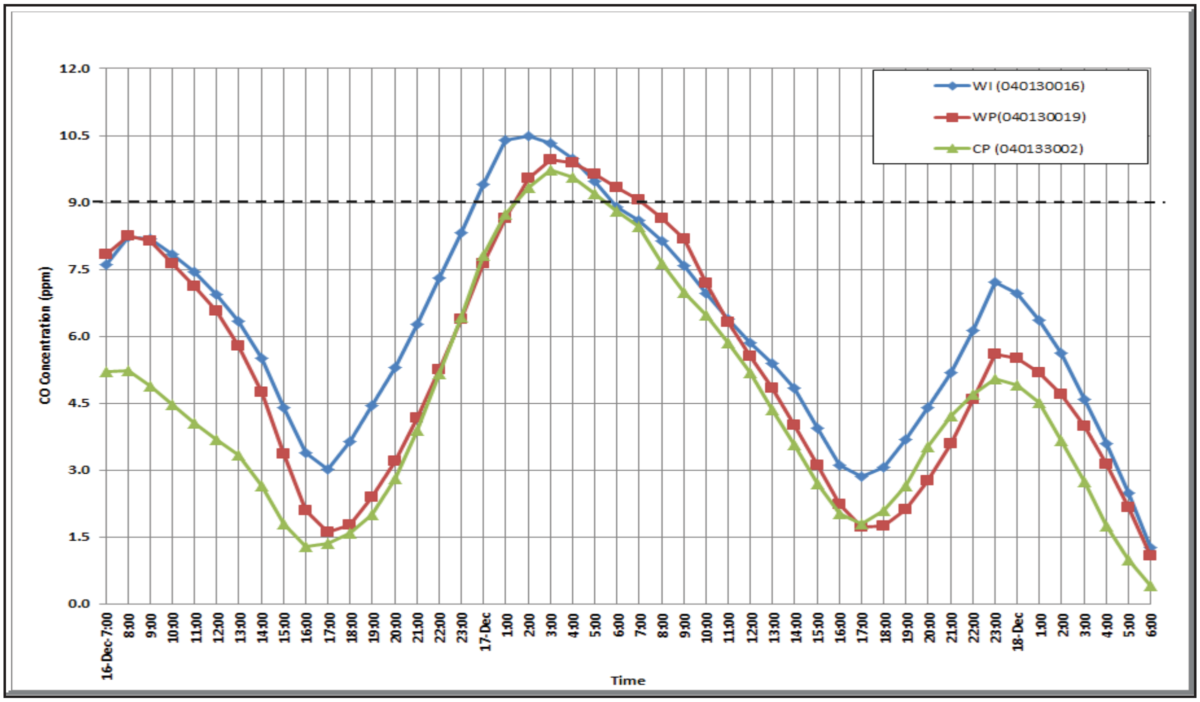


Figure IV-2. Eight-hour CO concentrations during the1994 episode (The horizontal black dashed line denotes the eight-hour CO standard of 9 ppm.)

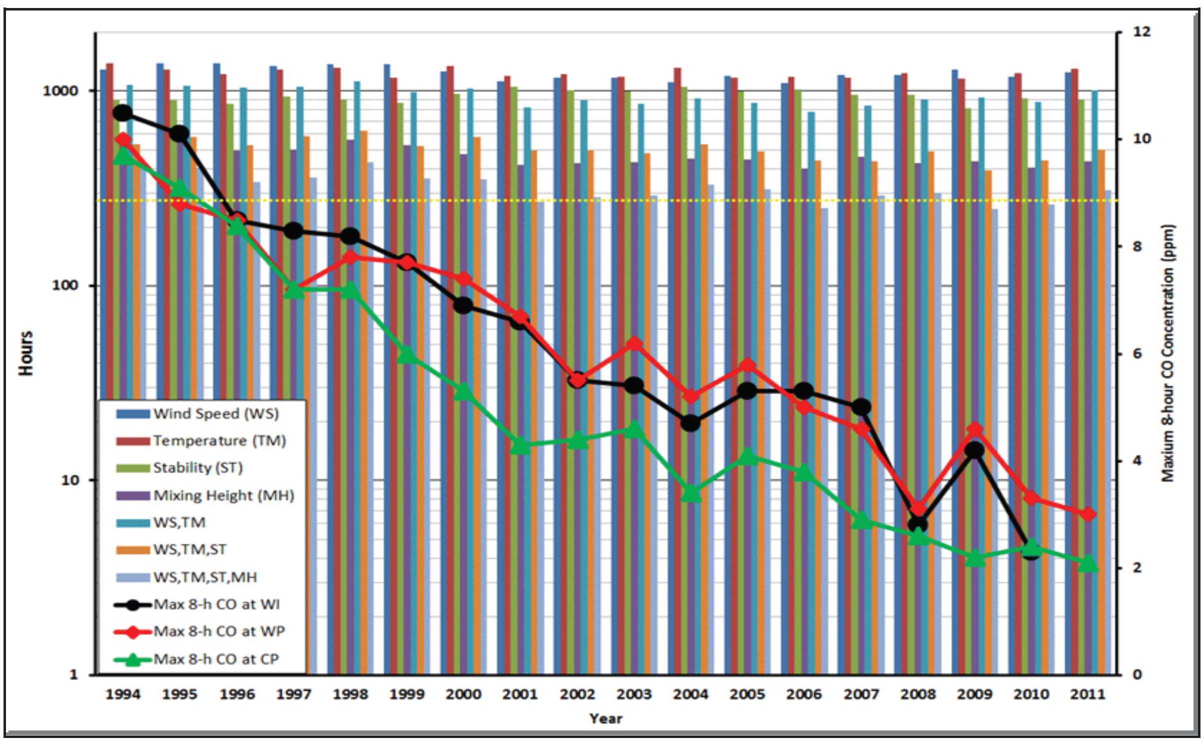


Figure IV-3. Hours of the 1994 CO episode meteorological conditions: 1994~2011 (The horizontal dashed yellow line denotes the eight-hour CO standard of 9 ppm.)

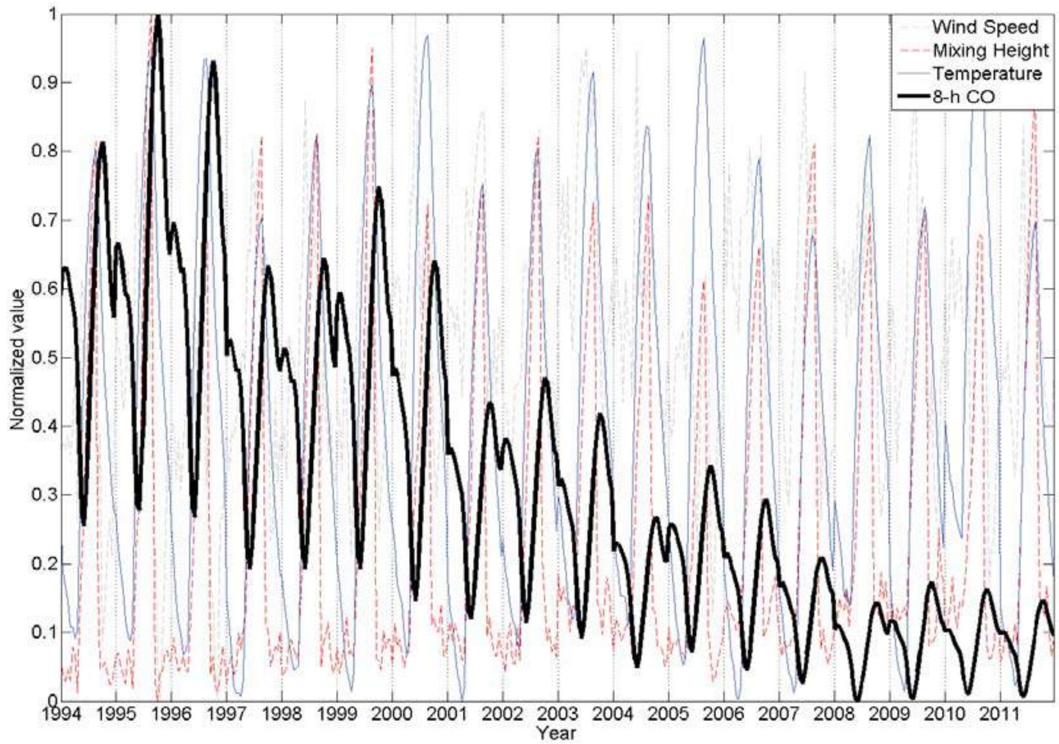
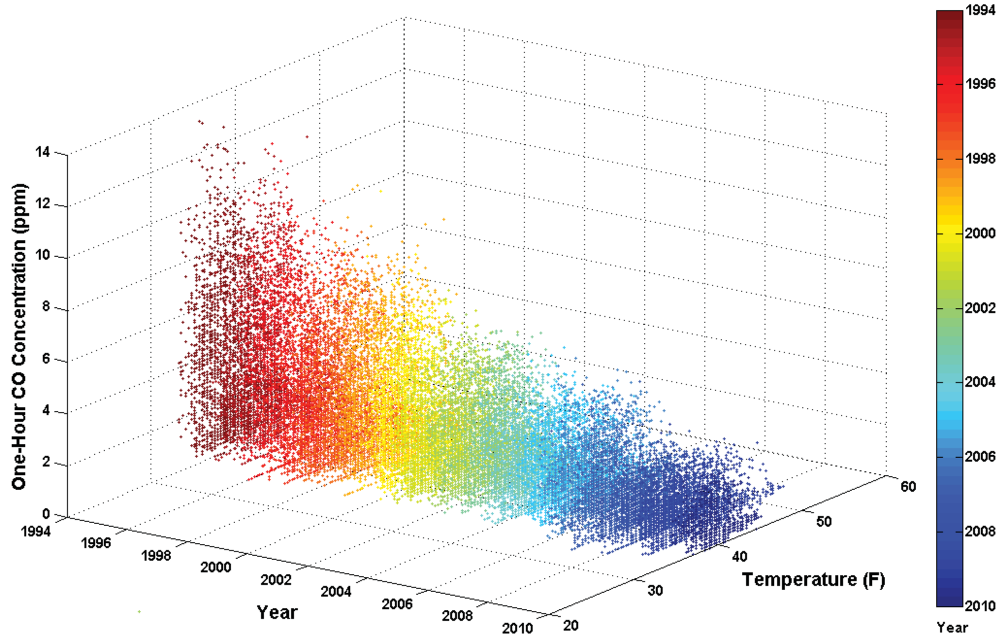


Figure IV-4. Normalized diurnal cycles of wind speed, temperature, mixing height, and maximum eight-hour CO concentrations

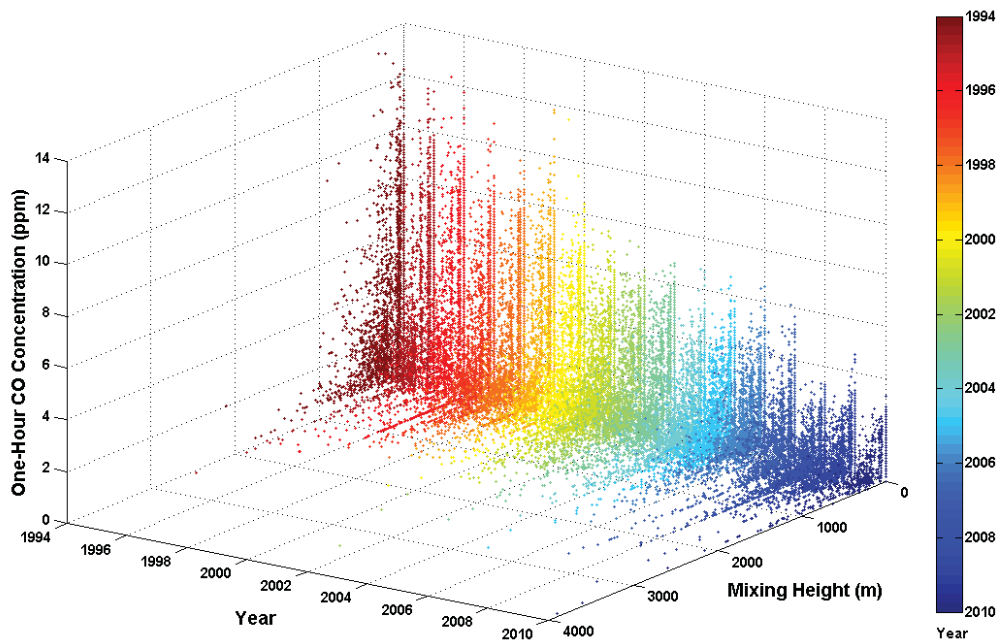
IV-3-2-5. Historical CO Concentrations Correlation and Distribution Analyses

In order to investigate the connection between CO concentrations and meteorological parameters, such as temperature, mixing height, wind speed, wind direction, relative humidity, and surface pressure, a correlation analysis was conducted using scatter plots. The West Indian School monitoring site was chosen for this analysis because it has typically measured the highest CO concentrations over time. Figure IV-5 illustrates correlations between historical one-hour CO concentrations at the West Indian School site and meteorological parameters at Sky Harbor International Airport during the three-month peak CO season for the years1994 through 2010. The three dimensional (3-D) scatter plots show a significant decreasing trend in one-hour CO concentrations over time, while the meteorological parameters do not show any significant changes during the same period. The same correlations are illustrated in the two dimensional (2-D) scatter plots in Figure IV-6. These figures show that the variations in meteorological parameters are not significant even though the CO concentrations have continued to decline over time.

High CO concentrations, specifically greater than 10 ppm for the one-hour average at the West Indian School site tend to occur at relatively lower temperatures (35~40 °F), lower mixing heights (less than 400 meters), lower wind speeds (less than 4 m/s), easterly wind directions (60~140 degrees), moderate humidity (20~80%), neutral stability, and moderate surface pressures (970~985 mb). For the application of the box plot analysis, three meteorological conditions were established: MC1(natural condition during the three-month peak CO season for the years 1994 through 2010), MC2 (favorable condition for high CO concentration as described above), and MC3 (the 1994 episode condition). Table IV-11 summarizes the characteristics of the three meteorological conditions. Figure IV-7 illustrates the distributions of one-hour average CO concentrations for the three meteorological conditions, identifying the 5th, 25th, 75th, and 95th percentiles, as well as median values. The median value of one-hour CO concentrations increases between the MC1 and MC3 meteorological conditions. The maximum one-hour CO concentrations under MC1 and MC2 in Figures IV-8 and IV-9 are almost identical, while those under MC3 in Figure IV-10 are lower than MC1 and MC2. Under MC3 conditions, one-hour CO concentrations have declined since1997, as shown in Figure IV-10. The one-hour CO concentrations during the 1994 episode are between the 99.5th and 99.8th percentiles under MC1, between the 97.9th and 99.8th percentiles under MC2, and between the 98.9th and 99.9th percentiles under MC3. These results indicate that the one-hour CO concentrations at the West Indian School site have decreased continuously over time under all three different meteorological conditions. As a result, it can be concluded that meteorology is not a major factor contributing to improvements in the ambient CO levels at the West Indian School Road site.

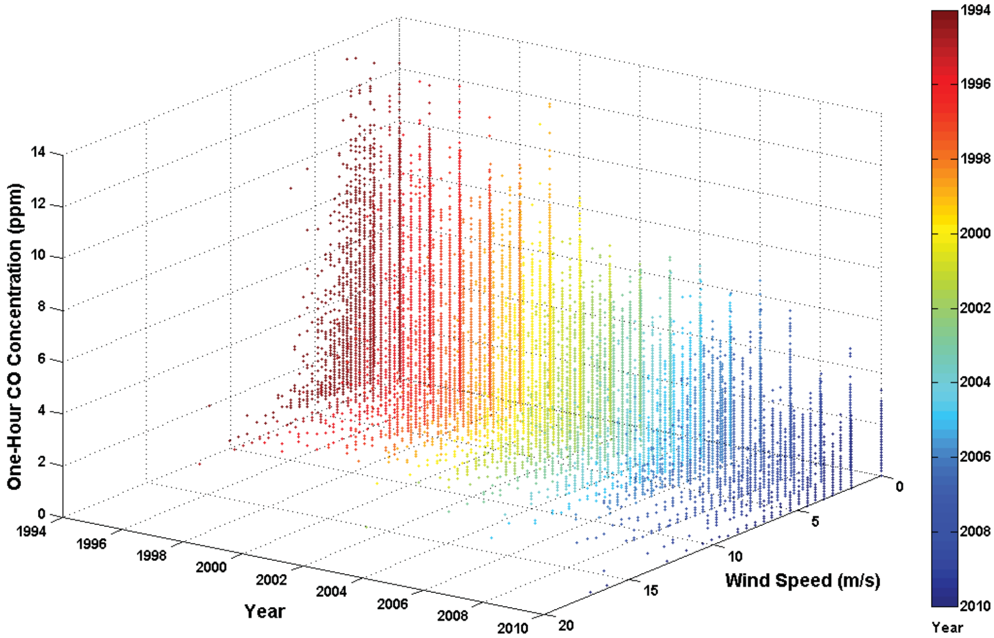


(a) Temperature

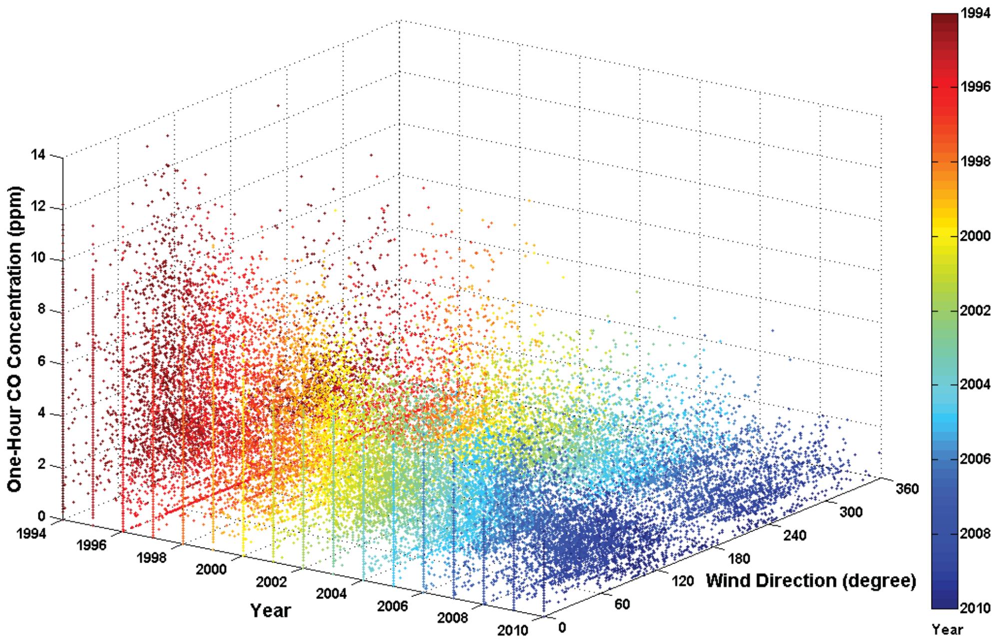


(b) Mixing Height

Figure IV-5. 3-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure

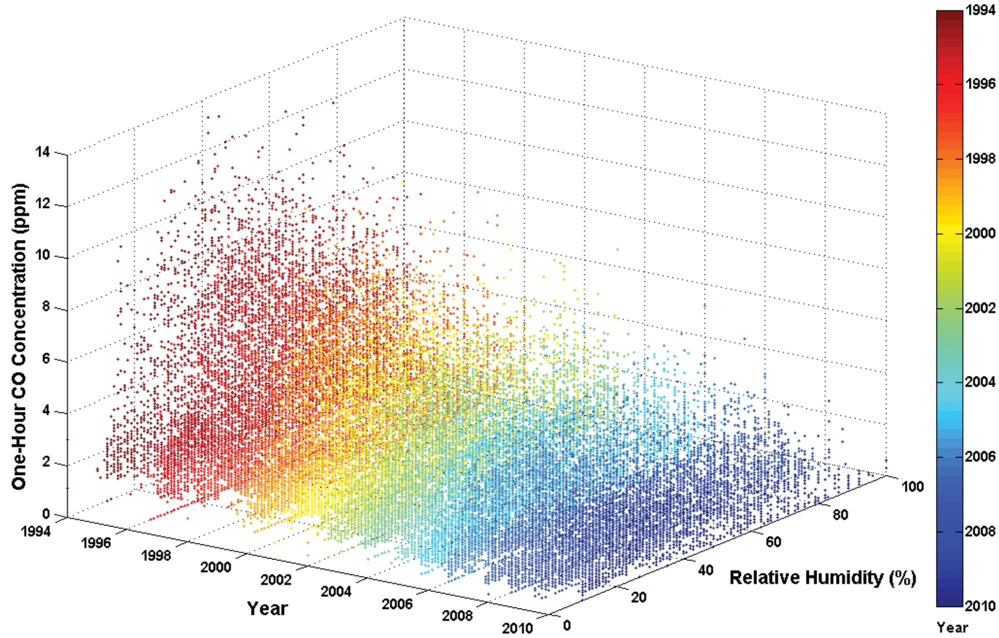


(c) Wind Speed

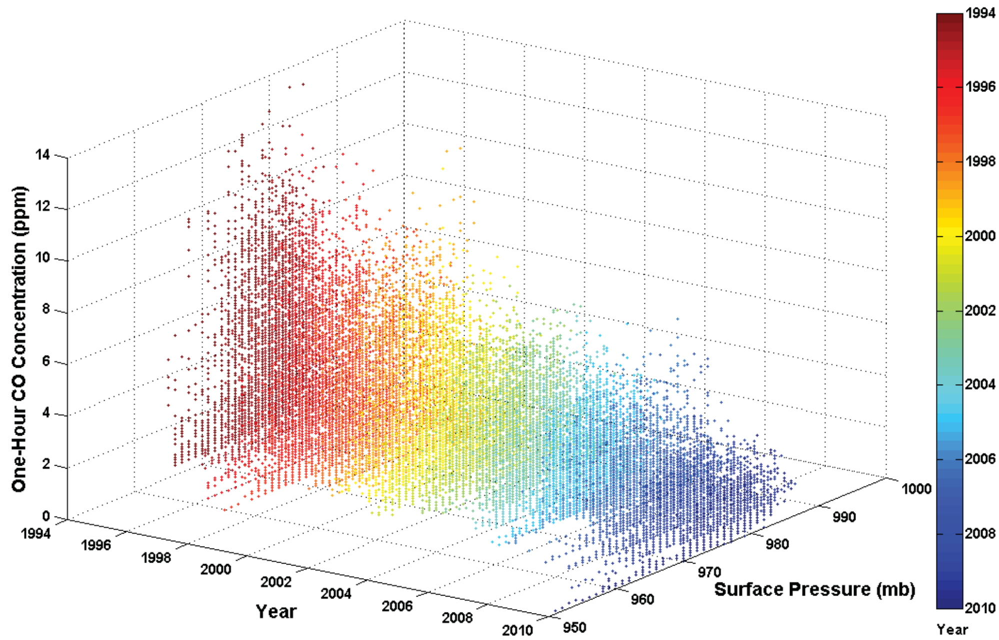


(d) Wind Direction

Figure IV-5. 3-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure (continued)

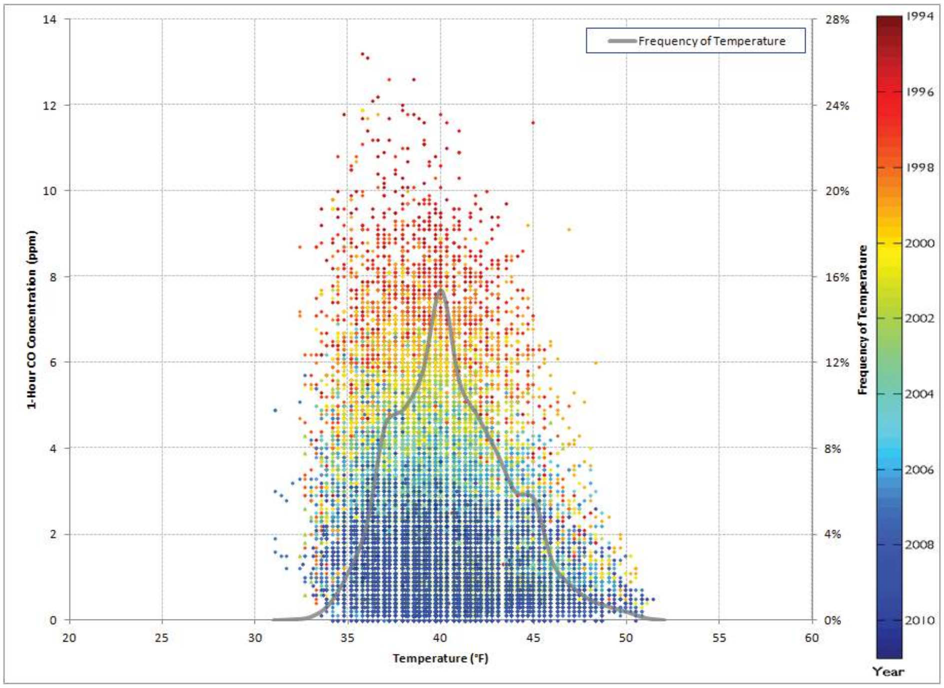


(e) Relative Humidity

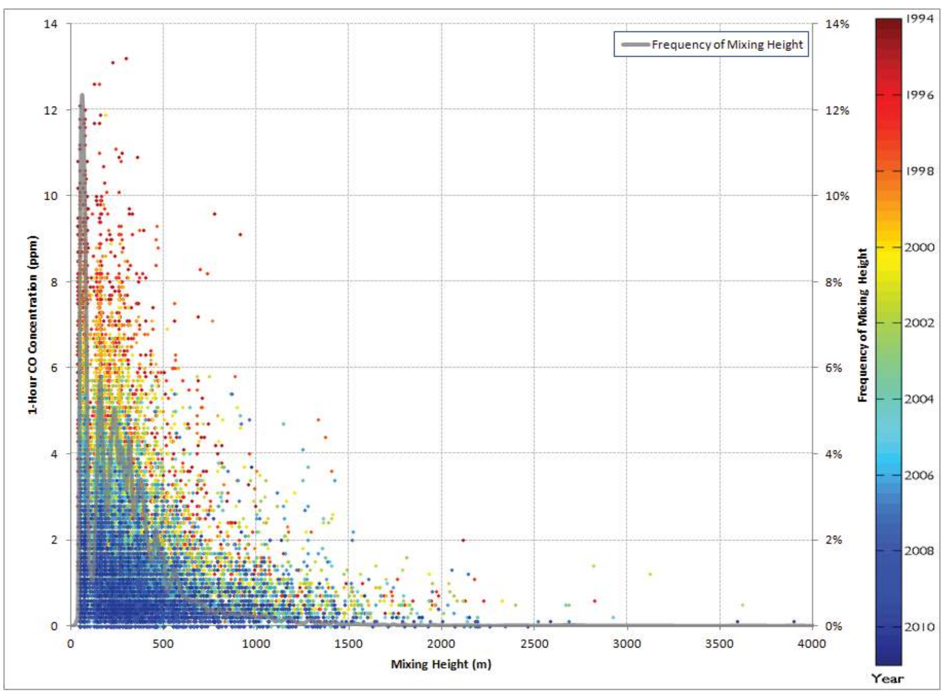


(f) Surface Pressure

Figure IV-5. 3-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure (continued)

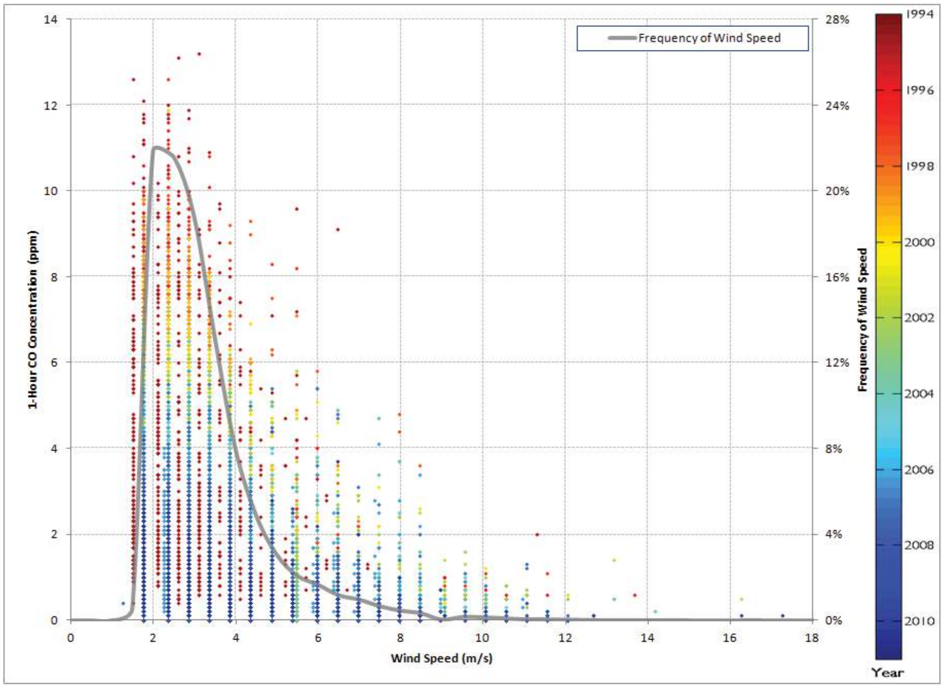


(a) Temperature

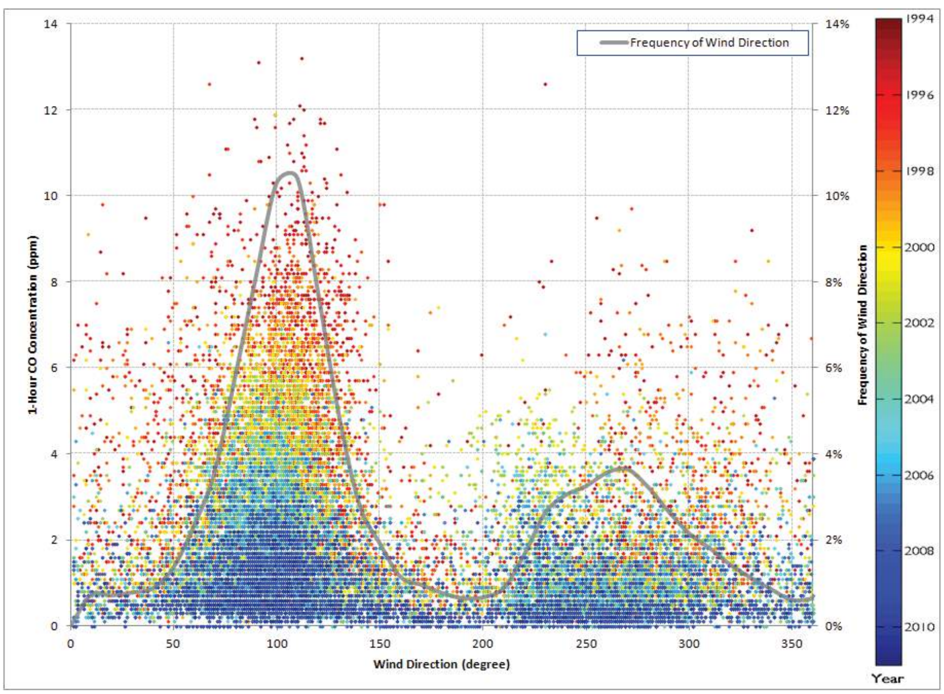


(b) Mixing Height

Figure IV-6. 2-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure

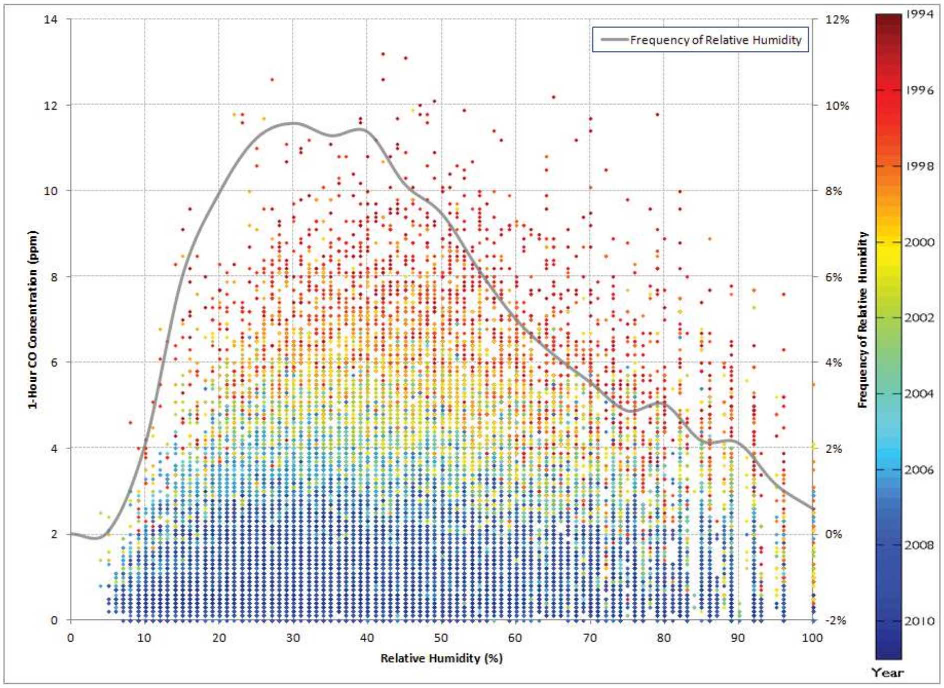


(c) Wind Speed

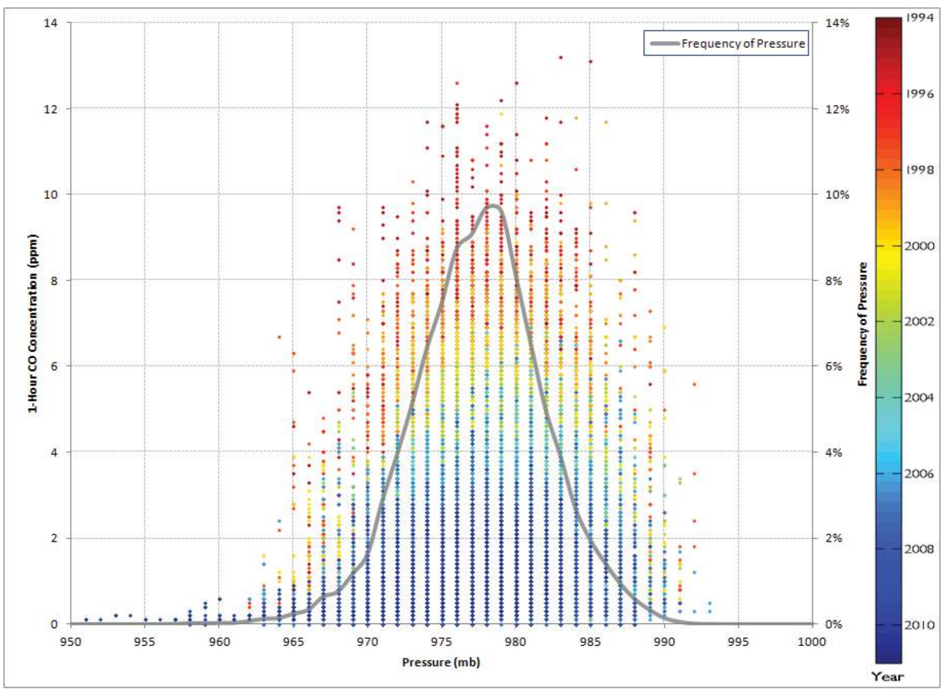


(d) Wind Direction

Figure IV-6. 2-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure (continued)



(e) Relative Humidity



(f) Surface Pressure

Figure IV-6. 2-D scatter plots of one-hour CO concentrations at the West Indian School monitor and meteorological parameters at Phoenix Sky Harbor International Airport: (a) Temperature, (b) Mixing Height, (c) Wind Speed, (d) Wind Direction, (e) Relative Humidity, and (f) Surface Pressure (continued)

Table IV-11. Three meteorological conditions: MC1, MC2, and MC3

Meteorological Parameter	MC1	MC2	MC3
Temperature	31~51 °F	35~40 °F	36~39 °F
Mixing Height	Less than 3,893 m	Less than 400 m	Less than 143 m
Wind Speed	Less than 17.26 m/s	Less than 4 m/s	Less than 1.76 m/s
Wind Direction	Any degree	60~140 degree	Any degree
Relative Humidity	4~100 %	20~80 %	41~70 %
Surface Pressure	951~993 mb	970~985 mb	979~980 mb

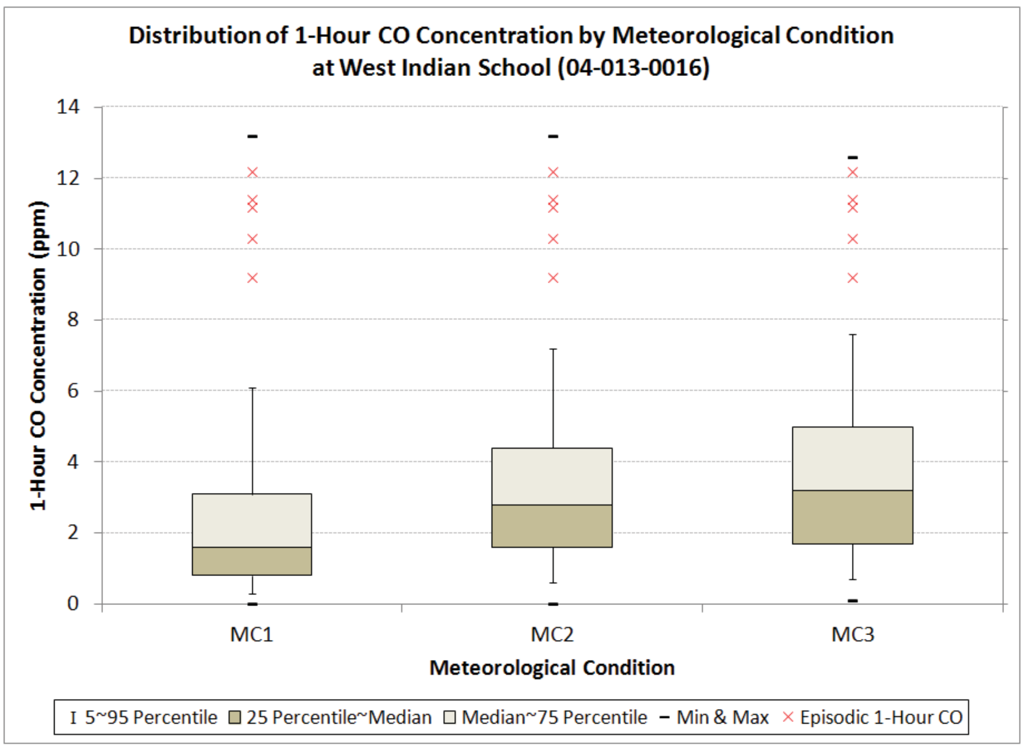


Figure IV-7. Distribution of one-hour CO concentrations relative to meteorological conditions for all years (1994~2010)

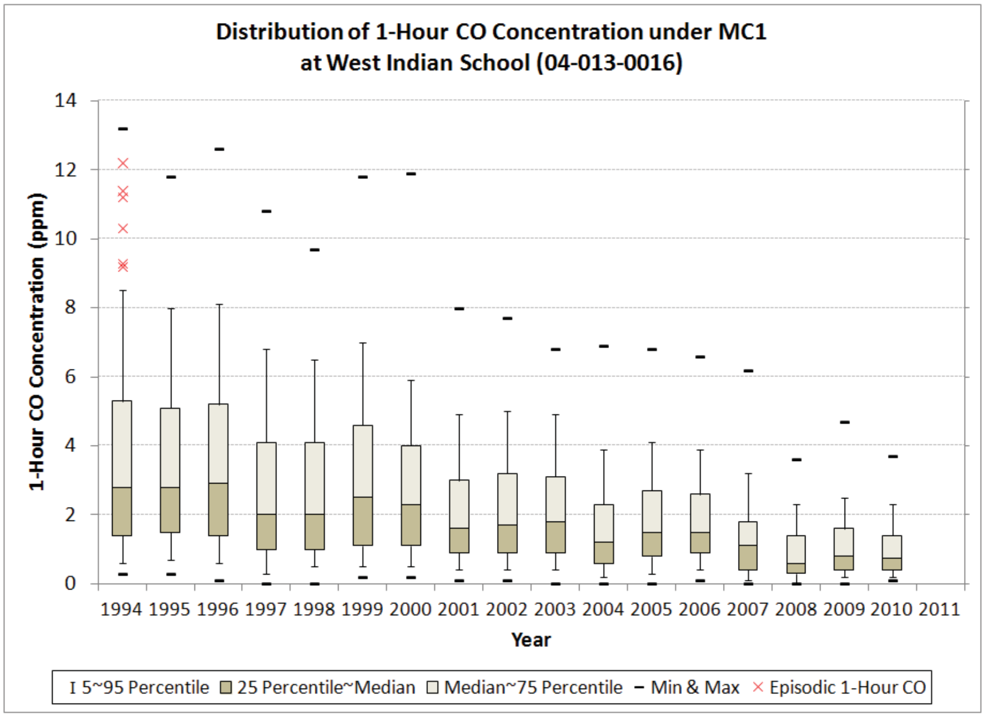


Figure IV-8. Distribution of one-hour CO concentrations relative to meteorological conditions under MC1

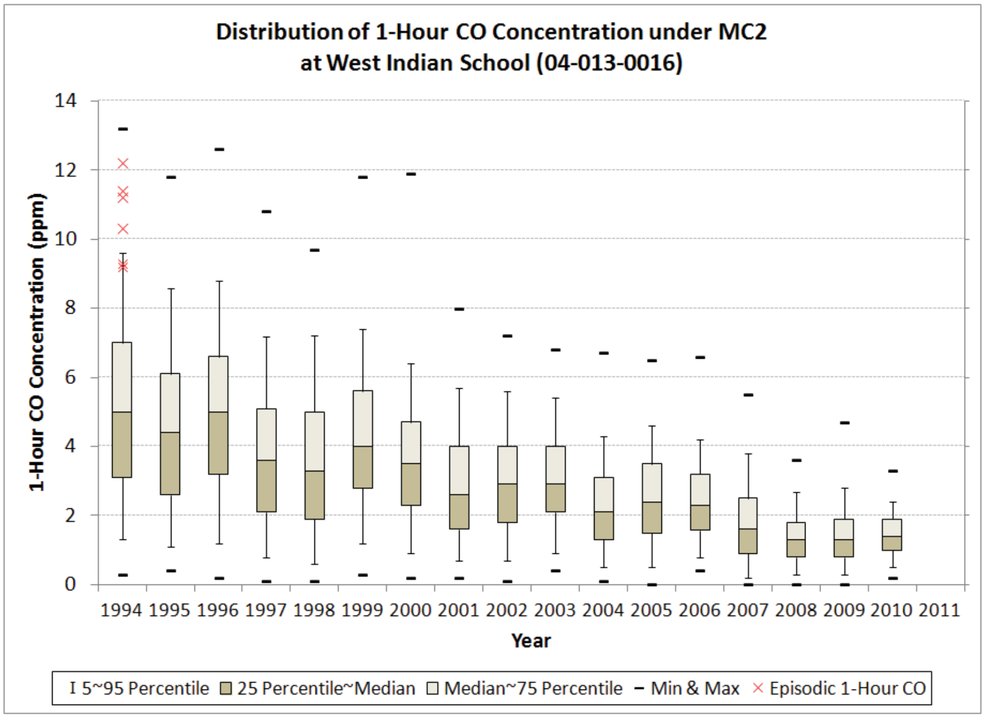


Figure IV-9. Distribution of one-hour CO concentrations relative to meteorological conditions under MC2

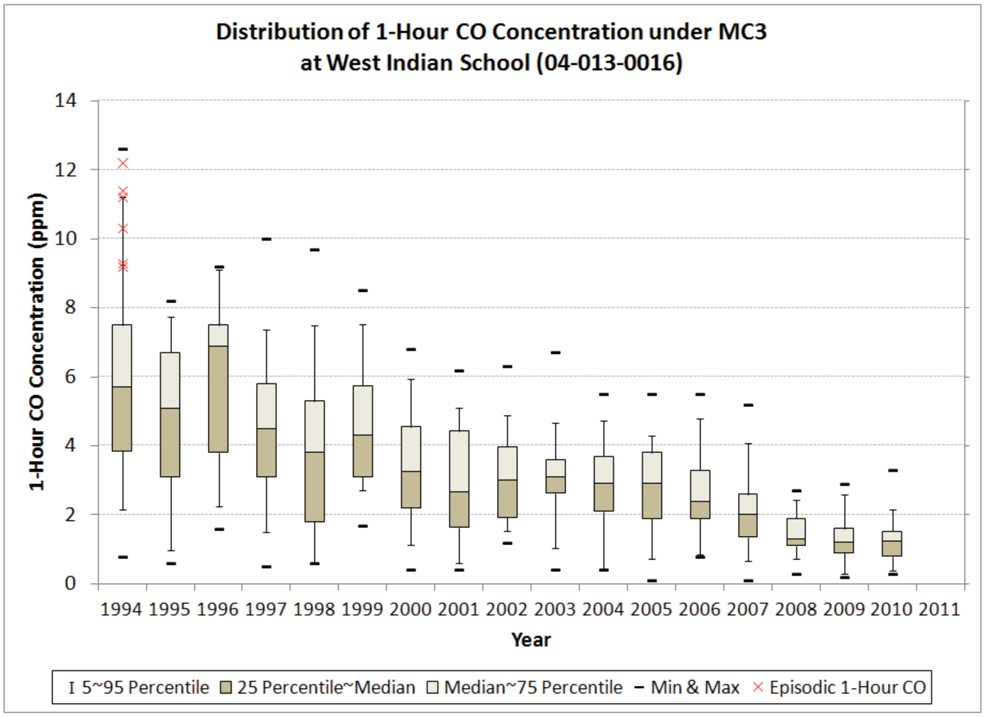


Figure IV-10. Distribution of one-hour CO concentrations relative to meteorological conditions under MC3

IV-3-2-6. Wind Speeds, Mixing Heights, and Maximum Eight-Hour CO Concentrations

Since wind speeds and mixing heights are important meteorological parameters influencing the magnitude of local CO concentrations, daily maximum eight-hour CO concentrations for the winter CO season in 1997 through 2011 have been calculated for periods when eight-hour average wind speeds were in the range of 1 to 3.5 meters per second and mixing heights were in the range of 0 to 300 meters. These represent the range of wind speeds and mixing heights that were observed during the five highest eight-hour CO concentrations in 1994. The results of this analysis are shown in Figure IV-11. The highest to fifth highest daily maximum CO concentrations for the winter in 1994 are denoted 1 to 5 inside the largest circles in Figure IV-11. The smaller dots represent the daily maximum eight-hour CO concentrations in 1997 through 2011 that occurred within the same range of wind speeds and mixing heights recorded in 1994. Daily maximum eight-hour CO concentrations lower than the standard were predominant during the period, even though they are observed under the same range of mixing heights and wind speeds as those for the five highest CO concentrations in 1994.

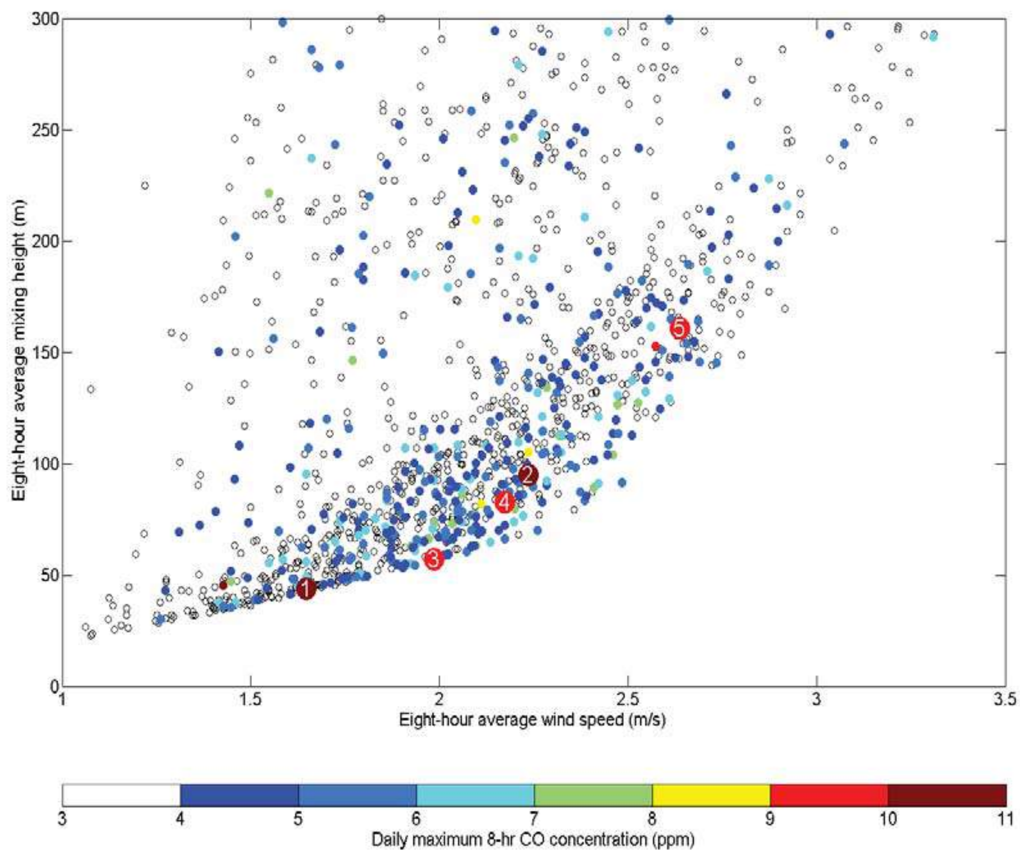


Figure IV-11. Daily maximum eight-hour CO concentrations in 1997 through 2011 compared with the five highest daily maximum CO concentrations in 1994 under the same meteorological conditions

IV-3-2-7. Summary of Meteorological Analysis

Four different meteorological analyses have been performed to demonstrate that the continuing trend in CO reductions in the Maricopa County area has not been due to favorable meteorological conditions. Findings from those meteorological analyses are as follows:

- The maximum eight-hour CO concentrations have continued to decline dramatically, even though meteorological conditions during those years have not differed significantly from the 1994 episode meteorological conditions.
- The diurnal CO concentrations have declined, while the daily variations in temperatures, wind speeds, and mixing heights have not changed significantly over time.
- The one-hour CO concentrations have continued to decrease over time regardless of meteorological conditions.
- Daily maximum eight-hour CO concentrations below the CO standard were predominant during the period 1997 through 2011 under the same range of wind speeds and mixing heights.

These analyses provide decisive evidence that the reductions in CO concentrations since 1996, despite major increases in population, employment, and vehicle travel over this period, can be attributed to permanent and enforceable measures in the EPA-approved CO plans for the region (MAG, 2001 & 2003), rather than favorable meteorological conditions.

IV-4. Ambient Air Quality Monitoring Network and Verification of Continued Attainment

The ambient air quality monitoring network in Maricopa County is designed to assess the extent of air pollution, ensure compliance with national legislation, evaluate control options, and provide data for air quality modeling. In accordance with the 40 CFR Part 58, Maricopa County Air Quality Department (MCAQD) operates and maintain twelve carbon monoxide monitoring sites in Maricopa county, and the Arizona Department of Environmental Quality (ADEQ) operates the Supersite in central Phoenix. Table IV-12 lists the CO monitoring sites and their addresses.

The MCAQD and ADEQ will continue to operate an appropriate air quality monitoring network to collect and provide air quality data for use in demonstrating ongoing attainment of the CO standards. If the ambient levels of CO rise and threaten to exceed the CO standards, the reasons for these occurrences will be investigated and appropriate actions will be taken. In compliance with 40 CRF Part 58 Subpart B annual air monitoring network review will be conducted to determine whether the network meets the monitoring objectives defined in Appendix D of 40 CFR Part 58, whether new sites are needed, whether existing sites are no longer needed and can be terminated.

Table IV-12. CO monitoring sites in Maricopa County

Site ID	Site Name	Abbr	Address	City
04-013-0016	West Indian School Rd*	WI	33rd Ave & W Indian School Rd	Phoenix
04-013-0019	West Phoenix	WP	39th Ave & Earll Dr	Phoenix
04-013-1003	Mesa	ME	Broadway Rd & Alma School Rd	Mesa
04-013-1004	North Phoenix	NP	7th St & Dunlap Ave	Phoenix
04-013-2001	Glendale	GL	59th Ave & W Olive	Glendale
04-013-3002	Central Phoenix	CP	16th St & Roosevelt St	Phoenix
04-013-3003	South Scottsdale	SS	Miller Rd & Thomas Rd	Scottsdale
04-013-3010	Greenwood	GR	27th Ave & Interstate 10	Phoenix
04-013-4003	South Phoenix	SP	Central Ave & Broadway Rd	Phoenix
04-013-4004	West Chandler	WC	Ellis St & Frye Rd	Chandler
04-013-4005	Tempe	TE	College Ave & Apache Blvd	Tempe
04-013-4010	Dysart	DY	Dysart Rd & Bell Rd	Surprise
04-013-4011	Buckeye	BE	Hwy 85 & MC 85	Buckeye
04-013-9997	Supersite	SUPR	4530 N 17th Ave	Phoenix

* Closed in 2010.

IV-5. Contingency Measures

Section 175A(d) of the Clean Air Act requires that the maintenance plan contain contingency provisions to ensure prompt actions to correct any violation of the CO standard which occurs after redesignation to attainment. The contingency measures in this plan include two emissions control measures described in the MAG 2003 CO Maintenance Plan (MAG, 2003): 1) Gross Emitter Waivers Option and 2) Increased Waiver Repair Limit. A third contingency measure, (3) Reinstatement of the VEI Program for Motorcycles, has been added to the 2013 CO Maintenance Plan.

IV-6. Transportation Conformity Budget

In accordance with the 1990 CAAA, transportation conformity requirements are intended to ensure that transportation activities do not result in air quality degradation. Section 176 of the Amendments requires that transportation plans, programs, and projects conform to applicable air quality plans before the transportation action is approved by a Metropolitan Planning Organization (MPO). The designated MPO for Maricopa County is the Maricopa Association of Governments.

Section 176(c) of the 1990 CAAA provides the framework for ensuring that Federal actions conform to air quality plans under section 110. Conformity to an implementation plan means that proposed activities must not: (1) Cause or contribute to any new violation of any standard in any area, (2) Increase the frequency or severity of any existing violation of any standard in any area, or (3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

EPA transportation conformity regulations establish criteria involving comparison of projected transportation plan emissions with the motor vehicle emissions assumed in applicable air quality plans. These regulations define the term “motor vehicle emissions budget” as meaning “the portion of the total allowable emissions defined in a revision of the applicable implementation plan (or in an implementation plan revision which was endorsed by the Governor or his or her designee) for a certain date for the purpose of meeting reasonable further progress milestones or attainment demonstrations, for any criteria pollutant or its precursors, allocated by the applicable implementation plan to highway and transit vehicles.”

MAG submitted the MAG 2003 CO Maintenance Plan to EPA in May 2003 (MAG, 2003). The MAG 2003 CO Maintenance Plan established two transportation conformity budgets for the CO modeling domain: a 2006 CO emissions budget of 699.7 metric tons per day and a 2015 CO budget of 662.9 metric tons per day. EPA found the 2006 and 2015 CO budgets to be adequate for conformity purposes, effective October 14, 2003. In addition, these budgets were approved by EPA as part of the MAG 2003 CO Maintenance Plan, effective April 8, 2005. Currently, the approved 2006 budget applies to conformity horizon years from 2006 through 2014 and the 2015 budget applies to horizon years after 2014.

Table II-25 indicates that the onroad mobile source emissions for the CO maintenance area in 2025 will be 359.4 metric tons per day, as estimated by MOVES2010b. This represents an average emission rate in the CO maintenance area of 2.8 grams per vehicle mile of travel (VMT). The comparable MOBILE6.2 CO emission rate in 2025 is 7.3 grams per VMT. Therefore, the MOVES2010b CO emission rate is 62 percent lower than the MOBILE6.2 CO emission rate in 2025.

EPA has indicated a new version of MOVES may be released in 2013 that "will incorporate multiple sources of new emissions data" and "it is too early in the development process for us to estimate the overall direction and magnitude of the emissions changes" (EPA, 2012c). To ensure that increases in CO emission rates in future versions of the MOVES model do not cause exceedances of the 2025 conformity budget, it is proposed that a "safety margin" be applied to the 2025 emissions produced with MOVES2010b.

Table II-25 indicates that the 2008 CO emissions estimated by MOVES2010b for the CO maintenance area are 581.6 metric tons per day. The maximum eight-hour CO concentration in 2008 was 3.1 ppm at the West Phoenix monitor, which is only one-third of the standard. Figure IV-1 indicates that CO concentrations have declined since 2008 and are projected to remain far below the 2008 concentrations at each monitoring site. The hotspot analysis also revealed that the traffic at high volume and heavily congested intersections will only increase eight-hour CO concentration by a maximum of 0.4 ppm in 2025. Therefore, an increase in the 2025 conformity budget to a level below the 2008 emissions will not result in an exceedance of the CO standard.

It is proposed that the safety margin represent 90 percent of the difference between the 2008 and 2025 CO emissions, which is 200.0 metric tons per day. When added to the 2025 CO emissions of 359.4 metric tons per day, this establishes a new 2025 conformity budget of 559.4 metric tons per day for the CO maintenance area. It is important to note that this 2025 budget is lower than the 2006 budget of 699.7 metric tons per day and the 2015 budget of 662.9 metric tons per day.

Once EPA finds the new 2025 budget to be adequate (or approves the 2025 budget as part of the MAG 2013 CO Maintenance Plan), the 2025 CO budget for the CO maintenance area will be applied in regional conformity analyses conducted by MAG for horizon years 2025 and beyond. The approved 2006 CO budget of 699.7 metic tons per day will continue to be applied in regional conformity analyses for horizon years 2006 through 2014 and the approved 2015 CO budget of 662.9 metric tons per day will continue to be used in regional conformity analyses for horizon years 2015 through 2024.

V. CONCLUSIONS

As discussed in Section IV, emissions inventories, scaled UAM/CAL3QHC model predictions, and a new intersection hotspot analysis have demonstrated maintenance of the CO standards through 2025. The maximum eight-hour CO predictions for the maintenance year 2025 based on emissions inventories were estimated at 2.7 ppm for the CO modeling domain and 2.2 ppm for the CO maintenance area. The scaled maximum UAM/CAL3QHC eight-hour concentration for 2025 was estimated to be 4.0 ppm. The new intersection hotspot CAL3QHC analysis estimated 1.7 ppm as the maximum eight-hour CO concentration in 2025. All three analyses predicted CO concentrations that will be significantly below the eight-hour CO standard in 2025. Historical CO concentration measurements at monitors provided supporting evidence that the Maricopa County area would continue to maintain the CO standard through 2025. In addition, the meteorological analysis has substantiated that improvements in the ambient CO levels over the past decade in the Maricopa County area were not due to favorable meteorological conditions. The 2013 MAG Carbon Monoxide Maintenance Plan also establishes a new 2025 conformity budget of 559.4 metric tons per day.

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APPENDICES

APPENDIX I

MODELING PROTOCOL AND DATA FILE LIST

Appendix I-i

Modeling Protocol

in Support of

the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area

MODELING PROTOCOL

IN SUPPORT OF

THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

JUNE 2012

Maricopa Association of Governments
302 North 1st Avenue, Suite 300
Phoenix, Arizona 85003

MARICOPA ASSOCIATION of GOVERNMENTS

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ACRONYMS AND ABBREVIATIONS

Acronyms

ADOT	Arizona Department of Transportation
ADEQ	Arizona Department of Environmental Quality
AERR	Annual Emissions Reporting Requirements
APM	Aviation Performance Metrics
APU	Auxiliary Power Unit
ATADS	Air Traffic Activity Data System
AVFT	Alternative Vehicle and Fuel Technologies
CAAA	Clean Air Act Amendments
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CTOC	Cap and Trade Oversight Committee
EDMS	Emissions and Dispersion Modeling System
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FR	Federal Register
GSE	Ground Support Equipment
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
LOS	Level-of-Service
LTO	Landing and Takeoff
LULC	Land Use Land Cover
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Department
MOVES	Motor Vehicle Emission Simulator
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PEI	Periodic Emissions Inventory
PTE	Potential To Emit
TDM	Travel Demand Model
TSD	Technical Support Document
UAM	Urban Airshed Model
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled

Abbreviations

CO	Carbon Monoxide
CO_2	Carbon Dioxide
ppm	parts per million

1 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) redesignated the Phoenix metropolitan area from a serious nonattainment area to attainment for the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO) and approved the Carbon Monoxide Redesignation Request and Maintenance Plan for the Maricopa County Nonattainment Area (MAG 2003) effective April 8, 2005 (70 FR 11553). The MAG 2003 CO Maintenance Plan demonstrated maintenance of the CO standards through 2015.
Section 175A(b) of the Clean Air Act Amendments (CAAA) states that *"8 years after redesignation of any area as an attainment area under section 107(d), the State shall submit to the Administrator an additional revision of the applicable State implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the initial 10-year period".* Thus, a second CO maintenance plan for the years 2016 through 2025 for the Phoenix metropolitan area is required for submittal to EPA by April 8, 2013.

The purpose of this modeling protocol is to describe modeling methodologies and assumptions which will be used to determine whether the CO NAAQS in the Phoenix metropolitan area will continue to be maintained through 2025, and to establish the 2025 conformity budget for onroad mobile source emissions using the latest version of EPA's Motor Vehicle Emission Simulator (MOVES) model, MOVES2010b. The protocol should be viewed as a set of general guidelines that provide focus, consistency, and a basis for consensus for all parties involved in this analysis. This modeling protocol will be reviewed and approved by members of the Air Quality Planning Team prior to commencement of modeling. This team includes staff representatives from the Maricopa Association of Governments (MAG), the Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Transportation (ADOT), and the Maricopa County Air Quality Department (MCAQD).

Background

Carbon monoxide is a colorless, odorless, and poisonous gas emitted from combustion processes. It is highly toxic to humans and animals when encountered in higher concentrations. In the atmosphere, it is short-lived and combines with oxygen to form carbon dioxide (CO_2). Since the principal source of CO in urban areas is motor vehicle exhaust, CO concentrations are closely related to vehicular traffic volume (Seinfeld 1986). CO problems generally occur in localized areas in association with cold, stagnant weather conditions during the winter (CARB 2004).

To protect the public health from this air pollutant, the 1990 CAAA required that all areas of the nation attain and maintain the NAAQS for CO. The federal standards for CO provide two primary standards: 9 parts per million (ppm) averaged over an 8-hour period and 35 ppm averaged over a 1-hour period. Any monitor must not exceed either standard more than once per year during two consecutive years.

In accordance with the 1990 CAAA, EPA designated the Phoenix metropolitan area as a moderate nonattainment area for CO. Since the area had not attained the standard by December 31, 1995, the area was re-designated as a serious nonattainment area in 1996. The attainment date for serious nonattainment areas is December 31, 2000 under the CAAA.

The MAG 1999 Serious Area Carbon Monoxide Plan (MAG 1999) demonstrated attainment of the CO standards by December 31, 2000 and was submitted to EPA in July 1999. Since the Arizona Legislature repealed the remote sensing program in 2000, the 1999 CO plan was revised to reflect the discontinuation of the remote sensing program. The Revised MAG 1999 Serious Area Carbon Monoxide Plan (MAG 2001) confirmed attainment of the standards without the remote sensing program and was submitted to EPA in March 2001.

Since no violation of the CO standards has occurred at any monitor in the area since 1996 and the EPA clean data requirement was satisfied for the re-designation from nonattainment to attainment, the MAG 2003 CO Redesignation Request and Maintenance Plan was submitted to EPA in May 2003. The plan demonstrated maintenance of the standards through 2015. On March 9, 2005, EPA re-designated the area to attainment for the CO standards and approved the MAG 2003 CO Maintenance Plan, effective April 8, 2005.

In accordance with Section 175A(b) of the 1990 CAAA, the second CO maintenance plan for an additional 10-year period for the Phoenix metropolitan area should be prepared and submitted to EPA by April 8, 2013.

Objectives

The protocol document describes the procedures MAG will use for conducting all phases of the modeling study.

Key objectives to be accomplished by this protocol document are to: (1) enhance technical credibility, (2) encourage the participation of all interested parties, (3) lay out responsibilities of all participants, (4) provide for consensus-building among all interested parties concerning modeling assumptions and approaches, and (5) provide documentation for technical decisions to be made in applying the modeling approaches.

2 MODELING MAINTENANCE DEMONSTRATION

The second MAG CO maintenance plan will perform three modeling analyses to demonstrate maintenance of the standards through 2025. The modeling will assume that the committed control measures in the MAG 2003 CO Maintenance Plan will continue to be implemented through 2025.

1) Emissions Inventory Comparison

Two sets of CO emissions inventories (point, area, onroad, and nonroad sources) will be developed for the years 2006, 2008, 2015, and 2025 for the CO modeling domain and maintenance area shown in Figure 2-1. The first set of emissions inventories will be developed for the CO modeling domain defined in the MAG 2003 CO Maintenance Plan for the years 2006, 2008, 2015, and 2025. The second set of emissions inventories will be developed for the CO maintenance area for the years 2008 and 2025. The emissions inventory for the base year 2008 for the CO maintenance area will be obtained from the 2008 Periodic Emissions Inventory (PEI) for CO (MCAQD 2012), currently under development by the Maricopa County Air Quality Department (MCAQD). Both sets of CO emissions inventories will be developed using the latest emissions models (i.e., MOVES2010b, NONROAD2008a, and EDMS version 5.1.3).

Emissions for the modeling domain in the years 2015 and 2025 will be compared to those for 2006 and 2008. A comparison of emission levels and actual CO concentrations in 2006 and 2008, as well as the continued decrease in emission levels in future years should substantiate maintenance of the CO standards through 2025.

2) Scaling UAM/CAL3QHC Maximum Concentrations

The MAG 2003 CO Maintenance Plan conducted Urban Airshed Model (UAM) and CAL3QHC modeling to estimate the combined UAM/CAL3QHC maximum 8-hour concentrations in the CO modeling domain for the years 2006 and 2015. The UAM/CAL3QHC maximum modeled concentrations shown in Table 2-1 were used to demonstrate maintenance of the standards for the interim year 2006 and maintenance year 2015.

Since the UAM/CAL3QHC maximum modeled predictions were based on emissions inventories developed with older versions of models (e.g., MOBILE6 and NONROAD) available at the time of development of the MAG 2003 CO Maintenance Plan, these projections will be adjusted by updated emissions inventories for 2006 and 2015. The ratio of the updated emissions in the new maintenance plan to the emissions in the MAG 2003 CO Maintenance Plan will be applied to the UAM/CAL3QHC maximum projected concentrations for 2006 and 2015. The adjusted maximum modeled concentrations will then be projected to 2025 by applying the ratios of the 2025 emissions to the 2006 emissions and the 2025 emissions to the 2015 emissions. The scaled maximum modeled concentration for 2025 in the CO modeling domain will be used to determine if the 8-hour

CO standard is met in 2025.

3) Intersection Analysis

An intersection analysis will be performed using the CAL3QHC model on potentially high traffic volume and congested intersections identified for the maintenance year 2025. The purpose of the intersection hotspot analysis is to assure that potential high traffic and congested intersections identified in the region for 2025 will not contribute to any exceedance of the standards. In accordance with EPA's intersection selection procedure guidance (EPA 1992), three intersections from those with the six worst Levels-of-Service (LOS) and three intersections from those with the six highest traffic volumes will be selected for the CAL3QHC modeling for the maintenance year of 2025. A traffic assignment produced by the TransCAD TDM for the PM peak period in 2025 will be used to identify intersections with the highest traffic volumes and levels of service in the CO maintenance area.

The CAL3QHC maximum 1-hour CO concentration predicted at receptors surrounding each selected intersection will be multiplied by a persistence factor to derive the maximum predicted 8-hour concentration (EPA 1992). The persistence factor will be based on the ratio of the 8-hour to the maximum1-hour measured CO concentration within the 8-hour period. The maximum 8-hour prediction will be derived by multiplying the CAL3QHC maximum 1-hour concentration by the persistence factor and combining the results with the background concentration. The background concentration for the base year 2008 will be determined by averaging the highest 8-hour CO concentrations at area-wide monitors for the years 2007, 2008, and 2009 (shown in Table 3-3).

The calculation of the background concentration will not include CO measurements at the West Indian School Road and West Phoenix monitors since these are located at sites typically affected by high traffic volumes and congestion. Consequently, the CO measurements at these monitors are not appropriate for representing the background concentration. The background concentration for the base year 2008 will be scaled to a future year background concentration by multiplying the base year background concentration by the ratio of the future year emissions to the base year emissions. The background concentration for the future year will be added to the maximum 8-hour concentration predicted by CAL3QHC.

The total CO concentration produced by combining the maximum CAL3QHC concentration with the background concentration should not exceed the 8-hour CO standard for the year 2025.

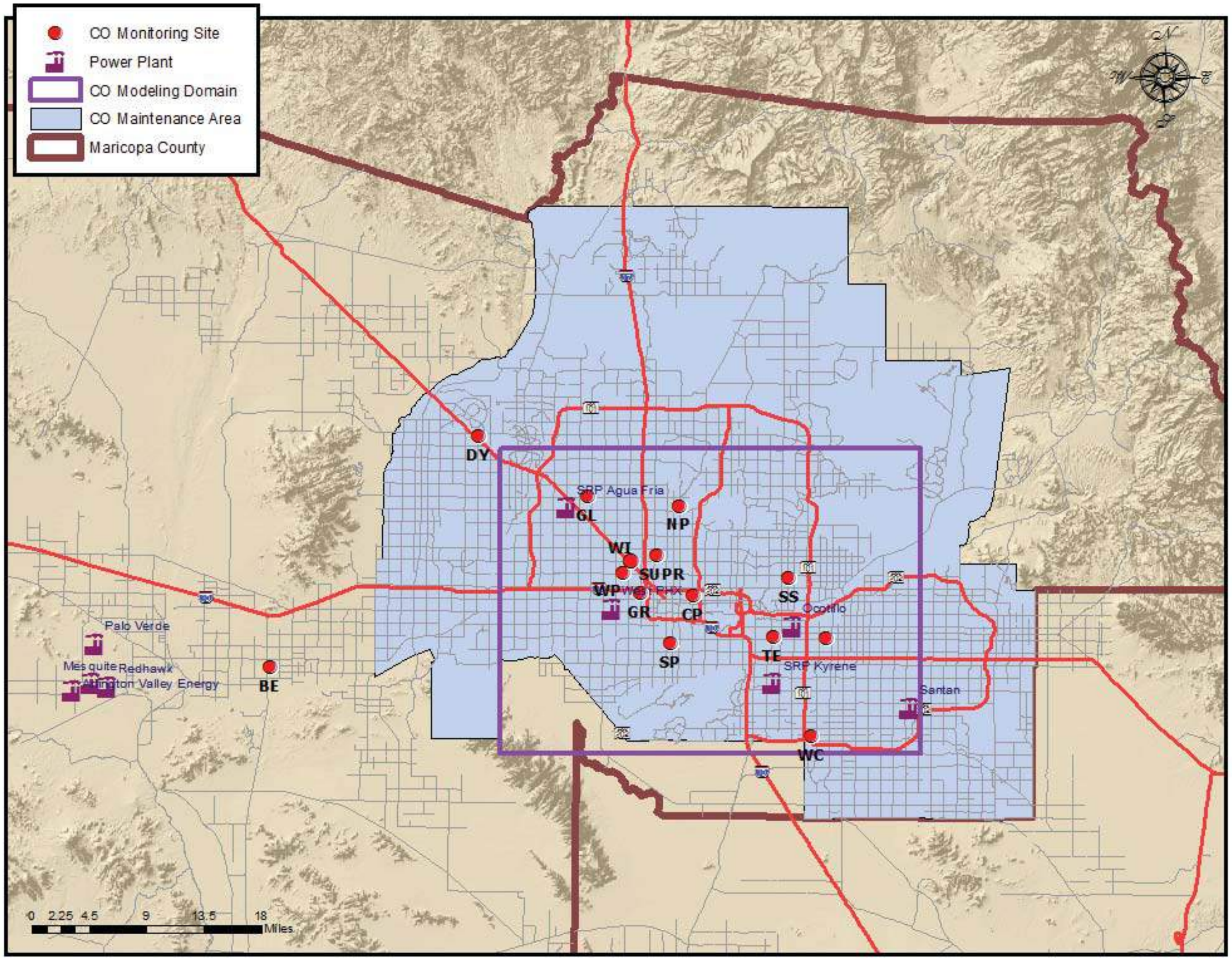

Figure 2-1 Carbon Monoxide Monitoring Sites and Boundaries of Modeling Domain and Maintenance Area

Table 2-1 Combined UAM/CAL3QHC Maximum Eight-hour CO Concentrations for the December 16-17 Episode in the MAG 2003 Carbon Monoxide Maintenance Plan

Location	UAM	CAL3QHC	Total
2006			
WISR Monitor	7.22 ppm	0.06 ppm	7.28 ppm
WISR Receptor #9	7.17 ppm	1.08 ppm	8.25 ppm
WISR Receptor #8	7.17 ppm	0.91 ppm	8.08 ppm
WISR Receptor #20	7.17 ppm	0.68 ppm	7.85 ppm
PHGA Monitor	N/A	N/A	N/A
PHGA Receptor #30	7.74 ppm	0.50 ppm	8.24 ppm
PHGA Receptor #46	7.89 ppm	0.19 ppm	8.08 ppm
PHGA Receptor #29	7.74 ppm	0.29 ppm	8.03 ppm
UAM Maximum	8.92 ppm	-	8.92 ppm
2015			
WISR Monitor	6.56 ppm	0.03 ppm	6.59 ppm
WISR Receptor #9	6.23 ppm	1.81 ppm	8.04 ppm
WISR Receptor #8	6.23 ppm	1.61 ppm	7.84 ppm
WISR Receptor #20	6.56 ppm	0.88 ppm	7.44 ppm
PHGA Monitor	N/A	N/A	N/A
PHGA Receptor #30	7.16 ppm	0.65 ppm	7.81 ppm
PHGA Receptor #46	7.16 ppm	0.29 ppm	7.45 ppm
PHGA Receptor #29	7.19 ppm	0.20 ppm	7.39 ppm
UAM Maximum	8.06 ppm	-	8.06 ppm

WISR = 35th Ave-Grand Ave-West Indian School Road Intersection
PHGA = 27th Ave-Grand Ave-Thomas Road Intersection

MOVES2010b Emission Rates

According to EPA guidance (EPA 1992), evaluation of the air quality impact of an intersection requires use of the CAL3QHC dispersion model and emission rates from the latest version of an EPA-approved onroad mobile source emissions model. MOVES2010b will be used to estimate emission rates for both free-flow and idling traffic for the selected intersections.

The MOVES2010b simulation will be performed for each selected intersection using the PM peak traffic volume, which represents the worst-case condition (EPA 2010).

For a project level analysis, it is required to develop a run specification ("RunSpec") defining the location, time span, vehicle types, fuel types, road types, pollutants, and processes of the analysis.

Following EPA guidance (EPA 2010), the RunSpecs will be developed as follows:

- Scale: To accept detailed activity input at the link level, MOVES2010b will be executed using the Project domain. Since CAL3QHC requires emission rates in terms of grams/vehicle-mile for free-flow links and grams/hour for queue links, the inventory option will be selected as output.
- Time Spans: To describe the PM peak traffic scenario, a PM peak hour in terms of traffic volume will be set to December 2025. Time aggregation and the day selection will be set to "hour" and "weekday", respectively.
- Geographic Bounds: Maricopa County will be selected at the project level.
- Vehicles/Equipment: The appropriate fuel and vehicle type combinations will be selected to reflect all vehicle types that are expected to operate in the selected intersection.
- Road Type: Based on the Highway Performance Monitoring System (HPMS) functional classification of the road type, a specific road type will be used for the selected intersection.
- Pollutants and Processes: To model an intersection, which requires CO emission rates for both free-flow and queue links, Running Exhaust and Crankcase Running Exhaust will be selected as processes.
- Output: Under General Output panel, "grams" and "miles" will be selected for the output units, and "Distance Traveled" and "Population" will be selected for the activity. For the Output Emissions Detail panel, only "Emission Process" will be selected along with the default selection of emissions by hour and link.

After creating the RunSpec, the project details will be entered using the MOVES Project Data Manager as follows:

- Meteorology: The 8-hour average temperature and humidity corresponding to each of the ten highest non-overlapping 8-hour CO monitoring values for the last three years (2009, 2010, and 2011) will be retrieved from the National Climatic Data Center (NCDC) database for the National Weather Service (NWS) station at the

Phoenix Sky Harbor International Airport (KPHX). Then, the ten values will be averaged for use with MOVES2010b.

- Age Distribution: The latest available local age distribution assumptions will be used. A MOVES age distribution table will be derived from EPA's registration distribution converter and the latest vehicle registration data for Maricopa County provided by the Arizona Department of Transportation (ADOT).
- Fuel Supply and Formulation: The MOVES default fuel formulation and fuel supply data will be revised based on local volumetric fuel property information provided by the Arizona Department of Weights and Measures.
- Inspection and Maintenance (I/M) program: The default I/M program in MOVES2010b will be changed to represent characteristics of the actual I/M program in Maricopa County.
- Link Source Type: With an assumption that distribution of a regional fleet for a given road type represents the source type distribution for selected intersections, the source type distribution consistent with the latest transportation conformity regional emissions analysis will be used.
- Links: The number of links and the length of each link for a given intersection will be determined by following EPA guidance (EPA, 2010). Traffic volume and average speed for each link will be assigned based on the information provided by the MAG Transportation Division.

MOVES will generate a grams/vehicle-mile emission rate for each free-flow link and a grams/vehicle-hour emission rate for each queue link. The emission rates will be used in CAL3QHC to perform the intersection analysis.

CAL3QHC Modeling Analysis

For the hotspot analysis, the CAL3QHC model (EPA 1992, 1995, and 2004) will be used as a dispersion model to predict localized "hotspot" impacts. Microscale CO concentrations will be calculated for the selected intersections.

CAL3QHC version 2.0 is a computer-based modeling methodology developed to predict CO or other pollutant concentrations from motor vehicles traveling near a roadway intersection. Based on the assumption that vehicles at an intersection are either in motion or in an idling state, the model is designed to predict air pollution impacts by combining emissions from both idling and moving vehicles with meteorological data. All simulations will be conducted in accordance with the methodologies described in the CAL3QHC User's Guide (EPA 1995) and the CO modeling guidance (EPA 1992).

Two of the major input categories for CAL3QHC are roadway links and receptors. At all locations, receptors will be placed outside the 3 meter (10 feet) wide mixing zone along the roadway and spaced regularly along each leg of the intersection on both sides of the road. While receptors will be identified by their X, Y, and Z coordinates, all receptor heights (Z) will be set to 1.8 meters (6 feet), which is assumed as a breathing height.

Multiple roadway links will be chosen for each selected intersection. Each roadway link is comprised of two nodes (endpoints) which are identified by an east coordinate (X) and a north coordinate (Y). All links will be modeled as at-grade (AG) roadways with zero vertical height. A link can be specified as either a "free flow" or "queue" link. Free flow links represent traffic conditions where vehicles have the green light and do not stop when traveling through an intersection. A queue link represents a situation where traffic has a red light and is stopped at an intersection. Traffic volumes and signal timing information (i.e., signal cycle length, average red time, arrival rate, etc.) will be obtained from the MAG Transportation Division.

3 WEIGHT OF THE EVIDENCE MAINTENANCE DEMONSTRATION

Continued Monitored Attainment

The Phoenix metropolitan area has not had an exceedance of the 1-hour CO standard (35 ppm) since 1986 and the 8-hour CO standard (9 ppm) since 1996.

Monitored data from 1996 through 2011 indicate that CO concentrations in the maintenance area have continued to decline over time to a level substantially below the1-hour and 8-hour standards. The highest and 2nd highest monitored 1-hour and 8-hour CO concentrations for the period of 1996-2011 are shown in Tables 3-1 through 3-4. The declining trend in historical CO concentrations for each monitor provides corroboration that the area will continue to maintain the standards.

As a weight of the evidence demonstration for the continued maintenance of the standards in future years, historical trends in concentrations measured at the CO monitors will be presented and discussed in the second MAG CO maintenance plan.

Meteorological Analysis

The meteorological analysis will support the premise that improvements in CO air quality are due to permanent and enforceable emission reductions, not unusually favorable meteorological conditions.

To demonstrate that the air quality improvements in the CO maintenance area are not due to unusually favorable meteorological conditions, historical conditions for the following meteorological parameters during the CO winter season will be compared with those during the 1994 CO episode (December 17, 1994).

Temperature

Higher CO emissions are typically caused by the incomplete combustion of fuel at lower temperatures. In addition, since the air stability is more stagnant in cold weather, a higher level of CO emissions tend to be trapped under a lower level of the atmosphere during winter. Based on the observations from the NWS station at the Phoenix Sky Harbor International Airport, historical trends and diurnal cycles of mean winter temperatures will be discussed to verify that temperatures during the past decade have not contributed favorably to the improvement in the air quality level for CO.

Wind speed

A lower wind speed (e.g., calm wind) contributes to the accumulation of ground-level CO emissions near emission sources. By using wind speed data from the NWS at the Phoenix Sky Harbor International Airport, historical wind speeds and diurnal patterns of wind speeds during winter will be compared to those during the 1994 CO episode. The comparison will provide evidence that historical wind speeds are not typically favorable to the improvement of air quality.

Mixing height and atmospheric stability

Mixing height may play a key role in higher CO concentrations measured at the monitors. Higher mixing height provides a large environmental capacity to dilute CO emissions, while lower mixing height may trap CO emissions in a very shallow layer and lead to higher CO concentrations in the urban area where traffic is heavy. The methodology to calculate the mixing height is discussed in "*Mixing height calculated based on surface and upper air meteorological data*" (See Section 4-4). The stability and turbulence in the atmospheric boundary layer are important factors affecting ground-level CO concentrations. Historical atmospheric stabilities during winter, along with mixing height, cloud cover, and solar radiation, will be discussed in comparison with those for the 1994 CO episode.

Table 3-1 Highest 1-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 1st highest 1-hour CO Concentrations															
			1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
04-013-0016	W Indian School Rd	WI	12.6	10.8	9.7	11.8	11.9	8.0	7.7	6.8	6.9	6.8	7.6	6.2	3.9	5.6	3.7	
04-013-0019	West Phoenix	WP	11.7	11.7	10.7	12.3	10.6	8.4	8.6	7.5	7.7	7.2	7.2	6.0	4.7	4.9	4.3	3.8
04-013-1003	Mesa	ME	6.7	7.5	6.5	7.2	6.0	4.6	4.9	3.5	3.0	3.4	4.1	3.9	1.7	2.0	2.0	1.5
04-013-1004	North Phoenix	NP	7.7	8.7	8.0	7.8	6.0	5.2	4.5	4.0	4.1	3.8	3.5	3.4	2.1	5.9	2.9	2.9
04-013-2001	Glendale	GL	8.2	5.4	5.0	5.7	4.6	4.7	4.1	5.7	6.1	3.2	3.8	4.3	2.1	2.0	9.0	1.8
04-013-3002	Central Phoenix	CP	11.1	9.4	9.1	11.3	8.1	6.0	6.0	5.9	5.0	5.2	6.0	4.1	3.6	3.6	3.2	2.5
04-013-3003	South Scottsdale	SS	8.0	6.3	5.5	6.0	5.0	4.5	5.5	4.1	3.4	3.2	5.5	2.7	2.0	2.9	2.1	1.6
04-013-3010	Greenwood	GR		9.7	9.4	10.8	8.1	7.0	7.3	6.8	7.6	5.9	6.3	4.6	3.0	3.5	4.3	2.9
04-013-4003	South Phoenix	SP				7.4	10.0	6.8	6.5	5.8	6.7	5.5	5.2	4.9	3.7	4.1	4.4	2.5
04-013-4004	West Chandler	WC					3.8	3.3	3.5	3.9	2.9	3.5	2.7	2.7	1.8	2.1	2.0	1.6
04-013-4005	Tempe	TE					5.0	4.3	4.9	3.8	3.1	3.2	3.7	3.2	2.4	4.0	3.4	3.6
04-013-4010	Dysart	DY								1.8	2.1	1.7	1.3	1.8	1.5	1.0	2.0	0.8
04-013-4011	Buckeye	BE									0.9	1.1	1.2	3.9	0.7	1.2	1.9	1.8
04-013-9997	Super Site	SUPR				8.5	9.1	7.0	5.7	6.7	4.9	5.6	5.3	4.6	3.1	2.9	2.9	2.3
Maximum			12.6	11.7	10.7	12.3	11.9	8.4	8.6	7.5	7.7	7.2	7.8	6.2	4.7	5.9	9.0	3.8

Table 3-2 Second Highest 1-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

			The 2nd highest 1-hour CO Concentrations															
Site ID	Site Name	Abbr	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
04-013-0016	W Indian School Rd	WI	11.8	10.3	9.4	11.7	9.6	7.7	7.3	6.8	6.7	6.5	7.7	5.7	3.6	5.0	3.3	
04-013-0019	West Phoenix	WP	11.2	10.3	9.6	11.9	10.4	8.2	7.9	7.3	7.5	7.0	6.5	6.0	4.5	4.8	4.2	3.7
04-013-1003	Mesa	ME	6.3	7.0	6.1	6.5	5.7	3.8	4.8	3.4	2.6	3.3	3.5	2.5	1.7	1.9	2.0	1.4
04-013-1004	North Phoenix	NP	7.5	7.5	7.3	6.4	5.9	4.7	4.5	4.0	3.7	3.5	3.3	3.0	2.0	2.1	2.4	2.7
04-013-2001	Glendale	GL	6.9	5.2	4.9	5.3	4.6	4.7	3.9	3.5	3.2	3.1	2.9	3.3	2.0	1.9	8.9	1.7
04-013-3002	Central Phoenix	CP	10.3	9.0	8.9	9.3	8.0	5.8	5.8	5.4	4.4	5.1	4.8	4.0	3.5	3.0	3.2	2.5
04-013-3003	South Scottsdale	SS	7.0	6.1	5.2	5.8	4.9	4.4	4.3	4.0	3.1	3.1	3.1	2.6	2.0	1.9	2.0	1.6
04-013-3010	Greenwood	GR		8.9	8.9	9.5	8.1	6.9	6.8	6.8	7.3	5.4	5.2	4.6	3.0	3.2	3.9	2.6
04-013-4003	South Phoenix	SP				7.4	8.4	6.3	6.5	5.5	5.9	5.2	4.7	4.3	3.2	3.4	4.3	2.3
04-013-4004	West Chandler	WC					3.4	3.3	3.2	3.3	2.7	2.7	2.6	2.4	1.7	2.1	2.0	1.5
04-013-4005	Tempe	TE					4.6	4.2	4.7	3.7	2.6	3.0	3.4	2.8	2.3	3.6	2.4	3.4
04-013-4010	Dysart	DY								1.6	1.8	1.7	1.3	1.7	1.4	0.9	1.8	0.8
04-013-4011	Buckeye	BE									0.9	1.1	1.2	1.6	0.7	1.1	1.3	1.2
04-013-9997	Super Site	SUPR				8.2	7.9	6.9	5.4	6.0	4.9	5.1	4.5	4.3	3.1	2.8	2.7	2.2
Maximum			11.8	10.3	9.6	11.9	10.4	8.2	7.9	7.3	7.5	7.0	7.7	6.0	4.5	5.0	8.9	3.7

Table 3-3 Highest 8-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

Site ID	Site Name	Abbr	The 1st highest Non-overlapping 8-hour CO Concentrations															
			1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
04-013-0016	W Indian School Rd	WI	8.5	8.3	8.2	7.7	6.9	6.6	5.5	5.4	4.7	5.3	5.3	5.0	2.8	4.2	2.3	
04-013-0019	West Phoenix	WP	8.5	7.2	7.8	7.7	7.4	6.7	5.5	6.2	5.2	5.8	5.0	4.6	3.1	4.6	3.3	2.7
04-013-1003	Mesa	ME	4.5	4.7	4.4	4.5	4.4	2.9	3.5	2.5	1.7	2.4	2.8	2.0	1.4	1.5	1.4	1.1
04-013-1004	North Phoenix	NP	3.9	4.0	6.2	3.5	3.2	2.5	3.3	2.3	2.2	2.3	2.0	1.7	1.3	1.3	1.7	1.6
04-013-2001	Glendale	GL	4.2	4.0	3.4	3.9	3.6	3.1	3.2	2.4	2.4	2.4	1.9	1.8	1.6	1.3	3.0	1.2
04-013-3002	Central Phoenix	CP	8.4	7.2	7.2	6.0	5.3	4.3	4.4	4.6	3.4	4.1	3.8	2.9	2.6	2.2	2.4	1.9
04-013-3003	South Scottsdale	SS	4.9	4.3	3.7	4.3	3.3	3.2	3.0	2.3	2.4	2.4	2.1	1.6	1.5	1.4	1.6	1.2
04-013-3010	Greenwood	GR		7.6	7.5	6.7	5.7	4.7	5.4	5.4	4.9	4.2	3.6	4.0	2.7	2.6	3.0	1.8
04-013-4003	South Phoenix	SP				4.6	5.9	3.4	3.8	3.6	3.5	3.8	3.2	3.1	2.2	2.6	3.1	1.6
04-013-4004	West Chandler	WC					2.5	2.3	2.2	2.6	2.1	2.4	2.2	1.6	1.4	1.7	1.9	1.2
04-013-4005	Tempe	TE					3.8	3.3	3.4	2.9	1.9	2.6	2.5	1.9	1.8	2.9	1.9	3.2
04-013-4010	Dysart	DY								1.2	1.1	1.3	0.9	1.3	1.0	0.9	0.9	0.4
04-013-4011	Buckeye	BE									0.5	0.9	0.7	1.0	0.5	0.6	0.6	0.9
04-013-9997	Super Site	SUPR				7.0	6.9	5.7	4.2	4.8	4.2	3.7	3.0	3.1	2.5	2.3	2.1	1.8
Maximum			8.5	8.3	8.2	7.7	7.4	6.7	5.5	6.2	5.2	5.8	5.3	5.0	3.1	4.6	3.3	3.2

Table 3-4 Second Highest 8-Hour CO Concentrations at Monitors in Maricopa County for 1996-2011

			The 2nd highest Non-overlapping 8-hour CO Concentrations															
Site ID	Site Name	Abbr	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
04-013-0016	W Indian School Rd	WI	8.3	7.2	8.1	7.6	6.8	6.0	5.4	5.3	4.6	4.8	4.5	3.9	2.8	3.3	2.3	
04-013-0019	West Phoenix	WP	8.2	7.0	7.1	7.5	7.2	6.6	5.5	5.5	5.1	4.6	4.6	4.1	3.0	3.3	3.2	2.5
04-013-1003	Mesa	ME	3.8	4.5	3.7	4.0	3.2	2.7	3.5	2.2	1.7	2.4	2.0	2.0	1.3	1.3	1.4	1.0
04-013-1004	North Phoenix	NP	3.7	3.4	5.6	3.5	3.1	2.5	2.7	2.1	2.0	2.2	1.9	1.6	1.3	1.3	1.6	1.5
04-013-2001	Glendale	GL	3.7	3.0	3.4	3.5	3.2	2.8	2.7	2.3	2.1	2.3	1.8	1.6	1.5	1.2	1.5	1.2
04-013-3002	Central Phoenix	CP	7.5	7.2	6.3	6.0	5.2	4.1	4.1	3.8	3.3	3.8	3.2	2.9	2.2	2.1	2.2	1.8
04-013-3003	South Scottsdale	SS	4.9	4.2	3.5	4.1	3.1	3.1	2.8	2.2	2.4	2.4	1.9	1.6	1.4	1.4	1.6	1.2
04-013-3010	Greenwood	GR		6.9	6.8	6.7	5.6	4.6	5.1	5.1	4.3	4.1	3.5	3.0	2.4	2.4	2.3	1.8
04-013-4003	South Phoenix	SP				4.4	4.8	3.4	3.7	3.3	3.3	3.2	2.7	2.3	2.0	2.2	3.1	1.5
04-013-4004	West Chandler	WC					2.2	2.1	2.2	2.6	2.1	2.0	2.0	1.5	1.4	1.5	1.6	1.1
04-013-4005	Tempe	TE					3.2	3.1	3.4	2.4	1.7	2.4	2.4	1.9	1.4	2.1	1.6	2.9
04-013-4010	Dysart	DY								1.1	1.1	1.2	0.8	1.3	1.0	0.8	0.6	0.4
04-013-4011	Buckeye	BE									0.4	0.9	0.6	0.8	0.5	0.5	0.6	0.8
04-013-9997	Super Site	SUPR				6.5	6.5	5.2	4.2	4.2	4.0	3.6	2.9	2.9	2.4	2.3	2.1	1.7
Maximum			8.3	7.2	8.1	7.6	7.2	6.6	5.5	5.5	5.1	4.8	4.6	4.1	3.0	3.3	3.2	2.9

4 EMISSIONS INVENTORIES

4-1 Point Sources

According to EPA's Annual Emissions Reporting Requirements Rule (AERR) (EPA 2008), point sources are defined as major stationary sources that emit substantial amounts of pollution into the air and are required to obtain a permit to operate under 40 CFR Part 70. Stationary sources include industrial processes, power plants, and large manufacturing facilities. According to the 2008 Periodic Emissions Inventory (PEI) for CO (MCAQD 2012), twenty-one stationary sources are located in Maricopa County and sixteen, in the CO maintenance area. Fourteen of these stationary sources reside in the CO modeling domain.

Point source emissions from the 2008 PEI for CO will be projected using growth factors. In accordance with EPA guidance (EPA 1999b), the growth factor will be developed by dividing the growth indicator representing a point source in a projection year by the same growth indicator in the base year 2008. The growth indicators for 2015 and 2025 will be obtained from the latest MAG socioeconomic projections for population, housing, and employment, which were approved by the MAG Regional Council in May 2007 (MAG 2007a). These socioeconomic projections reflect the 2005 Census Survey results and the population control totals for Maricopa County developed by the Arizona Department of Economic Security. Table 4-1 presents population and employment growth indicators for 2006, 2008, 2015, and 2025.

Table 4-1 Maricopa County Population and Employment in 2006, 2008, 2015, and 2025

Category	2006*	2008*	2015	2025
Total Population	3,793,000	3,988,000	4,732,000	5,697,000
Retail Employment	515,000	513,000	674,000	852,000
Office Employment	425,000	388,000	563,000	740,000
Industrial Employment	395,000	376,000	490,000	576,000
Public Employment	269,000	308,000	334,000	406,000
Other Employment	247,000	246,000	323,000	414,000
Construction Employment	75,000	64,000	94,000	103,000
Total Employment	1,926,000	1,895,000	2,478,000	3,091,000

* Actual population and employment data in 2006 and 2008

For power plants, Potential To Emit (PTE) values will be conservatively assumed for CO emissions in the years 2015 and 2025.

4-2 Area Sources

Area sources are facilities or activities that are not qualified as point sources in terms of the amount of pollution but collectively release significant amounts of pollutants into the air (EPA 2001). For example, small-scale industries, residential wood burning, commercial cooking, waste incineration, residential sources, and wildfires are defined as area sources. According to the 2008 PEI for CO (MCAQD 2012), there are twenty three area source categories in Maricopa County.

Following EPA guidance (EPA 1999b), growth factors derived from the population and employment indicators shown in Table 4-1 will be applied to the base year area source emissions from the 2008 PEI for CO to project future emissions.

Area source emissions for the CO modeling domain will be developed by applying surrogate factors to the county-level area source emissions as a whole. The surrogate factors are the ratios of land use acreage, population, and employment in the CO modeling domain versus Maricopa County. The selection of an appropriate surrogate factor will be made based on how well the surrogate represents the emissions levels for each area source category.

4-3 Onroad Sources

Network and off-network mobile source emissions for CO will be calculated by using the latest version of the Motor Vehicle Emission Simulator (MOVES2010b) and MAG MOVESLink software. MOVESLink is a tool designed to process network and off-network emissions factors from MOVES2010b and link data from the TransCAD TDM to develop an onroad emissions inventory for regional transportation conformity and photochemical air quality modeling analyses. This tool was developed by MAG based on the Python programming language and state-of-the-art GIS technology. MOVESLink is used to 1) read link-level activity data from the MAG TransCAD traffic assignment, 2) prepare MOVES2010b input data, 3) execute MOVES2010b, and 4) post-process MOVES2010b results.

To calculate the CO season-day vehicle emissions for the selected years, MOVES2010b will be executed using local input data for each month of the peak CO season and each geographical area (the CO maintenance area and the CO modeling domain). The CO season-day emissions will be calculated by dividing the three-month peak CO season emissions from November through January by 92 days. Each scenario will be created using the County Domain/Scale and the Inventory Calculation Type for all road types including off-network.

MOVES2010b requires a detailed level of local data, including fuel data, Inspection and Maintenance (I/M) program, meteorological data, vehicle population, source type age distribution, annual vehicle miles traveled (VMT), monthly/daily/hourly fractions, road type distribution, average speed distribution, ramp fraction, and Alternative Vehicle and Fuel

Technologies (AVFT). Following EPA's guidance (EPA 2012), local input data will be prepared as follows:

- Fuel data: The fuel data for each month will be derived from the fuel inspection results in Maricopa County provided by the Arizona Department of Weights and Measures. The fuel data for Maricopa County will be applied to both the CO maintenance area and the CO modeling domain. For future year modeling, 2011 fuel data will be used.
- I/M programs: The I/M program data will be converted from the MOBILE6.2 inputs used for the latest transportation conformity regional emissions analysis.
- Meteorological data: As a representative of local meteorological conditions, meteorological data for the Phoenix Sky Harbor International Airport will be obtained from the National Climatic Data Center (NCDC) for the selected peak CO seasons. The average data over the most recent three years, 2009 to 2011, will be applied to the future year modeling.
- Vehicle population: The vehicle population in Maricopa County for the past years will be obtained from the vehicle registration data provided by the Arizona Department of Transportation (ADOT). Following EPA's guidance (EPA 2012), the vehicle population data will be assigned to the 13 MOVES source types. Then, the vehicle population in the CO maintenance area and the CO modeling domain will be estimated by multiplying the vehicle population in Maricopa County by the population ratios of these two areas to Maricopa County. For future year modeling, the vehicle population data will be adjusted by applying the ratio of the projected future year population to the current population.
- Source type age distribution: EPA's data converter will be used to generate the appropriate MOVES age distribution input from the registration distribution input file created for MOBILE6.2. The source type age distribution for Maricopa County will be applied for both the CO maintenance area and the CO modeling domain.
- Annual VMT: The annual VMTs by Highway Performance Monitoring System (HPMS) vehicle type will be derived from the traffic assignment data provided by the MAG Transportation Division and the MOVES default VMT fraction.
- Road type distribution: The road type distribution by HPMS vehicle type will be derived from the traffic assignment data provided by the MAG Transportation Division and the MOVES default VMT fraction.
- VMT fraction: The month/day/hour VMT fractions will be developed from data recorded by continuous traffic counters on freeways (ADOT Freeway Management System) and arterials (Phoenix Automatic Traffic Recorders) during the year 2007.
- Average speed distribution: Estimates of local average speeds will be derived from a post-process of the output from the traffic assignment data provided by the MAG Transportation Division.
- Ramp fraction: The ramp fraction represents the percent of vehicle hours traveled (VHT) on ramps on both rural restricted roads (road type 2) and urban restricted roads (road type 4). The VHTs for both the CO maintenance area and the CO modeling domain will be obtained from the traffic assignment data provided by the MAG Transportation Division.

- AVFT strategy: The fleet information for transit buses provided by Valley Metro will be used to prepare the AVFT input file. For the unavailable fleet data, MOVES2010b default values will be obtained from the [fuelEngFraction] table in the MOVES default database.

MOVES2010b will generate monthly emissions including weekday and weekend emissions for a given month by specifying the output time aggregate level as month. Then, the CO season-day emissions will be calculated from the three-month peak CO season emissions.

4-4 Nonroad Sources

Nonroad mobile sources are defined as engines, equipments, and vehicles that are not certified as highway vehicles. Nonroad mobile sources consist of agricultural equipment, aircraft, construction equipment, industrial equipment, residential and commercial lawn and garden equipment, recreational vehicles, pleasure craft, and locomotive equipment.

The EPA NONROAD2008a model will be executed to estimate emissions for nonroad equipment categories in the CO season months of November through January for weekdays and weekends. Weekday emissions will be used for all nonroad equipment categories except residential lawn and garden equipment, pleasure craft, and recreational equipment. Since these activities are typically higher during weekends, weekend emissions will be used for these categories. Weekday or weekend emissions for the three months will then be averaged to derive the average season day emissions.

Monthly local fuel parameters (i.e., RVP, gasoline and diesel sulfur, and ethanol content) for use in NONROAD2008a runs will be provided by the Arizona Department of Weights and Measures. Temperatures will be consistent with those for the 2008 PEI for CO (MCAQD 2012).

Equipment population and activity levels for commercial lawn and garden equipment will be based on the results of a survey performed by ENVIRON as a part of the Cap and Trade Oversight Committee (CTOC) work (ENVIRON, 2003). The survey results indicate that the population of most of the commercial lawn and garden equipment in Maricopa County is significantly lower than the default values in NONROAD2008a, while average annual operating hours for these equipment are slightly higher than the default values.

The county total nonroad emissions derived using NONROAD2008a will be scaled to the CO maintenance area and the CO modeling domain based on the surrogate factors for land use, population and employment.

Locomotive Sources

Locomotive emissions for 2006 will be interpolated using the 2005 and 2008 locomotive emissions which will be extracted from the 2005 and 2008 PEIs for CO, respectively. Based on a recommendation by the Maricopa County Air Quality Department, future locomotive emissions will be assumed at the same level as 2008.

Aviation Sources

Airport emissions will be developed by using the Emissions and Dispersion Modeling System (EDMS). This model is specifically designed to assess the air quality impacts of airport emission sources, particularly aviation sources, which consist of aircraft, auxiliary power units (APUs), and ground support equipment (GSE). The latest EDMS 5.1.3 version was released on November 15, 2010. It features up-to-date aircraft engine emission factors. The EDMS model computes emissions for oxides of nitrogen (NOx), CO, volatile organic compounds (VOCs), and other gaseous pollutants and particulate matter.

Airport emissions for the CO maintenance area will be developed for the 12 medium and large airports identified in Table 4-2. Four of these airports are located within the CO modeling domain, as indicated in the table below.

Table 4-2 Airports in the CO Maintenance Area and the CO Modeling Domain

No.	Airport	Abbreviation	Longitude	Latitude	Within the CO modeling domain?
1	Chandler Municipal	CHD	-111.811	33.269	NO
2	Phoenix Deer Valley	DVT	-112.083	33.688	NO
3	Falcon Field	FFZ	-111.728	33.461	NO
4	Glendale Municipal	GEU	-112.295	33.527	YES
5	Phoenix Goodyear	GYR	-112.376	33.423	NO
6	Williams Gateway	IWA	-111.655	33.308	NO
7	Phoenix Sky Harbor Intl	PHX	-112.008	33.434	YES
8	Scottsdale	SDL	-111.911	33.623	YES
9	Luke Air Force Base	LUF	-112.383	33.535	NO
10	Stellar Airpark	P19	-111.916	33.299	YES
11	Pleasant Valley	P48	-112.251	33.801	NO
12	Sky Ranch At Carefree	18AZ	-111.898	33.818	NO

The four inputs to the EDMS model are described below:

Landing-takeoff cycles (LTOs)

The aircraft categories are classified as air commercial (AC), air taxi (AT), general aviation (GA), and military (ML). The historical (2006 and 2008) annual LTOs for each aircraft category will be retrieved from the MAG 2009 survey data and the Airport Operations database in the Federal Aviation Administration (FAA)'s Air Traffic Activity Data System (ATADS). The forecasted (2015 and 2025) annual LTOs data will be obtained from the FAA's latest 2011 Terminal Area Forecast system. To compute the CO seasonal LTOs, a monthly profile obtained from the FAA's Airport Operations database will be applied.

Aircraft fleet mix and LTOs for each aircraft type

The methodology described in the 2008 PM-10 PEI (MCAQD 2011) will be used to calculate the aircraft fleet mix. For each aircraft category, the top 10 aircraft types and their individual LTO weighting factors will be derived from the FAA's Enhanced Traffic Management System Counts database for each airport. The CO seasonal LTOs by aircraft category will be apportioned to the top 10 individual aircraft types by using weighting factors.

Monthly, weekly, and hourly operational profiles for each aircraft type

The CO seasonal LTOs for each aircraft type need to be broken down into hourly LTOs by using monthly, weekly, and hourly operational profiles. Monthly and weekly operational profiles by aircraft type for airports will be obtained from the FAA's ATADS database. Hourly operational profiles for each month will be obtained from the MAG 2009 airport survey data and FAA's Aviation Performance Metrics (APM) database. The monthly, weekly, and hourly operational profiles for 2008 are assumed to be the same as those for 2006, 2015, and 2025 for each aircraft category and airport.

Mixing height calculated based on surface and upper air meteorological data

EPA's latest version of AERMET (version 11059) will be used to calculate time-variant mixing heights for the EDMS runs. The three essential AERMET inputs are surface meteorological data, upper air meteorological data, and surface characteristics data including albedo, Bowen ratio, and surface roughness.

- The base year 2008 surface meteorological data will be retrieved from NCDC's Automated Surface Observing System and Integrated Surface Database for the NWS station at the Phoenix Sky Harbor International Airport.

- The upper air data will be obtained from the National Oceanic and Atmospheric Administration (NOAA) and Earth System Research Laboratory (ESRL) Radiosonde Database. While two upper air monitors located in Tucson and Flagstaff are in operation during the winter, upper air data monitored at the Tucson station (station number 23160) will be used since Tucson station represents similar meteorological and terrain features to Phoenix.

- Surface characteristics will be determined by using EPA's AERSURFACE (version 08009) processor with the Land Use and Land Cover (LULC) data for the Maricopa County area.

Luke Air Force Base emissions calculation

The 2008 PM-10 PEI (MCAQD 2011) reported three distinct aircraft activities for Luke Air Force Base (AFB): (1) the operation of aircraft stationed at the base, (2) a much smaller level of “transient” aircraft traffic within Luke AFB’s airspace, and (3) emissions produced during on-wing engine testing. Luke AFB also reported two additional types of military aircraft operations: aircraft low fly bys (LFB), and aircraft low fly patterns (LFP). Each of these types of operations can be characterized by a distinctive combination of the time-in-mode (e.g., approach, taxi in/out, takeoff, and climb out).

The 2008 aircraft and other source emissions for Luke AFB will be obtained from the 2008 PEI for CO (MCAQD 2012). These emissions in 2025 will be derived from the Final F-35A Basing Environmental Impact Statement (LAFB 2012).

5 TRANSPORTATION CONFORMITY BUDGET

The MAG 2003 CO Maintenance Plan established two transportation conformity budgets: a 2006 emissions budget of 699.7 metric tons per day and a 2015 budget of 662.9 metric tons per day. EPA found the 2006 and 2015 budgets to be adequate for conformity purposes, effective October 14, 2003. In addition, these budgets were approved by EPA as part of the MAG 2003 CO Maintenance Plan, effective April 8, 2005.

The second MAG CO maintenance plan will establish a new budget for the maintenance year of 2025 for the CO maintenance area. Currently, the approved 2006 budget applies to conformity horizon years from 2006 through 2014 and the 2015 budget applies to horizon years after 2014. Once EPA finds the new 2025 budget to be adequate (or approves the 2025 budget as part of the MAG 2013 CO Maintenance Plan), the 2015 budget will apply to horizon years from 2015 through 2024 and the new 2025 budget will apply to horizon years after 2024.

6 MANAGEMENT STRUCTURE AND COMMITTEES

MAG has responsibilities for regional involvement in a number of planning issues, and has established an extensive mechanism for ensuring coordinated policy direction from elected officials, coordinated management and technical input, and advice from the appropriate agency staff, as well as direct citizen input. Figure 6-1 displays the MAG Policy Structure and Figure 6-2 presents the MAG Committee Structure. All policy committees and formal technical committees follow the Arizona open meeting law which requires, among other requirements, the posting of meeting notices and agendas at least 24 hours prior to any meeting.

The MAG Regional Council is the governing body of MAG. It is comprised of elected officials from each member agency, two ex-officio members representing the Arizona State Transportation Board, and a representative from the Citizens Transportation Oversight Committee. This composition of elected officials is a reflection of citizen input at the local government level. The MAG Regional Council agenda includes a call to the audience, providing the opportunity for public comments at each monthly meeting. MAG holds at least one formal public meeting prior to the adoption of any new or updated nonattainment area plan. Formal public meetings are advertised locally at least 30 days prior to the meeting date and documentation is available for public review during this 30-day period. Draft documents are distributed to appropriate federal, state, and local agencies for review and comment during this period. Comments received are analyzed with a staff response for consideration by the MAG Air Quality Technical Advisory Committee and MAG Regional Council before taking approval action. Documentation of the comments and responses are incorporated into the plan document.

Due to the technical complexity of many MAG programs, committees consisting of professional experts are often needed to assist in program development. The Air Quality Technical Advisory Committee is composed of representatives from eight MAG member agencies, citizens, environmental interests, health interests, automobile industry, fuel industry, utilities, public transit, trucking industry, rock products industry, construction firms, housing industry, architecture, agriculture, industry, business, parties to the Air Quality Memorandum of Agreement, and various State and Federal agencies. The role of the Technical Advisory Committee is to review and comment on technical information generated during the planning process and make recommendations to the MAG Management Committee.

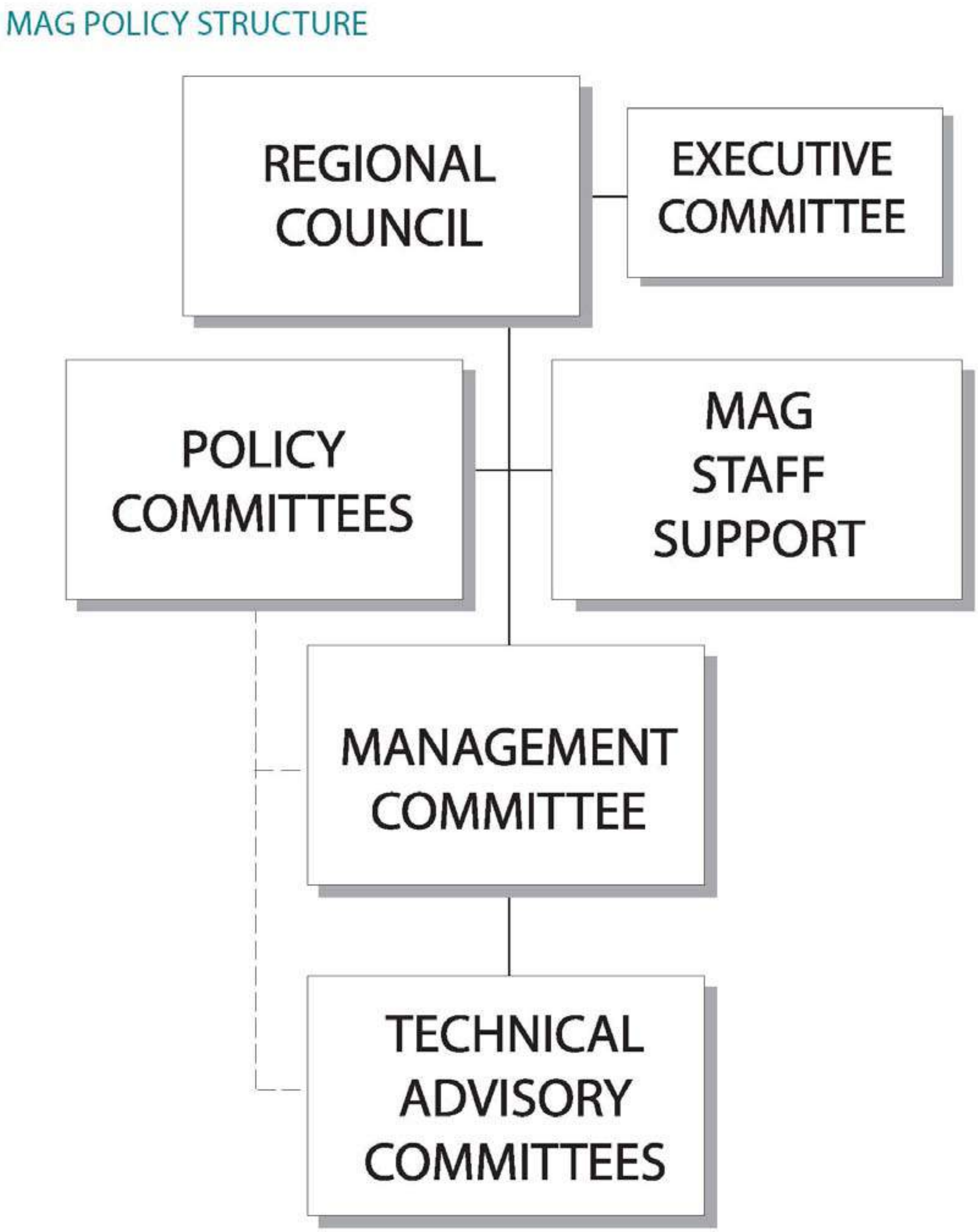

Figure 6-1 MAG Policy Structure

MAG COMMITTEE STRUCTURE

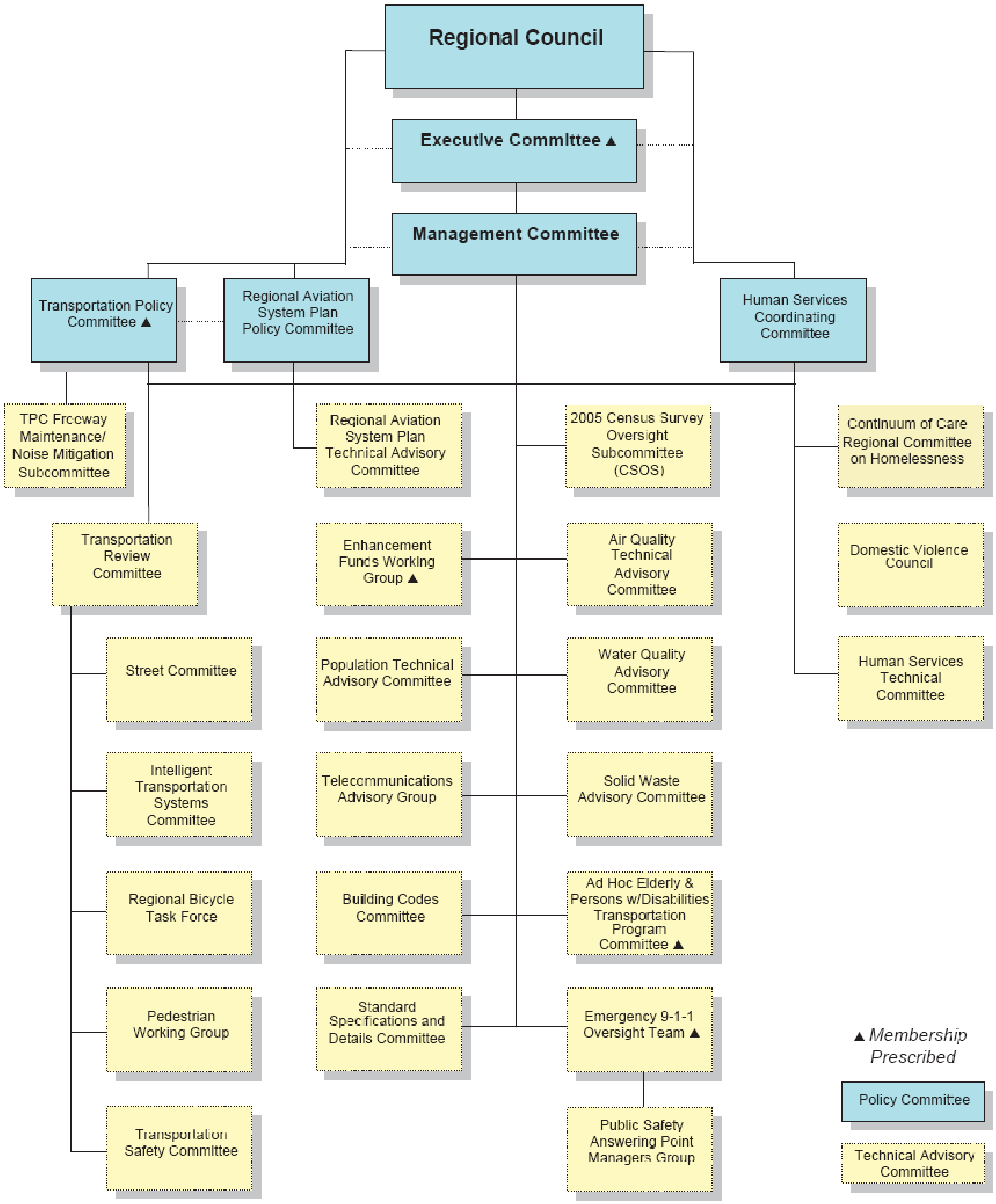

Figure 6-2 MAG Committee Structure

7 PARTICIPATING ORGANIZATIONS

Technical oversight for this project will be provided by the Air Quality Planning Team. This team includes staff representatives from the Maricopa Association of Governments (MAG), the Arizona Department of Environmental Quality (ADEQ), the Arizona Department of Transportation (ADOT), and the Maricopa County Air Quality Department (MCAQD). The activities of this working group are directed by a Memorandum of Agreement among the agencies involved (see Attachment I). Representatives of other agencies, including EPA and the U.S. Department of Transportation, will be consulted on technical matters, as needed. The Air Quality Planning Team will meet as necessary during the CO modeling effort. Periodic reports on the status and progress of various phases of the modeling work will be presented at these meetings, and technical issues will be discussed and resolved.

8 SCHEDULE

The CO air quality modeling analysis for the MAG 2013 Maintenance Plan will be comprised of the following tasks:

1. Prepare a protocol document (this document) that describes the purpose, background, analysis objectives, and procedures to be followed in the remainder of the analysis.

2. Develop point, area, onroad mobile, and nonroad source CO emission inventories for the years 2006, 2015, and 2025. 2008 emissions will be derived from the 2008 PEI for CO.

3. Use data on traffic volumes and signal timings, and free-flow and idling emission factors from MOVES2010b to perform CAL3QHC hotspot modeling for intersections.

4. Conduct maintenance modeling demonstration for CO.

5. Write a technical support document (TSD) and plan.

6. Submit the plan for external review.

7. Complete the final revision to the plan.

8. Provide the plan for public review and hearing.

9. Obtain Air Quality Technical Advisory Committee's recommendation.

10. Obtain Management Committee's recommendation.

11. Obtain Regional Council's approval for the plan.

12. Submit the plan to ADEQ/EPA.

The schedule for these tasks is presented in Table 8-1.

Table 8-1 Schedule for the Modeling Demonstration for the MAG 2013 Carbon Monoxide Maintenance Plan

	2012							2013		
The 2013 CO Maintenance Modeling Task List	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Submit modeling protocol document to EPA	■									
Develop base year, 2006, 2015, and 2025 emissions inventory		■	■							
Perform CAL3QHC intersection modeling analysis			■	■						
Conduct the CO maintenance demonstration				■	■					
Write Technical Support Document (TSD) and Plan					■	■				
Provide TSD for external review and comments							■			
Prepare a final revision							■			
30-day comment period								■		
Air Quality Technical Advisory Committee (AQTAC)									■	
Management Committee & Regional Council										■
Submit to EPA										■

9 REFERENCES

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19. US EPA, (2010), Using MOVES in Project-Level Carbon Monoxide Analyses, EPA-420-B-10-041, December 2010.

20. US EPA, (2012), Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, 2010a and 2010b, EPA-420-B-12-028, April 2012.

APPENDIX I

Comments and MAG Responses on the Modeling Protocol
in Support of the MAG 2013 Carbon Monoxide Maintenance Plan
for the Maricopa County Area, June 2012

Comments received from the Environmental Protection Agency (EPA) in an email from Scott Bohning dated June 25, 2012

Comment: I reviewed the CO maintenance plan protocol you provided back on June 13th ("Draft Modeling Protocol in Support of the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area", June 2012). Wienke Tax and Karina O'Connor also looked at it. You folks have done an excellent job on this. It covers what is needed, and I think it was a good idea to include the scaling of the old intersection work along with new intersection modeling. The use of multiple approaches will provide a solid basis for the maintenance demonstration. And the stability/mixing height information from AERMET is a good addition to the meteorological analysis in the weight of evidence portion. We have reviewed the conformity language and are comfortable with MAG's approach for budget years for the MAG 2013 CO Maintenance Plan. So, overall, we think this protocol will provide a good starting point for the 2013 CO maintenance plan.

MAG Response: We appreciate your positive feedback on the modeling protocol. We will also provide the protocol to the MAG Air Quality Planning Team for their review and comments.

ATTACHMENT I

Interagency Memorandum of Agreement

MEMORANDUM OF AGREEMENT

AMONG

THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

AND

THE ARIZONA DEPARTMENT OF TRANSPORTATION

AND

MARICOPA COUNTY, BY AND THROUGH THE MARICOPA COUNTY ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY

AND

THE MARICOPA ASSOCIATION OF GOVERNMENTS

PURPOSE

The purpose of this Memorandum of Agreement is to provide the framework and guidelines to promote coordinated decision making in planning, development, and implementation, and enforcement of those actions necessary to attain and maintain the National Ambient Air Quality Standards in Maricopa County, hereafter referred to as the Nonattainment Area Plan, or NAP. This Memorandum is required pursuant to A.R.S. 49-406 D. and E. The Memorandum also provides the framework and guidelines for preparing plans designed to address other air pollution problems of regional concern.

SCOPE

This Memorandum is designed to address the control of the following pollutants: Carbon Monoxide, Ozone, Particulates, and Other Air Pollution Problems of Regional Concern.

The geographical area of concern is Maricopa County or the area specifically designated by the Administrator of the U.S. Environmental Protection Agency as not having attained the National Ambient Air Quality Standards 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 preparation, development and maintenance of the State Implementation Plan (A.R.S. § 49-404); designation of areas of the state with respect to compliance with the National Ambient Air Quality Standards (A.R.S. § 49-405); and assuring that nonattainment area 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 (see A.R.S. § 49-480 B.). ADEQ is also responsible for providing technical assistance to political subdivisions of the State for implementing air pollution control programs (A.R.S. § 49-424 A.8.), conducting research on the amounts of hazardous air pollutants in ambient air and their impacts on human health (A.R.S. § 49-426.06); management and implementation of programs under the Air Quality Fee Fund (A.R.S. § 49-551), implementation of the Vehicle Emissions Inspections Program (A.R.S. § 49-521 through 550), and conducting research on vehicular emissions and clean burning fuels (A.R.S. § 49-553). The Department may delegate authority to a county for implementing air pollution control statutes (A.R.S. § 49-424 B.)

The Arizona Department of Transportation (ADOT) has exclusive control over state highways and all other state owned transportation systems (A.R.S. § 28-104). 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. § 28-104).

The ADOT Director shall also enter into agreements on behalf of the state with political subdivisions for the improvement, maintenance and construction of mass transit systems, and shall provide rules for the application for and expenditure of all mass transit funds (A.R.S. § 28-108).

In addition, ADOT is authorized to 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. § 28-2611). These projects are funded by an annual distribution of $400,000 from the air quality fund (A.R.S. § 49-551). ADOT must also support ADEQ on reporting to the Legislature results of mobile source emissions Research, where applicable, per A.R.S. § 49-553.

The Maricopa County Environmental Quality and Community Services Agency (MC EQ&CSA) is the local air pollution control department for Maricopa County. The Agency has jurisdiction over air pollution sources not explicitly reserved for state jurisdiction (A.R.S. § 49-402); the Agency is delegated authority from the State of Arizona to regulate certain portable air pollution sources initially reserved for state jurisdiction (A.R.S. § 49-424); the Agency operates the Regional Travel Reduction Program (A.R.S. § 49-582 et seq), and is the principal government sponsor for the Voluntary No Drive Days Program (A.R.S. § 49-506). The Agency 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 the Maricopa County Environmental Quality and Community Services Agency, the Assistant County Manager of the Agency 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 Control Officer also has the responsibility for assuring adequate nonattainment plan implementation as prescribed by A.R.S. § 49-406.

The Maricopa Association of Governments (MAG) is a nonprofit Arizona corporation composed of elected officials from twenty-four cities and towns, Maricopa County, Gila River Indian Community, and the Arizona Department of Transportation. MAG has been designated by the Governor of Arizona as the lead planning organization for Maricopa County that, together with the State, is responsible for determining which elements of the State Implementation Plan revision 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)). MAG is responsible for providing assistance to the Maricopa County Travel Reduction Regional Task Force and for recommending third and following year travel reduction targets, policies, standards and criteria for the Maricopa County Travel Reduction Program (A.R.S. § 49-582 and 49-588). Related directly to air quality, MAG is the official designated metropolitan transportation planning organization, and the designated agency for preparing population estimates and projections for the Maricopa County area. MAG is also responsible for making transportation/air quality conformity determinations, subject to the consultation procedures as provided by law (Clean Air Act § 176).

UNDERSTANDING/AGREEMENTS

In recognition and to facilitate the accomplishment of the foregoing, IT IS HEREBY AGREED that:

1. The Arizona Department of Environmental Quality; Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; and Maricopa Association of Governments will work through a coordinated effort to prepare the MAG regional air quality plans as described in Attachments One, Three, Four, and Five. Attachment One contains a description of the generalized roles and areas of expertise of the agencies, the MAG Air Quality Planning Team, and the MAG Air Quality Policy Team. Attachment Three contains the general implementation authorities for measures in the air quality plans. Attachment Four includes provisions for tracking plan implementation; determining reasonable further progress; assurances for adequate plan implementation, and adoption of control measures. Attachment Five contains the Work Programs for Preparing Air Quality Plans.

2. The Maricopa Association of Governments will maintain the MAG Regional Air Quality Planning Process for decision making as described in Attachment Two. This Attachment contains the roles of the MAG Regional Council, MAG Management Committee, MAG Air Quality Policy Committee, and ad hoc Working Groups. MAG will coordinate the preparation of the NAPs. Representatives from ADEQ, ADOT and MC EQ&CSA will be included as ex-officio members of the MAG Air Quality Policy Committee, and active members of all working groups associated with this MAG committee.

3. The Arizona Department of Environmental Quality; Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; Maricopa Association of Governments will pursue commitments to implement the measures in the NAPs. The aforementioned agencies will continue to evaluate and pursue the implementation of additional air pollution control measures as a result of the evaluations performed as described in Attachment Four.

EFFECTIVE DATE

The 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, as certified by the signatures of the Designated Officers affixed hereto:

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

By ______________________
Edward Z. Fox, Director, Arizona Department of Environmental Quality

Date Nov 9, 1992

ARIZONA DEPARTMENT OF TRANSPORTATION

By James O. Creedon
James Creedon, Acting Director, Arizona Department of Transportation

Date Nov 9, 1992

MARICOPA COUNTY, BY AND THROUGH THE MARICOPA COUNTY ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY

By Betsy Bayless
Betsy Bayless, Chairman, Maricopa County Board of Supervisors

Date 11·2·92

MARICOPA ASSOCIATION OF GOVERNMENTS

By J. J. DeBolske
John J. DeBolske, Secretary, Maricopa Association of Governments

Date 11·2·92

MAG REGIONAL AIR QUALITY PLANNING TECHNICAL PROCESS

- All MAG regional air quality plans are prepared through a coordinated effort among the Arizona Department of Environmental Quality, Arizona Department of Transportation, Maricopa County Environmental Quality and Community Services Agency, and Maricopa Association of Governments.

MAG AIR QUALITY POLICY TEAM

***Composition:** Director of Arizona Department of Environmental Quality; Director of Arizona Department of Transportation; Air Pollution Control Officer of Maricopa County; MAG Secretary*

- Oversees preparation of plans and overall technical planning effort
- Resolves technical problems and issues

MAG AIR QUALITY PLANNING TEAM

***Composition:** Staff from the Arizona Department of Environmental Quality, Arizona Department of Transportation; Maricopa County Environmental Quality and Community Services Agency; Maricopa Association of Governments*

Agency Roles

- Arizona Department of Environmental Quality - air quality modeling and technical assistance, mobile source emissions research and inventory, input for the comprehensive list of measures and feasibility analysis, information relating to the Vehicle Emission Inspection Maintenance Program, stationary and portable source control strategies, air quality research studies, State Air Quality Fund administration, adoption and submittal of State Implementation Plans to the Environmental Protection Agency, tracking plan implementation, assurances, special purpose air quality and meteorological monitoring for plan development and compliance
- Arizona Department of Transportation - State Transportation Improvement Program, other transportation plans and programs, input for the comprehensive list of measures and feasibility analysis
- Maricopa County Environmental Quality and Community Services Agency - stationary source emissions inventory and controls, coordinating the comprehensive emissions inventory, air quality monitoring data,input for comprehensive list of measures and feasibility analysis, mandatory travel reduction program, trip reduction data, voluntary no drive days program, tracking plan implementation, reasonable further progress, assurances, special purpose air quality and meteorological monitoring for plan development and compliance
- Maricopa Association of Governments - demographic projections and socioeconomic data, transportation modeling, air quality modeling, Regional Transportation Improvement Program, Regional Transportation Plan, other transportation plans and programs, congestion mangement system, conformity, input for comprehensive list of measures and feasibility analysis, development of the air quality plans, interface with state, county, and local entities, recommending future year travel reduction goals, policies, and standards to Maricopa County, assistance to Maricopa County for the mandatory travel reduction program, review reasonable further progress made to reduce air pollution and plan adjustments if necessary, review plan implementation

The technical planning work is closely coordinated with EPA Region IX staff, Federal Highway Administration, and Federal Transit Administration.

ATTACHMENT TWO

MAG REGIONAL AIR QUALITY PLANNING PROCESS

MAG REGIONAL COUNCIL

Composition: Elected officials from 24 cities and towns, Maricopa County, Gila River Indian Community, and Arizona Department of Transportation, Regional Public Transportation Authority

- Reviews all pertinent air quality data
- Adopts regional air quality plans
- Formally requests that state, county, local, and other appropriate agencies implement measures in the plans
- Approves trip reduction goals and policies and recommends to Maricopa County
- Determines conformity, subject to the consultation procedures as provided by law (Clean Air Act § 176)
- Maintains an air quality/transportation planning process consistent with federal law

MAG MANAGEMENT COMMITTEE

Composition: Managers from 24 cities and towns, Maricopa County, Gila River Indian Community, and Arizona Department of Transportation, Regional Public Transportation Authority

- Reviews all pertinent air quality and transportation data
- Recommends regional air quality and transportation plans
- Recommends trip reduction goals and policies

MAG AIR QUALITY POLICY COMMITTEE

Composition: 10 elected officials from cities and towns and Maricopa County and 9 citizen representatives + ex-officio representatives from Arizona Department of Environmental Quality, Arizona Department of Transportation, and Maricopa County Environmental Quality and Community Services Agency

- Reviews all pertinent air quality data from the technical planning process
- Reviews air quality research studies conducted by MAG, Arizona Department of Environmental Quality, EPA, Maricopa County Environmental Quality and Community Services Agency, etc.
- Reviews related data generated from other MAG regional planning areas such as transportation, transit, population, regional development, water quality, solid waste, etc.
- Studies in detail a comprehensive list of control measures. Data on the measures includes: description of the measures, air quality impacts, complementary measures, implementation responsibility, costs, advantages and disadvantages, etc.
- Recommends air quality measures for the plans
- Conducts public hearings on the plans
- Formally recommends regional air quality plans and control measures
- Recommends trip reduction goals and policies
- Conducts conformity reviews, subject to the consultation procedures as provided by law (Clean Air Act § 176)
- Reviews reasonable further progress made to reduce air pollution and recommends plan adjustments if necessary
- Provides input on the MAG congestion management system

ADDITIONAL WORKING GROUPS AS NECESSARY

ATTACHMENT THREE

IMPLEMENTATION OF MAG REGIONAL AIR QUALITY PLANS
GENERAL IMPLEMENTATION AUTHORITIES

STATE - ARIZONA DEPARTMENT OF ADMINISTRATION

- Travel reduction and adjusted work hours for state employees

STATE - ARIZONA DEPARTMENT OF COMMERCE

- Capitol Ridesharing Program

STATE - ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

- Mobile source emissions controls
- Mobile source emissions research
- Portable and some major stationary source controls
- Ambient air quality monitoring and research
- Assurances

STATE - ARIZONA DEPARTMENT OF TRANSPORTATION

- State and interstate transportation system planning, development and management (includes High Occupancy Vehicle Lanes, Freeway Management Systems, etc.)
- Vehicle registration and licensing
- Transit Assistance Grants

STATE - ARIZONA DEPARTMENT OF WEIGHTS AND MEASURES

- Oxygenated fuels
- Other fuel quality regulation (e.g. Reid Vapor Pressure)
- Stage I and Stage II vapor recovery

MARICOPA COUNTY - ENVIRONMENTAL QUALITY AND COMMUNITY SERVICES AGENCY

- Stationary source controls
- Delegated portable source controls
- Area source controls (e.g. *de minimis* sources, materials storage and handling, construction)
- Open burning control
- Mandatory Travel Reduction Program (TRP) and Voluntary No Drive Days
- Other transportation control measures in unincorporated areas
- Ambient air monitoring
- County roadways system planning, development and management
- Planning and zoning (unincorporated areas)
- Assurances

MAG CITIES AND TOWNS

- Municipal roadways system planning, development and management
- Transportation control measures (besides TRP)
- Planning and zoning
- Some area source controls (e.g. vacant land, construction practices)
- Public transit (including Regional Public Transportation Authority)

MARICOPA ASSOCIATION OF GOVERNMENTS

- Future year travel reduction goals, policies, standards, and criteria
- Ridesharing program
- Conformity determinations, as provided by law (Clean Air Act § 176)
- Allocation of Congestion Mitigation Air Quality Improvement Program Funds and Surface Transportation Program Funds

* As noted in the MAG regional air quality plans, the action taken by the MAG Regional Council to approve the Suggested Measures and Adopted Plan Measures does not commit each jurisdiction to implement those measures. As indicated in the resolutions and commitments, each jurisdiction determines which measures are reasonably available for implementation by that jurisdiction.

ATTACHMENT FOUR

OTHER IMPLEMENTATION AND ADOPTION FUNCTIONS

This attachment includes provisions for tracking plan implementation and determining reasonable further progress; assurances for adequate plan implementation, and procedures and responsibilities for adoption of control measures and emissions limitations.

TRACKING PLAN IMPLEMENTATION AND DETERMINING REASONABLE FURTHER PROGRESS

Each agency is afforded a review and comment period for each ongoing portion of a plan or revision to a plan being prepared by another agency. Every effort will be made to incorporate the comments of the reviewing agency into each portion of the plan being prepared by another agency.

Maricopa County will develop monitoring guidelines with respect to reasonable further progress which will be consistent with the needs of the Arizona Department of Environmental Quality and U.S. EPA. Maricopa County will be responsible for tracking emissions from point, area and non-road mobile sources and for tracking implementation of control strategies. MAG will be responsible for tracking on-road mobile source emissions and conformity. Maricopa County will integrate the MAG information and reports with the Maricopa County information and submit it to the Arizona Department of Environmental Quality.

For the EPA, the primary means of demonstrating the rate of progress will be through the periodic inventories (i.e., complete, actual inventories) submitted every 3 years. EPA has indicated in the General Preamble Section III.A.3 (d) that they currently intend to rely on existing reporting requirements such as emission statements, periodic inventories, annual Aerometric Information Retrieval System update, and conformity reviews.

ASSURANCES FOR ADEQUATE PLAN IMPLEMENTATION

In order to comply with the Clean Air Act, State law provides an approach for assurances that State and local committed measures will be adequately implemented (A.R.S. §49-406 I. and J.). If any person (includes State, County, local governments, regional agencies, and other entities) fails to implement a committed measure, the County would file an action in Superior Court to have the court order that the measure be implemented. Likewise, the ADEQ Director will backstop the County if it fails to implement a committed measure or if the County fails to backstop the local governments and regional agencies.

Regarding committed measures, A.R.S. §49-406 G. requires that each agency that commits to implement any control measure contained in the State Implementation Plan must describe the commitment in a resolution. The resolution must be adopted by the appropriate governing body of the agency. State law also requires the resolution to 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; and (3) The level of personnel and funding allocated to the implementation of the measure.

As noted in the MAG regional air quality plans, the action taken by the MAG Regional Council to approve the Suggested Measures and Adopted Plan Measures does not commit each jurisdiction to implement those measures. As indicated in the resolutions and commitments, each jurisdiction determines which measures are reasonably available for implementation by that jurisdiction.

PROCEDURES AND RESPONSIBILITIES FOR ADOPTION OF CONTROL MEASURES AND EMISSIONS LIMITATIONS

According to A.R.S. §49-404 B., the ADEQ Director may adopt rules that describe procedures for adoption of revisions to the State Implementation Plan. The State, in accordance with these rules, and the governing body of the metropolitan planning organization (MAG) are required to adopt the nonattainment area plans (A.R.S. §49-406 H.).

Appendix I-ii

Modeling Directory Structure and File List

Modeling Directory Structure

```
MAG_2013_CO_plan
           |
           +-> CAL3QHC Modeling
           |      |
           |      +-> MOVES2010b Inputs
           |      |      |
           |      |      \-> MySQL Database
           |      |             |
           |      |             +-> c2_co_2025_in
           |      |             +-> c3_co_2025_in
           |      |             +-> c4l5_co_2025_in
           |      |             +-> c6_co_2025_in
           |      |             +-> l3_co_2025_in
           |      |             \-> l6_co_2025_in
           |      |
           |      +-> MOVES2010b Outputs
           |      |      |
           |      |      \-> MySQL Database
           |      |             |
           |      |             +-> c2_co_2025_out
           |      |             +-> c3_co_2025_out
           |      |             +-> c4l5_co_2025_out
           |      |             +-> c6_co_2025_out
           |      |             +-> l3_co_2025_out
           |      |             \-> l6_co_2025_out
           |      |
           |      +-> CAL3QHC_input
           |      |
           |      \-> CAL3QHC_output
           |
           |
           \-> Emissions Inventory
                  |
                  +-> EDMS
                  |      |
                  |      +-> EDMS_inputs
                  |      |      |
                  |      |      +-> CHD
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             \-> Chandler Muni
                  |      |      +-> DVT
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             +-> Phoenix Deer Valley
                  |      |      |             \-> DVT
                  |      |      +-> FFZ
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             \-> Falcon Fld
                  |      |      +-> Glendale
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             \-> Glendale Muncipal
                  |      |      +-> Goodyear
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             +-> Phoenix Goodyear
                  |      |      |             \-> goodyear
                  |      |      +-> PHX
                  |      |      |      |
                  |      |      |      \-> Baseline
                  |      |      |             |
                  |      |      |             \-> Phoenix Sky Harbor Intl
                  |      |      |
```

```
|       |       +-> Pleasant Valley
|       |       |      |
|       |       |      \-> Baseline
|       |       |             |
|       |       |             \-> Pleasant Valley
|       |       +-> Scottsdale
|       |       |      |
|       |       |      \-> Baseline
|       |       |             |
|       |       |             \-> Scottsdale
|       |       +-> Sky Ranch
|       |       |      |
|       |       |      \-> Baseline
|       |       |             |
|       |       |             \-> Sky Ranch At Carefree
|       |       +-> Stellar
|       |       |      |
|       |       |      \-> Baseline
|       |       |             |
|       |       |             \-> Stellar Airpark
|       |       \-> Wms Gateway
|       |              |
|       |              \-> Baseline
|       |                     |
|       |                     \-> Williams Gateway
|       |
|       \-> EDMS_outputs
|
+-> Nonroad
|       |
|       +-> DATA
|       |       |
|       |       +-> ACTIVITY
|       |       |
|       |       +-> ALLOCATE
|       |       |
|       |       +-> DAILY
|       |       |
|       |       +-> DETFAC
|       |       |
|       |       +-> EMSFAC
|       |       |
|       |       +-> GROWTH
|       |       |
|       |       +-> POP
|       |       |
|       |       +-> RETROFIT
|       |       |
|       |       +-> SEASON
|       |       |
|       |       \-> TECH
|       |
|       \-> Run
|               |
|               \-> output
|
\-> Onroad
        |
        +-> 2006
        |       |
        |       +-> MOVESLINK
        |       |
        |       \-> MOVESRUN
        |
        +-> 2008
        |       |
        |       +-> MOVESLINK
        |       |
        |       \-> MOVESRUN
        |
        +-> 2015
        |       |
        |       +-> MOVESLINK
```

```
|      |
|      \-> MOVESRUN
|
+-> 2025
|      |
|      +-> MOVESLINK
|      |
|      \-> MOVESRUN
|
\-> MySQL Database
       |
       +-> mag_co_maintenance_area_2025inv_in_v2
       |
       +-> mag_co_maintenance_area_2025inv_out_v2
       |
       +-> mag_co_mana_2008inv_in_v3
       |
       +-> mag_co_mana_2008inv_out_v3
       |
       +-> mag_co_modeling_domain_2006inv_in_v3
       |
       +-> mag_co_modeling_domain_2006inv_out_v3
       |
       +-> mag_co_modeling_domain_2008inv_in_v3
       |
       +-> mag_co_modeling_domain_2008inv_out_v3
       |
       +-> mag_co_modeling_domain_2015inv_in_v2
       |
       +-> mag_co_modeling_domain_2015inv_out_v2
       |
       +-> mag_co_modeling_domain_2025inv_in_v2
       |
       \-> mag_co_modeling_domain_2025inv_out_v2
```

File List

```
./MAG_2013_CO_plan:
CAL3QHC_Modeling
Emissions_Inventory

./CAL3QHC_Modeling:
MOVES2010b_Inputs
MOVES2010b_Outputs

./CAL3QHC_Modeling/MOVES2010b_Inputs:
MySQL_Database
C2_co_2025.mrs
L3_co_2025.mrs
Local_Input_Data_C4L5.xlsx
C3_co_2025.mrs
L6_co_2025.mrs
Local_Input_Data_C6.xlsx
C4L5_co_2025.mrs
Local_Input_Data_C2.xlsx
Local_Input_Data_L3.xlsx
C6_co_2025.mrs
Local_Input_Data_C3.xlsx
Local_Input_Data_L6.xlsx

./CAL3QHC_Modeling/MOVES2010b_Outputs:
MySQL_Database
MOVES2010b_results_C2.xlsx
MOVES2010b_results_C6.xlsx
MOVES2010b_results_C3.xlsx
MOVES2010b_results_L3.xlsx
MOVES2010b_results_C4L5.xlsx
MOVES2010b_results_L6.xlsx

./CAL3QHC_Modeling/CAL3QHC_input:
C2-16Street.NE.DAT
C3-107thAve.SW.DAT
L3-07Avenue.NW.DAT
L6-ThomasRd.NE.DAT
C2-16Street.NW.DAT
C6-PriestDr.NE.DAT
L3-07Avenue.SE.DAT
L6-ThomasRd.NW.DAT
C2-16Street.SE.DAT
C6-PriestDr.NW.DAT
L3-07Avenue.SW.DAT
L6-ThomasRd.SE.DAT
C2-16Street.SW.DAT
C6-PriestDr.SE.DAT
L5-GermanRd.NE.DAT
L6-ThomasRd.SW.DAT
C3-107thAve.NE.DAT
C6-PriestDr.SW.DAT
L5-GermanRd.NW.DAT
C3-107thAve.NW.DAT
L3-07Avenue.NE.DAT
L5-GermanRd.SE.DAT
C3-107thAve.SE.DAT
L3-07Avenue.NNW.DAT
L5-GermanRd.SW.DAT

./CAL3QHC_Modeling/CAL3QHC_output:
C2-16Street.NE.OUT
C3-107thAve.SW.OUT
L3-07Avenue.NW.OUT
L6-ThomasRd.NE.OUT
C2-16Street.NW.OUT
C6-PriestDr.NE.OUT
L3-07Avenue.SE.OUT
L6-ThomasRd.NW.OUT
C2-16Street.SE.OUT
```

```
C6-PriestDr.NW.OUT
L3-07Avenue.SW.OUT
L6-ThomasRd.SE.OUT
C2-16Street.SW.OUT
C6-PriestDr.SE.OUT
L5-GermanRd.NE.OUT
L6-ThomasRd.SW.OUT
C3-107thAve.NE.OUT
C6-PriestDr.SW.OUT
L5-GermanRd.NW.OUT
C3-107thAve.NW.OUT
L3-07Avenue.NE.OUT
L5-GermanRd.SE.OUT
C3-107thAve.SE.OUT
L3-07Avenue.NNW.OUT
L5-GermanRd.SW.OUT

./Emissions_Inventory/
EDMS
Nonroad
Onroad

./Emissions_Inventory/EDMS/EDMS_outputs/
18AZ 2006.txt
18AZ 2008.txt
18AZ 2015.txt
18AZ 2025.txt
CHD 2006.txt
CHD 2008.txt
CHD 2015.txt
CHD 2025.txt
DVT 2006.txt
DVT 2008.txt
DVT 2015.txt
DVT 2025.txt
FFZ 2006.txt
FFZ 2008.txt
FFZ 2015.txt
FFZ 2025.txt
GEU 2006.txt
GEU 2008.txt
GEU 2015.txt
GEU 2025.txt
GYR 2006.txt
GYR 2008.txt
GYR 2015.txt
GYR 2025.txt
IWA 2006.txt
IWA 2008.txt
IWA 2015.txt
IWA 2025.txt
P19 2006.txt
P19 2008.txt
P19 2015.txt
P19 2025.txt
P48 2006.txt
P48 2008.txt
P48 2015.txt
P48 2025.txt
PHX 2006.txt
PHX 2008.txt
PHX 2015.txt
PHX 2025.txt
SDL 2006.txt
SDL 2008.txt
SDL 2015.txt
SDL 2025.txt
x18AZ 2006.txt
x18AZ 2008.txt
x18AZ 2015.txt
x18AZ 2025.txt
xCHD 2006.txt
xCHD 2008.txt
```

```
xCHD 2015.txt
xCHD 2025.txt
xDVT 2006.txt
xDVT 2008.txt
xDVT 2015.txt
xDVT 2025.txt
xFFZ 2006.txt
xFFZ 2008.txt
xFFZ 2015.txt
xFFZ 2025.txt
xGEU 2006.txt
xGEU 2008.txt
xGEU 2015.txt
xGEU 2025.txt
xGYR 2006.txt
xGYR 2008.txt
xGYR 2015.txt
xGYR 2025.txt
xIWA 2006.txt
xIWA 2008.txt
xIWA 2015.txt
xIWA 2025.txt
xP19 2006.txt
xP19 2008.txt
xP19 2015.txt
xP19 2025.txt
xP48 2006.txt
xP48 2008.txt
xP48 2015.txt
xP48 2025.txt
xPHX 2006.txt
xPHX 2008.txt
xPHX 2015.txt
xPHX 2025.txt
xSDL 2006.txt
xSDL 2008.txt
xSDL 2015.txt
xSDL 2025.txt

./Emissions_Inventory/Nonroad:
DATA
Run

./Emissions_Inventory/Nonroad/DATA:
ACTIVITY
ALLOCATE
DAILY
DETFAC
EMSFAC
GROWTH
POP
RETROFIT
SEASON
TECH

./Emissions_Inventory/Nonroad/DATA/ACTIVITY:
ACTIVITY.DAT
AZMCL.DAT


./Emissions_Inventory/Nonroad/DATA/ALLOCATE:
AZ_AIRTR.ALO
AZ_CONST.ALO
AZ_GOLF.ALO
AZ_HOUSE.ALO
AZ_LSCAP.ALO
AZ_OIL.ALO
AZ_RAIL.ALO
AZ_SBC.ALO
AZ_SNOWM.ALO
AZ_WOB.ALO
AZ_COAL.ALO
AZ_FARMS.ALO
```

```
AZ_HOLSL.ALO
AZ_LOGGN.ALO
AZ_MNFG.ALO
AZ_POP.ALO
AZ_RVPRK.ALO
AZ_SBR.ALO
AZ_WIB.ALO

./Emissions_Inventory/Nonroad/DATA/DAILY:
DAYTMPRV.DAT

./Emissions_Inventory/Nonroad/DATA/DETFAC:
EVDIU.DET
EVHOSE.DET
EVHOTSK.DET
EVNECK.DET
EVRUNLS.DET
EVSUPRET.DET
EVTANK.DET
EVVENT.DET
EXHCO.DET
EXHNOX.DET
EXHPM.DET
EXHTHC.DET

./Emissions_Inventory/Nonroad/DATA/EMSFAC:
BSFC.EMF
EVDIU.EMF
EVHOTSK.EMF
EVRUNLS.EMF
EVTANK.EMF
EXHCO.EMF
EXHPM.EMF
SPILLAGE.EMF
CRANK.EMF
EVHOSE.EMF
EVNECK.EMF
EVSUPRET.EMF
EVVENT.EMF
EXHNOX.EMF
EXHTHC.EMF

./Emissions_Inventory/Nonroad/DATA/GROWTH:
NATION.GRW

./Emissions_Inventory/Nonroad/DATA/POP:
AZMCLG.POP
AZ.POP

./Emissions_Inventory/Nonroad/DATA/RETROFIT:
retrotst.dat

./Emissions_Inventory/Nonroad/DATA/SEASON:
SEASON.DAT

./Emissions_Inventory/Nonroad/DATA/TECH:
TECHEVBA.DAT
TECH-EVP.DAT
TECHEXBA.DAT
TECH-EXH.DAT

./Emissions_Inventory/Nonroad/Run:
output
Jan06.OPT
Jan06lg.OPT
Jan08.OPT
Jan08lg.OPT
Jan15.OPT
Jan15lg.OPT
Jan25.OPT
Jan25lg.OPT
Nov06.OPT
Nov06lg.OPT
```

```
Nov08.OPT
Nov08lg.OPT
Nov15.OPT
Nov15lg.OPT
Nov25.OPT
Nov25lg.OPT
Dec06.OPT
Dec06lg.OPT
Dec08.OPT
Dec08lg.OPT
Dec15.OPT
Dec15lg.OPT
Dec25.OPT
Dec25lg.OPT

./Emissions_Inventory/Nonroad/Run/output:
jan06.out
jan08.out
jan15.out
jan25.out
jan06lg.out
jan08lg.out
jan15lg.out
jan25lg.out
nov06.out
nov08.out
nov15.out
nov25.out
nov06lg.out
nov08lg.out
nov15lg.out
nov25lg.out
dec06.out
dec08.out
dec15.out
dec25.out
dec06lg.out
dec08lg.out
dec15lg.out
dec25lg.out
jan06.msg
jan08.msg
jan15.msg
jan25.msg
jan06lg.msg
jan08lg.msg
jan15lg.msg
jan25lg.msg
nov06.msg
nov08.msg
nov15.msg
nov25.msg
nov06lg.msg
nov08lg.msg
nov15lg.msg
nov25lg.msg
dec06.msg
dec08.msg
dec15.msg
dec25.msg
dec06lg.msg
dec08lg.msg
dec15lg.msg
dec25lg.msg

./Emissions_Inventory/Onroad:
2006
2008
2015
2025
MySQL_Database

./Emissions_Inventory/Onroad/2006:
```

```
MOVESLINK
MOVESRUN
config_co_modeling_domain_2006_v3.xlsx
Log_mag_co_modeling_domain_2006inv_v3.txt
Vol_AM_2006.dbf
Vol_AM_2006.shx
Vol_MD_2006.shp
Vol_NT_2006.dbf
Vol_NT_2006.shx
Vol_PM_2006.shp
Vol_AM_2006.shp
Vol_MD_2006.dbf
Vol_MD_2006.shx
Vol_NT_2006.shp
Vol_PM_2006.dbf
Vol_PM_2006.shx

./Emissions_Inventory/Onroad/2006/MOVESLINK:
Summary_mag_co_modeling_domain_2006inv_v3.xlsx

./Emissions_Inventory/Onroad/2006/MOVESRUN:
mag_co_modeling_domain_2006inv_out_v3.bat
mag_co_modeling_domain_2006inv_out_v3_ei.mrs
mag_co_modeling_domain_2006inv_out_v3_ei.log
MOVES_Local_Data_mag_co_modeling_domain_2006inv_v2.xlsx

./Emissions_Inventory/Onroad/2008:
MOVESLINK
MOVESRUN
config_co_maintenance_area_2008_v3.xlsx
config_co_modeling_domain_2008_v3.xlsx
Log_mag_co_modeling_domain_2008inv_v3.txt
Log_mag_co_mma_2008inv_v3.txt
Vol_AM_2008.dbf
Vol_MD_2008.dbf
Vol_NT_2008.dbf
Vol_PM_2008.dbf
Vol_AM_2008.shp
Vol_MD_2008.shp
Vol_NT_2008.shp
Vol_PM_2008.shp
Vol_AM_2008.shx
Vol_MD_2008.shx
Vol_NT_2008.shx
Vol_PM_2008.shx

./Emissions_Inventory/Onroad/2008/MOVESLINK:
Summary_mag_co_mma_2008inv_v3.xlsx
Summary_mag_co_modeling_domain_2008inv_v3.xlsx

./Emissions_Inventory/Onroad/2008/MOVESRUN:
mag_co_mma_2008inv_out_v3.bat
mag_co_modeling_domain_2008inv_out_v3.bat
mag_co_mma_2008inv_out_v3_ei.log
mag_co_modeling_domain_2008inv_out_v3_ei.log
mag_co_mma_2008inv_out_v3_ei.mrs
mag_co_modeling_domain_2008inv_out_v3_ei.mrs
MOVES_Local_Data_mag_co_maintenance_area_2008inv_v2.xlsx
MOVES_Local_Data_mag_co_modeling_domain_2008inv_v2.xlsx

./Emissions_Inventory/Onroad/2015:
MOVESLINK
MOVESRUN
config_co_modeling_domain_2015_v2.xlsx
Vol_AM_2015.dbf
Vol_AM_2015.shx
Vol_MD_2015.shp
Vol_NT_2015.dbf
Vol_NT_2015.shx
Vol_PM_2015.shp
Log_mag_co_modeling_domain_2015inv_v2.txt
Vol_AM_2015.shp
Vol_MD_2015.dbf
```

```
Vol_MD_2015.shx
Vol_NT_2015.shp
Vol_PM_2015.dbf
Vol_PM_2015.shx

./Emissions_Inventory/Onroad/2015/MOVESLINK:
Summary_mag_co_modeling_domain_2015inv_v2.xlsx

./Emissions_Inventory/Onroad/2015/MOVESRUN:
mag_co_modeling_domain_2015inv_out_v2.bat
mag_co_modeling_domain_2015inv_out_v2_ei.mrs
mag_co_modeling_domain_2015inv_out_v2_ei.log
MOVES_Local_Data_mag_co_modeling_domain_2015inv_v2.xlsx

./Emissions_Inventory/Onroad/2025:
MOVESLINK
MOVESRUN
config_co_maintenance_area_2025_v2.xlsx
config_co_modeling_domain_2025_v2.xlsx
Log_mag_co_maintenance_area_2025inv_v2.txt
Log_mag_co_modeling_domain_2025inv_v2.txt
Vol_AM_2025.dbf
Vol_MD_2025.dbf
Vol_NT_2025.dbf
Vol_PM_2025.dbf
Vol_AM_2025.shp
Vol_MD_2025.shp
Vol_NT_2025.shp
Vol_PM_2025.shp
Vol_AM_2025.shx
Vol_MD_2025.shx
Vol_NT_2025.shx
Vol_PM_2025.shx

./Emissions_Inventory/Onroad/2025/MOVESLINK:
Summary_mag_co_maintenance_area_2025inv_v2.xlsx
Summary_mag_co_modeling_domain_2025inv_v2.xlsx

./Emissions_Inventory/Onroad/2025/MOVESRUN:
mag_co_maintenance_area_2025inv_out_v2.bat
mag_co_modeling_domain_2025inv_out_v2.bat
mag_co_maintenance_area_2025inv_out_v2_ei.log
mag_co_modeling_domain_2025inv_out_v2_ei.log
mag_co_maintenance_area_2025inv_out_v2_ei.mrs
mag_co_modeling_domain_2025inv_out_v2_ei.mrs
MOVES_Local_Data_mag_co_maintenance_area_2025inv.xlsx
MOVES_Local_Data_mag_co_modeling_domain_2025inv.xlsx
```

APPENDIX II

MODEL INPUTS AND OUTPUTS
FOR EMISSIONS INVENTORY DEVELOPMENT

Appendix II-i

MOVES2010b Input Data and RunSpecs

In order to calculate the winter season weekday onroad source emissions, MOVES2010b was executed using local input data for the winter season (November~January) of the year and each geographical area (the CO maintenance area and the CO modeling domain).

The MOVES2010b RunSpec summary, RunSpec, and a portion of input data for the CO maintenance area for December 2008 are provided in this appendix as an example.

MOVES2010b RunSpec Summary (the CO maintenance area, December 2008)

Time Spans:
- Aggregate By: Hour
- Years: 2008
- Months: December
- Days: Weekdays
- Hours: Begin Hour: 00:00 - 00:59
  - End Hour: 23:00 - 23:59

Geographic Bounds:
- COUNTY geography
- Selection: ARIZONA - Maricopa County

On Road Vehicle Equipment:
- Diesel Fuel - Combination Long-haul Truck
- Diesel Fuel - Combination Short-haul Truck
- Diesel Fuel - Intercity Bus
- Diesel Fuel - Light Commercial Truck
- Diesel Fuel - Motor Home
- Diesel Fuel - Motorcycle
- Diesel Fuel - Passenger Car
- Diesel Fuel - Passenger Truck
- Diesel Fuel - Refuse Truck
- Diesel Fuel - School Bus
- Diesel Fuel - Single Unit Long-haul Truck
- Diesel Fuel - Single Unit Short-haul Truck
- Diesel Fuel - Transit Bus
- Gasoline - Combination Long-haul Truck
- Gasoline - Combination Short-haul Truck
- Gasoline - Intercity Bus
- Gasoline - Light Commercial Truck
- Gasoline - Motor Home
- Gasoline - Motorcycle
- Gasoline - Passenger Car
- Gasoline - Passenger Truck
- Gasoline - Refuse Truck
- Gasoline - School Bus
- Gasoline - Single Unit Long-haul Truck
- Gasoline - Single Unit Short-haul Truck
- Gasoline - Transit Bus
- Compressed Natural Gas (CNG) - Combination Long-haul Truck
- Compressed Natural Gas (CNG) - Combination Short-haul Truck
- Compressed Natural Gas (CNG) - Intercity Bus
- Compressed Natural Gas (CNG) - Light Commercial Truck
- Compressed Natural Gas (CNG) - Motor Home
- Compressed Natural Gas (CNG) - Motorcycle
- Compressed Natural Gas (CNG) - Passenger Car
- Compressed Natural Gas (CNG) - Passenger Truck
- Compressed Natural Gas (CNG) - Refuse Truck
- Compressed Natural Gas (CNG) - School Bus
- Compressed Natural Gas (CNG) - Single Unit Long-haul Truck
- Compressed Natural Gas (CNG) - Single Unit Short-haul Truck
- Compressed Natural Gas (CNG) - Transit Bus

Road Types:
- Off-Network
- Rural Restricted Access
- Rural Unrestricted Access
- Urban Restricted Access
- Urban Unrestricted Access

Pollutants And Processes:
- Running Exhaust Carbon Monoxide (CO)
- Start Exhaust Carbon Monoxide (CO)
- Crankcase Running Exhaust Carbon Monoxide (CO)
- Crankcase Start Exhaust Carbon Monoxide (CO)
- Crankcase Extended Idle Exhaust Carbon Monoxide (CO)
- Extended Idle Exhaust Carbon Monoxide (CO)

General Output:
- Output Database Server Name: [using default]
- Output Database Name: mag_co_mma_2008inv_out_v3
- Mass Units: Grams
- Energy Units: Joules
- Distance Units: Miles
- Time Aggregate Level: Month
- Output Emissions Breakdown Selection:
  - Fuel Type
  - Emission Process
  - Road Type
  - Onroad SCC

Manage Input Data Sets:
- selection: / stageii_input /

MOVES2010b RunSpec (the CO maintenance area, December 2008)


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</runspec>

MOVES2010b Input Data (the CO maintenance area, December 2008)

[FuelFormulation]

Fuel FormulationID	Fuel SubtypeID	RVP	Sulfur Level	ETOH Volume	MTBE Volume	ETBE Volume	TAME Volume	Aromatic Content	Olefin Content	Benzene Content	e200	e300	VolToWt PercentOxy	BioDiesel EsterVolume	Cetane Index	PAH Content	T50	T90
10812	13	8.38	29.45	8.8	0	0	0	14.5	5.3	0.9	50.7	90.9	3.277	0	0	0	194.79	293.18
30812	20	0.00	6.85	0	0	0	0	0	0	0	0	0	0.000	0	0	0	0.00	0.00
30	30	0.00	0.00	0	0	0	0	0	0	0	0	0	0.000	0	0	0	0.00	0.00

[FuelSupply]

countyID	fuelYearID	monthGroupID	fuelFormulationID	marketShare	marketShareCV
4013	2008	12	10812	1	0.5
4013	2008	12	30812	1	0.5
4013	2008	12	30	1	0.5

[HPMSvTypeYear]

HPMSVtypeID	yearID	VMTGrowthFactor	HPMSBaseYearVMT	baseYearOffNetVMT
10	2008	0	130,117,882	0
20	2008	0	16,832,469,721	0
30	2008	0	11,123,422,636	0
40	2008	0	73,283,283	0
50	2008	0	1,519,531,013	0
60	2008	0	1,581,610,699	0

[SourceTypeYear]

yearID	sourceTypeID	sourceTypePopulation
2008	11	66,964
2008	21	1,902,105
2008	31	439,280
2008	32	169,882
2008	41	1,061
2008	42	650
2008	43	6,511
2008	51	766
2008	52	24,997
2008	53	1,613
2008	54	3,265
2008	61	12,839
2008	62	10,578

[ZoneMonthHour]

monthID	zoneID	HourID	temperature	relHumidity
12	40130	1	51.0	65.0
12	40130	2	51.0	66.0
12	40130	3	50.0	68.0
12	40130	4	49.0	69.0
12	40130	5	49.0	68.0
12	40130	6	48.0	67.0
12	40130	7	48.0	68.0
12	40130	8	48.0	67.0
12	40130	9	51.0	60.0
12	40130	10	54.0	52.0
12	40130	11	57.0	45.0
12	40130	12	60.0	39.0
12	40130	13	61.0	38.0
12	40130	14	63.0	36.0
12	40130	15	64.0	35.0
12	40130	16	64.0	33.0
12	40130	17	63.0	35.0
12	40130	18	61.0	41.0
12	40130	19	59.0	47.0
12	40130	20	57.0	51.0
12	40130	21	55.0	54.0
12	40130	22	54.0	56.0
12	40130	23	54.0	59.0
12	40130	24	52.0	61.0

[SourceTypeAgeDistribution]

		AgeFraction by SourceTypeID												
YearID	AgeID	11	21	31	32	41	42	43	51	52	53	54	61	62
2008	0	0.0976	0.0586	0.0561	0.0598	0.0544	0.0544	0.0917	0.0916	0.0829	0.0909	0.0920	0.0920	0.0918
2008	1	0.1537	0.0898	0.0900	0.0957	0.1270	0.1270	0.1486	0.1485	0.1332	0.1464	0.1492	0.1492	0.1488
2008	2	0.1245	0.0909	0.0929	0.0991	0.1378	0.1378	0.1579	0.1578	0.1404	0.1551	0.1586	0.1585	0.1581
2008	3	0.0881	0.0847	0.0749	0.0771	0.1142	0.1142	0.0987	0.0986	0.0920	0.0971	0.0991	0.0991	0.0988
2008	4	0.1002	0.0786	0.0769	0.0748	0.0624	0.0624	0.0568	0.0567	0.0613	0.0562	0.0570	0.0570	0.0568
2008	5	0.0751	0.0710	0.0630	0.0600	0.0420	0.0420	0.0334	0.0334	0.0406	0.0333	0.0336	0.0336	0.0335
2008	6	0.0607	0.0690	0.0579	0.0541	0.0312	0.0312	0.0201	0.0201	0.0293	0.0202	0.0202	0.0202	0.0201
2008	7	0.0502	0.0639	0.0658	0.0618	0.0413	0.0413	0.0254	0.0254	0.0353	0.0255	0.0255	0.0255	0.0254
2008	8	0.0418	0.0628	0.0619	0.0625	0.0576	0.0576	0.0694	0.0693	0.0668	0.0682	0.0696	0.0696	0.0694
2008	9	0.0307	0.0539	0.0483	0.0476	0.0536	0.0536	0.0427	0.0427	0.0437	0.0421	0.0429	0.0429	0.0428
2008	10	0.0247	0.0440	0.0425	0.0416	0.0309	0.0309	0.0345	0.0345	0.0361	0.0340	0.0347	0.0347	0.0346
2008	11	0.0232	0.0383	0.0429	0.0432	0.0297	0.0297	0.0463	0.0463	0.0449	0.0455	0.0465	0.0465	0.0464
2008	12	0.0193	0.0297	0.0314	0.0315	0.0305	0.0305	0.0329	0.0329	0.0322	0.0324	0.0331	0.0331	0.0330
2008	13	0.0146	0.0294	0.0309	0.0310	0.0291	0.0291	0.0312	0.0316	0.0315	0.0332	0.0301	0.0316	0.0316
2008	14	0.0135	0.0230	0.0284	0.0294	0.0546	0.0546	0.0382	0.0386	0.0363	0.0405	0.0369	0.0377	0.0382
2008	15	0.0095	0.0187	0.0188	0.0192	0.0142	0.0142	0.0219	0.0226	0.0221	0.0255	0.0203	0.0224	0.0225
2008	16	0.0070	0.0147	0.0126	0.0119	0.0082	0.0082	0.0048	0.0049	0.0069	0.0054	0.0046	0.0048	0.0049
2008	17	0.0069	0.0129	0.0111	0.0105	0.0076	0.0076	0.0048	0.0049	0.0066	0.0054	0.0046	0.0049	0.0049
2008	18	0.0064	0.0106	0.0101	0.0097	0.0148	0.0148	0.0065	0.0065	0.0074	0.0068	0.0064	0.0064	0.0065
2008	19	0.0062	0.0088	0.0114	0.0111	0.0231	0.0231	0.0091	0.0091	0.0097	0.0092	0.0090	0.0087	0.0089
2008	20	0.0066	0.0066	0.0089	0.0087	0.0175	0.0175	0.0069	0.0068	0.0074	0.0066	0.0070	0.0064	0.0067
2008	21	0.0102	0.0056	0.0058	0.0054	0.0045	0.0045	0.0024	0.0024	0.0033	0.0024	0.0025	0.0023	0.0024
2008	22	0.0087	0.0043	0.0076	0.0071	0.0035	0.0035	0.0027	0.0027	0.0041	0.0030	0.0027	0.0026	0.0027
2008	23	0.0062	0.0036	0.0057	0.0053	0.0023	0.0023	0.0017	0.0017	0.0029	0.0019	0.0017	0.0016	0.0017
2008	24	0.0045	0.0030	0.0043	0.0040	0.0015	0.0015	0.0011	0.0011	0.0021	0.0014	0.0011	0.0010	0.0010
2008	25	0.0032	0.0025	0.0032	0.0031	0.0010	0.0010	0.0007	0.0007	0.0017	0.0011	0.0007	0.0006	0.0007
2008	26	0.0023	0.0021	0.0025	0.0024	0.0007	0.0007	0.0004	0.0004	0.0016	0.0011	0.0004	0.0004	0.0004
2008	27	0.0016	0.0018	0.0019	0.0018	0.0004	0.0004	0.0003	0.0003	0.0010	0.0006	0.0003	0.0003	0.0003
2008	28	0.0012	0.0015	0.0015	0.0014	0.0003	0.0003	0.0002	0.0002	0.0007	0.0003	0.0002	0.0002	0.0002
2008	29	0.0008	0.0012	0.0012	0.0011	0.0002	0.0002	0.0001	0.0001	0.0005	0.0002	0.0001	0.0001	0.0001
2008	30	0.0008	0.0145	0.0295	0.0279	0.0039	0.0039	0.0083	0.0076	0.0157	0.0086	0.0093	0.0064	0.0071

[IMCoverage]

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101	4	4013	2008	21	1	10	1996	2002	2	51	N	95.8845
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201	4	4013	2008	32	1	3	1967	1980	1	13	N	95.8845
201	4	4013	2008	32	1	6	1981	1995	2	33	N	95.8845
201	4	4013	2008	32	1	10	1996	2002	2	51	N	95.8845
201	4	4013	2008	52	1	3	1967	2002	1	13	N	95.8845
202	4	4013	2008	21	1	3	1967	1980	1	13	N	95.8845
202	4	4013	2008	21	1	6	1981	1995	2	33	N	95.8845
202	4	4013	2008	21	1	10	1996	2002	2	51	N	95.8845
202	4	4013	2008	31	1	3	1967	1980	1	13	N	95.8845
202	4	4013	2008	31	1	6	1981	1995	2	33	N	95.8845
202	4	4013	2008	31	1	10	1996	2002	2	51	N	95.8845
202	4	4013	2008	32	1	3	1967	1980	1	13	N	95.8845
202	4	4013	2008	32	1	6	1981	1995	2	33	N	95.8845
202	4	4013	2008	32	1	10	1996	2002	2	51	N	95.8845
202	4	4013	2008	52	1	3	1967	2002	1	13	N	95.8845
301	4	4013	2008	21	1	3	1967	1980	1	13	N	95.8845
301	4	4013	2008	21	1	6	1981	1995	2	33	N	95.8845
301	4	4013	2008	21	1	10	1996	2002	2	51	N	95.8845
301	4	4013	2008	31	1	3	1967	1980	1	13	N	95.8845
301	4	4013	2008	31	1	6	1981	1995	2	33	N	95.8845
301	4	4013	2008	31	1	10	1996	2002	2	51	N	95.8845
301	4	4013	2008	32	1	3	1967	1980	1	13	N	95.8845
301	4	4013	2008	32	1	6	1981	1995	2	33	N	95.8845
301	4	4013	2008	32	1	10	1996	2002	2	51	N	95.8845
301	4	4013	2008	52	1	3	1967	2002	1	13	N	95.8845
302	4	4013	2008	21	1	3	1967	1980	1	13	N	95.8845
302	4	4013	2008	21	1	6	1981	1995	2	33	N	95.8845
302	4	4013	2008	21	1	10	1996	2002	2	51	N	95.8845
302	4	4013	2008	31	1	3	1967	1980	1	13	N	95.8845
302	4	4013	2008	31	1	6	1981	1995	2	33	N	95.8845
302	4	4013	2008	31	1	10	1996	2002	2	51	N	95.8845
302	4	4013	2008	32	1	3	1967	1980	1	13	N	95.8845

olProcessID	stateID	countyID	yearID	sourceTypeID	fuelTypeID	IMProgramID	begModelYearID	endModelYearID	inspectFreq	testStandardsID	useIMyn	complianceFactor
302	4	4013	2008	32	1	6	1981	1995	2	33	N	95.8845
302	4	4013	2008	32	1	10	1996	2002	2	51	N	95.8845
302	4	4013	2008	52	1	3	1967	2002	1	13	N	95.8845
101	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
101	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
101	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
101	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
101	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
101	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428
101	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
101	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
101	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
101	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032
102	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
102	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
102	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
102	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
102	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
102	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428
102	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
102	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
102	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
102	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032
112	4	4013	2008	21	1	108	1996	2004	2	43	Y	83.8140
112	4	4013	2008	21	1	109	1981	1995	2	44	Y	64.1200
112	4	4013	2008	31	1	108	1996	2004	2	43	Y	83.8140
112	4	4013	2008	31	1	109	1981	1995	2	44	Y	64.1200
112	4	4013	2008	32	1	108	1996	2004	2	43	Y	83.8140
112	4	4013	2008	32	1	109	1981	1995	2	44	Y	64.1200
112	4	4013	2008	52	1	107	1981	2004	1	41	Y	86.2872
113	4	4013	2008	21	1	108	1996	2004	2	43	Y	83.8140
113	4	4013	2008	21	1	109	1981	1995	2	44	Y	64.1200
113	4	4013	2008	31	1	108	1996	2004	2	43	Y	83.8140
113	4	4013	2008	31	1	109	1981	1995	2	44	Y	64.1200
113	4	4013	2008	32	1	108	1996	2004	2	43	Y	83.8140
113	4	4013	2008	32	1	109	1981	1995	2	44	Y	64.1200
113	4	4013	2008	52	1	107	1981	2004	1	41	Y	86.2872
201	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
201	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
201	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
201	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
201	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
201	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428
201	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
201	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
201	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
201	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032
202	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
202	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
202	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
202	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
202	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
202	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428
202	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
202	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
202	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
202	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032
301	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
301	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
301	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
301	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
301	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
301	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428
301	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
301	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
301	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
301	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032
302	4	4013	2008	21	1	103	1967	1980	1	13	Y	57.6164
302	4	4013	2008	21	1	106	1981	1995	2	31	Y	64.1200
302	4	4013	2008	21	1	110	1996	2004	2	51	Y	90.0428
302	4	4013	2008	31	1	103	1967	1980	1	13	Y	57.6164
302	4	4013	2008	31	1	106	1981	1995	2	31	Y	64.1200
302	4	4013	2008	31	1	110	1996	2004	2	51	Y	90.0428

polProcessID	stateID	countyID	yearID	sourceTypeID	fuelTypeID	IMProgramID	begModelYearID	endModelYearID	inspectFreq	testStandardsID	useIMyn	complianceFactor
302	4	4013	2008	32	1	103	1967	1980	1	13	Y	57.6164
302	4	4013	2008	32	1	106	1981	1995	2	31	Y	64.1200
302	4	4013	2008	32	1	110	1996	2004	2	51	Y	90.0428
302	4	4013	2008	52	1	103	1967	2004	1	13	Y	87.2032

[RoadType]

roadTypeID	rampFraction
2	0.051088
4	0.083599

[RoadTypeDistribution]

sourceTypeID	roadTypeID	roadTypeVMTFraction
11	1	0.00000
11	2	0.02349
11	3	0.04593
11	4	0.32785
11	5	0.60273
21	1	0.00000
21	2	0.02373
21	3	0.03749
21	4	0.32681
21	5	0.61196
31	1	0.00000
31	2	0.02465
31	3	0.04060
31	4	0.32438
31	5	0.61037
32	1	0.00000
32	2	0.02465
32	3	0.04060
32	4	0.32438
32	5	0.61037
41	1	0.00000
41	2	0.01995
41	3	0.04532
41	4	0.35698
41	5	0.57776
42	1	0.00000
42	2	0.01995
42	3	0.04532
42	4	0.35698
42	5	0.57776
43	1	0.00000
43	2	0.01995
43	3	0.04532
43	4	0.35698
43	5	0.57776
51	1	0.00000
51	2	0.03920
51	3	0.02553
51	4	0.49884
51	5	0.43643
52	1	0.00000
52	2	0.03920
52	3	0.02553
52	4	0.49884
52	5	0.43643
53	1	0.00000
53	2	0.03920
53	3	0.02553
53	4	0.49884
53	5	0.43643
54	1	0.00000
54	2	0.03920
54	3	0.02553
54	4	0.49884
54	5	0.43643
61	1	0.00000
61	2	0.05053
61	3	0.02735
61	4	0.52904
61	5	0.39308
62	1	0.00000
62	2	0.05053
62	3	0.02735
62	4	0.52904
62	5	0.39308

[MonthVMTFraction]

sourceTypeID	isLeapYear	monthID	monthVMTFraction
11	Y	12	0.083229
21	Y	12	0.083229
31	Y	12	0.083229
32	Y	12	0.083229
41	Y	12	0.083229
42	Y	12	0.083229
43	Y	12	0.083229
51	Y	12	0.083229
52	Y	12	0.083229
53	Y	12	0.083229
54	Y	12	0.083229
61	Y	12	0.083229
62	Y	12	0.083229

[DayVMTFraction]

sourceTypeID	monthID	dayID	dayVMTFraction by roadTypeID				
			1	2	3	4	5
11	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
21	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
31	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
32	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
41	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
42	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
43	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
51	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
52	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
53	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
54	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
61	12	5	0.767488	0.768458	0.766507	0.768458	0.766507
62	12	5	0.767488	0.768458	0.766507	0.768458	0.766507

[HourVMTFraction]

sourceTypeID	roadTypeID	dayID	hourID	hourVMTFraction by roadTypeID				
				1	2	3	4	5
11~62	1	5	1	0.0080	0.0098	0.0061	0.0098	0.0061
	1	5	2	0.0054	0.0069	0.0040	0.0069	0.0040
	1	5	3	0.0050	0.0065	0.0034	0.0065	0.0034
	1	5	4	0.0060	0.0080	0.0040	0.0080	0.0040
	1	5	5	0.0135	0.0173	0.0096	0.0173	0.0096
	1	5	6	0.0343	0.0428	0.0257	0.0428	0.0257
	1	5	7	0.0547	0.0603	0.0489	0.0603	0.0489
	1	5	8	0.0647	0.0594	0.0700	0.0594	0.0700
	1	5	9	0.0603	0.0574	0.0633	0.0574	0.0633
	1	5	10	0.0527	0.0550	0.0503	0.0550	0.0503
	1	5	11	0.0510	0.0521	0.0498	0.0521	0.0498
	1	5	12	0.0549	0.0548	0.0550	0.0548	0.0550
	1	5	13	0.0576	0.0568	0.0584	0.0568	0.0584
	1	5	14	0.0590	0.0600	0.0580	0.0600	0.0580
	1	5	15	0.0648	0.0655	0.0640	0.0655	0.0640
	1	5	16	0.0692	0.0655	0.0730	0.0655	0.0730
	1	5	17	0.0700	0.0617	0.0785	0.0617	0.0785
	1	5	18	0.0701	0.0592	0.0812	0.0592	0.0812
	1	5	19	0.0590	0.0543	0.0639	0.0543	0.0639
	1	5	20	0.0419	0.0408	0.0430	0.0408	0.0430
	1	5	21	0.0334	0.0330	0.0338	0.0330	0.0338
	1	5	22	0.0292	0.0308	0.0275	0.0308	0.0275
	1	5	23	0.0214	0.0249	0.0179	0.0249	0.0179
	1	5	24	0.0139	0.0171	0.0107	0.0171	0.0107

[AvgSpeedDistribution]

road TypeID	sourceTypeID	hourDayID	avgSpeedFraction by avgSpeedBinID															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2	11,22,31	15~65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0186	0.0705	0.1726	0.2802	0.2780	0.0231	0.0761	0.0380	0.0255	0.0128	0.0047
		75~95	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016	0.0327	0.0000	0.0374	0.2097	0.2690	0.2349	0.0936	0.0418	0.0573	0.0220
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0448	0.1118	0.3412	0.2453	0.0519	0.1147	0.0466	0.0342	0.0094
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0592	0.2593	0.4298	0.1897	0.0620
		195~245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0186	0.0705	0.1726	0.2802	0.2780	0.0231	0.0761	0.0380	0.0255	0.0128	0.0047
	32	15~65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0054	0.0443	0.1195	0.2201	0.2288	0.0220	0.1110	0.0777	0.0810	0.0822	0.0081
		75~95	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0087	0.0000	0.0219	0.1547	0.1950	0.1719	0.0913	0.0349	0.1672	0.1540
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0331	0.0843	0.2625	0.2040	0.0731	0.1469	0.0651	0.0973	0.0337
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0427	0.1920	0.3649	0.2480	0.1523
		195~245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0054	0.0443	0.1195	0.2201	0.2288	0.0220	0.1110	0.0777	0.0810	0.0822	0.0081
	41,42,43, 51,52,53,54	15~65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0094	0.0702	0.1954	0.2696	0.2922	0.0205	0.0670	0.0299	0.0213	0.0174	0.0070
		75~95	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0146	0.0000	0.0361	0.1720	0.2761	0.2564	0.0760	0.0438	0.0719	0.0525
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0479	0.1257	0.3898	0.2392	0.0378	0.0909	0.0285	0.0306	0.0096
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0645	0.2820	0.4457	0.1457	0.0621
		195~245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0094	0.0702	0.1954	0.2696	0.2922	0.0205	0.0670	0.0299	0.0213	0.0174	0.0070
	61,62	15~65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0079	0.0622	0.1676	0.2489	0.2677	0.0210	0.0819	0.0500	0.0448	0.0412	0.0068
		75~95	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0104	0.0000	0.0265	0.1581	0.2201	0.1960	0.0867	0.0394	0.1416	0.1206
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0421	0.1080	0.3352	0.2164	0.0534	0.1167	0.0488	0.0588	0.0205
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0469	0.2120	0.3788	0.2309	0.1314
		195~245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0079	0.0622	0.1676	0.2489	0.2677	0.0210	0.0819	0.0500	0.0448	0.0412	0.0068
3	11,22,31	15~65	0.0000	0.0645	0.0003	0.0195	0.0209	0.0322	0.2205	0.0757	0.2169	0.2945	0.0001	0.0547	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0818	0.0240	0.0090	0.0171	0.0278	0.1939	0.0486	0.2043	0.3368	0.0000	0.0561	0.0006	0.0000	0.0000	0.0000
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0287	0.2337	0.0435	0.2038	0.4355	0.0002	0.0547	0.0000	0.0000	0.0000	0.0000
		165~185	0.0000	0.0000	0.0000	0.0011	0.0000	0.0295	0.2194	0.0312	0.1459	0.5181	0.0002	0.0534	0.0012	0.0000	0.0000	0.0000
		195~245	0.0000	0.0645	0.0003	0.0195	0.0209	0.0322	0.2205	0.0757	0.2169	0.2945	0.0001	0.0547	0.0000	0.0000	0.0000	0.0000
	32	15~65	0.0000	0.0129	0.0001	0.0038	0.0210	0.0249	0.1768	0.0772	0.1860	0.3222	0.0001	0.1750	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0153	0.0044	0.0036	0.0076	0.0307	0.1585	0.0353	0.1540	0.4036	0.0001	0.1830	0.0040	0.0000	0.0000	0.0000
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0124	0.1739	0.0396	0.2008	0.4091	0.0002	0.1641	0.0000	0.0000	0.0000	0.0000
		165~185	0.0000	0.0000	0.0000	0.0029	0.0000	0.0091	0.1698	0.0328	0.1293	0.4834	0.0002	0.1684	0.0042	0.0000	0.0000	0.0000
		195~245	0.0000	0.0129	0.0001	0.0038	0.0210	0.0249	0.1768	0.0772	0.1860	0.3222	0.0001	0.1750	0.0000	0.0000	0.0000	0.0000
	41,42,43, 51,52,53,54	15~65	0.0000	0.0151	0.0001	0.0046	0.0230	0.0309	0.1940	0.1051	0.2321	0.2859	0.0001	0.1092	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0179	0.0053	0.0049	0.0083	0.0375	0.1582	0.0438	0.1860	0.4168	0.0000	0.1184	0.0028	0.0000	0.0000	0.0000
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0140	0.1614	0.0568	0.2666	0.3902	0.0001	0.1109	0.0000	0.0000	0.0000	0.0000
		165~185	0.0000	0.0000	0.0000	0.0049	0.0000	0.0102	0.1508	0.0411	0.1630	0.5034	0.0001	0.1230	0.0034	0.0000	0.0000	0.0000
		195~245	0.0000	0.0151	0.0001	0.0046	0.0230	0.0309	0.1940	0.1051	0.2321	0.2859	0.0001	0.1092	0.0000	0.0000	0.0000	0.0000
	61,62	15~65	0.0000	0.0212	0.0002	0.0064	0.0230	0.0328	0.1779	0.1036	0.2241	0.2979	0.0001	0.1129	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0241	0.0073	0.0057	0.0101	0.0372	0.1439	0.0425	0.1791	0.4114	0.0000	0.1355	0.0034	0.0000	0.0000	0.0000
		105~155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0192	0.1501	0.0538	0.2505	0.4099	0.0001	0.1163	0.0000	0.0000	0.0000	0.0000
		165~185	0.0000	0.0000	0.0000	0.0047	0.0000	0.0140	0.1356	0.0425	0.1542	0.5028	0.0001	0.1422	0.0039	0.0000	0.0000	0.0000
		195~245	0.0000	0.0212	0.0002	0.0064	0.0230	0.0328	0.1779	0.1036	0.2241	0.2979	0.0001	0.1129	0.0000	0.0000	0.0000	0.0000
4	11,22,31	15~65	0.0000	0.0000	0.0028	0.0224	0.0619	0.1481	0.1247	0.1100	0.1113	0.1105	0.0728	0.0849	0.0634	0.0450	0.0340	0.0080
		75~95	0.0000	0.0000	0.0000	0.0016	0.0357	0.0869	0.1036	0.1328	0.1091	0.0921	0.0826	0.0991	0.0892	0.0740	0.0797	0.0136
		105~155	0.0000	0.0000	0.0000	0.0055	0.0028	0.0186	0.0612	0.1320	0.1384	0.1448	0.1001	0.1153	0.1125	0.0925	0.0627	0.0136
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0024	0.0007	0.0038	0.0266	0.1143	0.1918	0.1799	0.2133	0.2282	0.0384
		195~245	0.0000	0.0000	0.0028	0.0224	0.0619	0.1481	0.1247	0.1100	0.1113	0.1105	0.0728	0.0849	0.0634	0.0450	0.0340	0.0080
	32	15~65	0.0000	0.0000	0.0031	0.0216	0.0502	0.1310	0.1125	0.1015	0.1194	0.1205	0.0782	0.0954	0.0732	0.0521	0.0346	0.0068
		75~95	0.0000	0.0000	0.0000	0.0016	0.0313	0.0660	0.0795	0.0979	0.0771	0.0815	0.0889	0.1079	0.1083	0.1058	0.1384	0.0158
		105~155	0.0000	0.0000	0.0000	0.0049	0.0026	0.0201	0.0622	0.1338	0.1417	0.1445	0.0986	0.1273	0.1076	0.0915	0.0547	0.0106
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0021	0.0006	0.0035	0.0273	0.1177	0.1928	0.1856	0.2205	0.2208	0.0283
		195~245	0.0000	0.0000	0.0031	0.0216	0.0502	0.1310	0.1125	0.1015	0.1194	0.1205	0.0782	0.0954	0.0732	0.0521	0.0346	0.0068
	41,42,43, 51,52,53,54	15~65	0.0000	0.0000	0.0033	0.0237	0.0582	0.1474	0.1169	0.1055	0.1165	0.1206	0.0740	0.0853	0.0649	0.0463	0.0315	0.0058
		75~95	0.0000	0.0000	0.0000	0.0020	0.0322	0.0673	0.0863	0.1048	0.0848	0.0827	0.0882	0.1074	0.1136	0.1000	0.1157	0.0149
		105~155	0.0000	0.0000	0.0000	0.0052	0.0027	0.0227	0.0698	0.1454	0.1511	0.1500	0.1000	0.1115	0.1038	0.0808	0.0480	0.0091
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0023	0.0006	0.0034	0.0291	0.1233	0.2146	0.1987	0.2027	0.1998	0.0245
		195~245	0.0000	0.0000	0.0033	0.0237	0.0582	0.1474	0.1169	0.1055	0.1165	0.1206	0.0740	0.0853	0.0649	0.0463	0.0315	0.0058

road TypeID	sourceTypeID	hourDayID	avgSpeedFraction by avgSpeedBinID															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	61,62	15~65	0.0000	0.0000	0.0036	0.0236	0.0556	0.1413	0.1157	0.1032	0.1161	0.1204	0.0754	0.0895	0.0685	0.0481	0.0327	0.0064
		75~95	0.0000	0.0000	0.0000	0.0019	0.0328	0.0676	0.0826	0.0997	0.0786	0.0825	0.0894	0.1076	0.1096	0.1036	0.1299	0.0143
		105~155	0.0000	0.0000	0.0000	0.0053	0.0027	0.0223	0.0677	0.1411	0.1486	0.1473	0.0984	0.1191	0.1032	0.0837	0.0509	0.0100
		165~185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010	0.0022	0.0006	0.0034	0.0291	0.1246	0.2046	0.1909	0.2121	0.2064	0.0251
		195~245	0.0000	0.0000	0.0036	0.0236	0.0556	0.1413	0.1157	0.1032	0.1161	0.1204	0.0754	0.0895	0.0685	0.0481	0.0327	0.0064
5	11,22,31	15~65	0.0007	0.0040	0.0168	0.0601	0.1920	0.3071	0.1783	0.1395	0.0935	0.0039	0.0026	0.0016	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0029	0.0113	0.0520	0.1563	0.2724	0.1760	0.1866	0.1321	0.0034	0.0044	0.0026	0.0000	0.0000	0.0000	0.0000
		105~155	0.0000	0.0022	0.0037	0.0326	0.1520	0.2679	0.1798	0.2106	0.1407	0.0038	0.0042	0.0026	0.0000	0.0000	0.0000	0.0001
		165~185	0.0000	0.0000	0.0017	0.0153	0.1002	0.2377	0.1251	0.2800	0.2269	0.0041	0.0046	0.0043	0.0000	0.0000	0.0000	0.0001
		195~245	0.0007	0.0040	0.0168	0.0601	0.1920	0.3071	0.1783	0.1395	0.0935	0.0039	0.0026	0.0016	0.0000	0.0000	0.0000	0.0000
	32	15~65	0.0007	0.0050	0.0161	0.0616	0.1922	0.2829	0.1848	0.1458	0.0938	0.0092	0.0048	0.0030	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0029	0.0107	0.0480	0.1469	0.2446	0.1758	0.2010	0.1477	0.0077	0.0098	0.0051	0.0000	0.0000	0.0000	0.0000
		105~155	0.0000	0.0026	0.0058	0.0329	0.1520	0.2392	0.1964	0.2185	0.1319	0.0074	0.0089	0.0044	0.0000	0.0000	0.0000	0.0001
		165~185	0.0000	0.0000	0.0027	0.0208	0.1003	0.2100	0.1468	0.2950	0.2017	0.0067	0.0091	0.0068	0.0000	0.0000	0.0000	0.0001
		195~245	0.0007	0.0050	0.0161	0.0616	0.1922	0.2829	0.1848	0.1458	0.0938	0.0092	0.0048	0.0030	0.0000	0.0000	0.0000	0.0000
	41,42,43, 51,52,53,54	15~65	0.0005	0.0056	0.0174	0.0628	0.1900	0.2819	0.2041	0.1464	0.0793	0.0067	0.0034	0.0019	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0030	0.0119	0.0492	0.1368	0.2370	0.1981	0.2137	0.1327	0.0064	0.0077	0.0035	0.0000	0.0000	0.0000	0.0000
		105~155	0.0000	0.0025	0.0068	0.0298	0.1453	0.2272	0.2214	0.2348	0.1157	0.0063	0.0071	0.0030	0.0000	0.0000	0.0000	0.0001
		165~185	0.0000	0.0000	0.0031	0.0185	0.0863	0.1925	0.1669	0.3245	0.1886	0.0065	0.0080	0.0051	0.0000	0.0000	0.0000	0.0001
		195~245	0.0005	0.0056	0.0174	0.0628	0.1900	0.2819	0.2041	0.1464	0.0793	0.0067	0.0034	0.0019	0.0000	0.0000	0.0000	0.0000
	61,62	15~65	0.0004	0.0044	0.0157	0.0589	0.1810	0.2764	0.2031	0.1502	0.0952	0.0081	0.0041	0.0025	0.0000	0.0000	0.0000	0.0000
		75~95	0.0000	0.0021	0.0113	0.0474	0.1312	0.2305	0.1928	0.2121	0.1511	0.0075	0.0097	0.0044	0.0000	0.0000	0.0000	0.0001
		105~155	0.0000	0.0018	0.0058	0.0291	0.1360	0.2186	0.2158	0.2356	0.1375	0.0077	0.0084	0.0038	0.0000	0.0000	0.0000	0.0001
		165~185	0.0000	0.0000	0.0027	0.0177	0.0816	0.1851	0.1616	0.3198	0.2073	0.0081	0.0096	0.0064	0.0000	0.0000	0.0000	0.0001
		195~245	0.0004	0.0044	0.0157	0.0589	0.1810	0.2764	0.2031	0.1502	0.0952	0.0081	0.0041	0.0025	0.0000	0.0000	0.0000	0.0000

[AVFT]

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction by fuelTypeID		
				1	2	3
42	1960	2	1	0.0000	1.0000	0.0000
42	1961	2	1	0.0000	1.0000	0.0000
42	1962	2	1	0.0000	1.0000	0.0000
42	1963	2	1	0.0000	1.0000	0.0000
42	1964	2	1	0.0000	1.0000	0.0000
42	1965	2	1	0.0000	1.0000	0.0000
42	1966	2	1	0.0000	1.0000	0.0000
42	1967	2	1	0.0000	1.0000	0.0000
42	1968	2	1	0.0000	1.0000	0.0000
42	1969	2	1	0.0000	1.0000	0.0000
42	1970	2	1	0.0000	1.0000	0.0000
42	1971	2	1	0.0000	1.0000	0.0000
42	1972	2	1	0.0000	1.0000	0.0000
42	1973	2	1	0.0000	1.0000	0.0000
42	1974	2	1	0.0000	1.0000	0.0000
42	1975	2	1	0.0000	1.0000	0.0000
42	1976	2	1	0.0000	1.0000	0.0000
42	1977	2	1	0.0000	1.0000	0.0000
42	1978	2	1	0.0000	1.0000	0.0000
42	1979	2	1	0.0000	1.0000	0.0000
42	1980	2	1	0.0000	1.0000	0.0000
42	1981	2	1	0.0000	1.0000	0.0000
42	1982	2	1	0.0000	1.0000	0.0000
42	1983	2	1	0.0000	1.0000	0.0000
42	1984	2	1	0.0000	1.0000	0.0000
42	1985	2	1	0.0000	1.0000	0.0000
42	1986	2	1	0.0000	1.0000	0.0000
42	1987	2	1	0.0000	1.0000	0.0000
42	1988	2	1	0.0000	1.0000	0.0000
42	1989	2	1	0.0000	1.0000	0.0000
42	1990	2	1	0.0000	0.9930	0.0070
42	1991	2	1	0.0000	0.9820	0.0180
42	1992	2	1	0.0100	0.9440	0.0460
42	1993	2	1	0.0100	0.9140	0.0760

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction by fuelTypeID		
				1	2	3
42	1994	2	1	0.0100	0.9050	0.0850
42	1995	2	1	0.0100	0.8370	0.1530
42	1996	2	1	0.0100	0.8920	0.0980
42	1997	2	1	0.0000	1.0000	0.0000
42	1998	2	1	0.0000	0.0000	1.0000
42	1999	2	1	0.0000	0.0000	1.0000
42	2000	2	1	0.0000	0.0000	1.0000
42	2001	2	1	0.0000	0.0000	1.0000
42	2002	2	1	0.0000	0.0000	1.0000
42	2003	2	1	0.0000	0.0800	0.9200
42	2004	2	1	0.0000	0.3971	0.6029
42	2005	2	1	0.0000	1.0000	0.0000
42	2006	2	1	0.0897	0.1282	0.7821
42	2007	2	1	0.1495	0.8505	0.0000
42	2008	2	1	0.0000	0.4796	0.5204
42	2009	2	1	0.1212	0.0303	0.8485
42	2010	2	1	0.0000	1.0000	0.0000
42	2011	2	1	0.0000	1.0000	0.0000
42	2012	2	1	0.0000	1.0000	0.0000
42	2013	2	1	0.0000	1.0000	0.0000
42	2014	2	1	0.0000	1.0000	0.0000
42	2015	2	1	0.0000	1.0000	0.0000
42	2016	2	1	0.0000	1.0000	0.0000
42	2017	2	1	0.0000	1.0000	0.0000
42	2018	2	1	0.0000	1.0000	0.0000
42	2019	2	1	0.0000	1.0000	0.0000
42	2020	2	1	0.0000	1.0000	0.0000
42	2021	2	1	0.0000	1.0000	0.0000
42	2022	2	1	0.0000	1.0000	0.0000
42	2023	2	1	0.0000	1.0000	0.0000
42	2024	2	1	0.0000	1.0000	0.0000
42	2025	2	1	0.0000	1.0000	0.0000
42	2026	2	1	0.0000	1.0000	0.0000
42	2027	2	1	0.0000	1.0000	0.0000
42	2028	2	1	0.0000	1.0000	0.0000
42	2029	2	1	0.0000	1.0000	0.0000
42	2030	2	1	0.0000	1.0000	0.0000
42	2031	2	1	0.0000	1.0000	0.0000
42	2032	2	1	0.0000	1.0000	0.0000
42	2033	2	1	0.0000	1.0000	0.0000
42	2034	2	1	0.0000	1.0000	0.0000
42	2035	2	1	0.0000	1.0000	0.0000
42	2036	2	1	0.0000	1.0000	0.0000
42	2037	2	1	0.0000	1.0000	0.0000
42	2038	2	1	0.0000	1.0000	0.0000
42	2039	2	1	0.0000	1.0000	0.0000
42	2040	2	1	0.0000	1.0000	0.0000
42	2041	2	1	0.0000	1.0000	0.0000
42	2042	2	1	0.0000	1.0000	0.0000
42	2043	2	1	0.0000	1.0000	0.0000
42	2044	2	1	0.0000	1.0000	0.0000
42	2045	2	1	0.0000	1.0000	0.0000
42	2046	2	1	0.0000	1.0000	0.0000
42	2047	2	1	0.0000	1.0000	0.0000
42	2048	2	1	0.0000	1.0000	0.0000
42	2049	2	1	0.0000	1.0000	0.0000
42	2050	2	1	0.0000	1.0000	0.0000

Appendix II-ii

NONROAD2008a RunSpecs

In order to calculate the winter season weekday nonroad source emissions, NONROAD2008a was executed for the winter season (November~January) of the year.

A portion of the NONROAD2008a RunSpec for December 2008 is provided in this appendix as an example.

PERIOD PACKET

This is the packet that defines the period for
which emissions are to be estimated. The order of the
records matter. The selection of certain parameters
will cause some of the record that follow to be ignored.
The order of the records is as follows:

1 - Char 10 - Period type for this simulation.
Valid responses are: ANNUAL, SEASONAL, and MONTHLY
2 - Char 10 - Type of inventory produced.
Valid responses are: TYPICAL DAY and PERIOD TOTAL
3 - Integer - year of episode (4 digit year)
4 - Char 10 - Month of episode (use complete name of month)
5 - Char 10 - Type of day
Valid responses are: WEEKDAY and WEEKEND

/PERIOD/
Period type : Monthly
Summation type : TYPICAL DAY
Year of episode : 2008
Season of year :
Month of year : December
Weekday or weekend : weekday
Year of growth calc: 2008
Year of tech sel : 2008
/END/

OPTIONS PACKET

This is the packet that defines some of the user
options that drive the model. Most parameters are
used to make episode specific emission factor
adjustments. The order of the records is fixed.
The order is as follows.

1 - Char 80 - First title on reports
2 - Char 80 - Second title on reports
3 - Real 10 - Fuel RVP of gasoline for this simulation
4 - Real 10 - Oxygen weight percent of gasoline for simulation
5 - Real 10 - Percent sulfur for gasoline
6 - Real 10 - Percent sulfur for diesel
7 - Real 10 - Percent sulfur for LPG/CNG
8 - Real 10 - Minimum daily temperature (deg. F)
9 - Real 10 - maximum daily temperature (deg. F)
10 - Real 10 - Representative average daily temperature (deg. F)
11 - Char 10 - Flag to determine if region is high altitude
Valid responses are: HIGH and LOW
12 - Char 10 - Flag to determine if RFG adjustments are made
Valid responses are: YES and NO

/OPTIONS/
Title 1 : MARICOPA COUNTY DECEMBER 2008
Title 2 : 2008
Fuel RVP for gas : 8.3
Oxygen Weight % : 3.03
Gas sulfur % : 0.0028
Diesel sulfur % : 0.0007
Marine Dsl sulfur %: 0.0007
CNG/LPG sulfur % : 0.003
Minimum temper. (F): 46
Maximum temper. (F): 65
Average temper. (F): 56.03
Altitude of region : LOW
EtOH Blend % Mkt : 100.0
EtOH Vol % : 8.17
/END/

REGION PACKET

This is the packet that defines the region for which emissions are to be estimated.

The first record tells the type of region and
allocation to perform.

Valid responses are:
US TOTAL - emissions are for entire USA without state
breakout.

50STATE - emissions are for all 50 states
and Washington D.C., by state.

STATE - emissions are for a select group of states
and are state-level estimates

COUNTY - emissions are for a select group of counties
and are county level estimates. If necessary,
allocation from state to county will be performed.

SUBCOUNTY - emissions are for the specified sub counties
and are subcounty level estimates. If necessary,
county to subcounty allocation will be performed.

The remaining records define the regions to be included.
The type of data which must be specified depends on the
region level.

US TOTAL - Nothing needs to be specified. The FIPS
code 00000 is used automatically.

50STATE - Nothing needs to be specified. The FIPS
code 00000 is used automatically.

STATE - state FIPS codes

COUNTY - state or county FIPS codes. State FIPS
code means include all counties in the
state.

SUBCOUNTY - county FIPS code and subregion code.

```
------------------------------------------------------
/REGION/
Region Level       : COUNTY
Maricopa County AZ : 04013
/END/

or use -
Region Level       : STATE
Michigan           : 26000
------------------------------------------------------
```

SOURCE CATEGORY PACKET

This packet is used to tell the model which source
categories are to be processed. It is optional.
If used, only those source categories list will
appear in the output data file. If the packet is
not found, the model will process all source
categories in the population files.

```
------------------------------------------------------

Diesel Only -
                :2270000000
                :2282020000
                :2285002015
Spark Ignition Only -
                :2260000000
                :2265000000
                :2267000000
                :2268000000
                :2282005010
                :2282005015
                :2282010005
                :2285004015
                :2285006015
------------------------------------------------------
```

```
 This is the packet that lists the names of output files
 and some of the input data files read by the model.  If
 a drive:\path\ is not given, the location of the
 NONROAD.EXE file itself is assumed.  You will probably
 want to change the names of the Output and Message files
 to match that of the OPTion file, e.g., MICH-97.OPT,
 MICH-97.OUT, MICH-97.MSG, and if used MICH-97.AMS.
------------------------------------------------------
/RUNFILES/
ALLOC XREF         : data\allocate\allocate.xrf
ACTIVITY           : data\activity\activity.dat
EXH TECHNOLOGY     : data\tech\tech-exh.dat
EVP TECHNOLOGY     : data\tech\tech-evp.dat
SEASONALITY        : data\season\season.dat
REGIONS            : data\season\season.dat
MESSAGE            : c:\nonroad\co_maintenence\daily\weekday\output\dec08.msg
OUTPUT DATA        : c:\nonroad\co_maintenence\daily\weekday\output\dec08.out
EPS2 AMS           :
US COUNTIES FIPS   : data\allocate\fips.dat
RETROFIT           :
/END/

------------------------------------------------------
This is the packet that defines the equipment population
files read by the model.
------------------------------------------------------
/POP FILES/
Population files   : data\pop\az.pop
/END/

POPULATION FILE    : c:\nonroad\data\POP\MI.POP


------------------------------------------------------
This is the packet that defines the growth files
files read by the model.
------------------------------------------------------
/GROWTH FILES/
National defaults  : data\growth\nation.grw
/END/

/ALLOC FILES/
Air trans. empl.   :c:\nonroad\data\allocate\az_airtr.alo
Undergrnd coal prod:c:\nonroad\data\allocate\az_coal.alo
Construction cost  :c:\nonroad\data\allocate\az_const.alo
Harvested acres    :c:\nonroad\data\allocate\az_farms.alo
Golf course estab. :c:\nonroad\data\allocate\az_golf.alo
Wholesale estab.   :c:\nonroad\data\allocate\az_holsl.alo
Family housing     :c:\nonroad\data\allocate\az_house.alo
Logging employees  :c:\nonroad\data\allocate\az_loggn.alo
Landscaping empl.  :c:\nonroad\data\allocate\az_lscap.alo
Manufacturing empl.:c:\nonroad\data\allocate\az_mnfg.alo
Oil & gas employees:c:\nonroad\data\allocate\az_oil.alo
Census population  :c:\nonroad\data\allocate\az_pop.alo
Allocation File    :c:\nonroad\data\allocate\az_rail.alo
RV Park establish. :c:\nonroad\data\allocate\az_rvprk.alo
Snowblowers comm.  :c:\nonroad\data\allocate\az_sbc.alo
Snowblowers res.   :c:\nonroad\data\allocate\az_sbr.alo
Snowmobiles        :c:\nonroad\data\allocate\az_snowm.alo
Rec marine inboard :c:\nonroad\data\allocate\az_wib.alo
Rec marine outboard:c:\nonroad\data\allocate\az_wob.alo
/END/
------------------------------------------------------
This is the packet that defines the emssions factors
files read by the model.
------------------------------------------------------
/EMFAC FILES/
THC exhaust        : data\emsfac\exhthc.emf
CO exhaust         : data\emsfac\exhco.emf
NOX exhaust        : data\emsfac\exhnox.emf
PM exhaust         : data\emsfac\exhpm.emf
BSFC               : data\emsfac\bsfc.emf
Crankcase          : data\emsfac\crank.emf
Spillage           : data\emsfac\spillage.emf
Diurnal            : data\emsfac\evdiu.emf
Tank Perm          : data\emsfac\evtank.emf
```

```
Non-RM Hose Perm   : data\emsfac\evhose.emf
RM Fill Neck Perm  : data\emsfac\evneck.emf
RM Supply/Return   : data\emsfac\evsupret.emf
RM Vent Perm       : data\emsfac\evvent.emf
Hot Soaks          : data\emsfac\evhotsk.emf
RuningLoss         : data\emsfac\evrunls.emf
/END/

------------------------------------------------------
This is the packet that defines the deterioration factors
files read by the model.
------------------------------------------------------
/DETERIORATE FILES/
THC exhaust        : data\detfac\exhthc.det
CO exhaust         : data\detfac\exhco.det
NOX exhaust        : data\detfac\exhnox.det
PM exhaust         : data\detfac\exhpm.det
Diurnal            : data\detfac\evdiu.det
Tank Perm          : data\detfac\evtank.det
Non-RM Hose Perm   : data\detfac\evhose.det
RM Fill Neck Perm  : data\detfac\evneck.det
RM Supply/Return   : data\detfac\evsupret.det
RM Vent Perm       : data\detfac\evvent.det
Hot Soaks          : data\detfac\evhotsk.det
RuningLoss         : data\detfac\evrunls.det
/END/

Optional Packets - Add initial slash "/" to activate

/STAGE II/
Control Factor     : 46.0
/END/
Enter percent control: 95 = 95% control = 0.05 x uncontrolled
Default should be zero control.

/MODELYEAR OUT/
EXHAUST BMY OUT    :
EVAP BMY OUT       :
/END/

SI REPORT/
SI report file-CSV :OUTPUTS\NRPOLLUT.CSV
/END/

/DAILY FILES/
DAILY TEMPS/RVP    :
/END/

PM Base Sulfur
 cols 1-10: dsl tech type;
 11-20: base sulfur wt%; or '1.0' means no-adjust (cert= in-use)
/PM BASE SULFUR/
T2        0.0350    0.02247
T3        0.2000    0.02247
T3B       0.0500    0.02247
T4A       0.0500    0.02247
T4B       0.0015    0.02247
T4        0.0015    0.30
T4N       0.0015    0.30
T2M       0.0350    0.02247
T3M       1.0       0.02247
T4M       1.0       0.02247
/END/
/SOURCE CATEGORY/
               :2260004010
               :2260004015
               :2260004020
               :2260004025
               :2260004030
               :2260004035
               :2260004040
               :2260004045
               :2260004050
               :2260004055
               :2260004060
               :2260004065
```

:2260004075
:2265004010
:2265004015
:2265004020
:2265004025
:2265004030
:2265004035
:2265004040
:2265004045
:2265004050
:2265004055
:2265004060
:2265004065
:2265004075
:2267004010
:2267004015
:2267004020
:2267004025
:2267004030
:2267004035
:2267004040
:2267004045
:2267004050
:2267004055
:2267004060
:2267004065
:2267004075
:2268004010
:2268004015
:2268004020
:2268004025
:2268004030
:2268004035
:2268004040
:2268004045
:2268004050
:2268004055
:2268004060
:2268004065
:2268004075
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:2285000000
:2282000000
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:2268008005
:2265003020
:2267003020
:2265001050
/END/

Appendix II-iii

EDMS Input Data

In order to calculate the winter season weekday airport emissions, EDMS was executed for the winter season (November~January) of the year.

A portion of the EDMS input data for KPHX for 2008 is provided in this appendix as an example.

2008 CO Seasonal LTOs for Each Aircraft type at Phoenix Sky Harbor Airport (KPHX)

NO.	User ID	ICAO Aircraft Code	ICAO Engine UID	LTOs
1	AC-01	B737-7	3CM031	13,343
2	AC-02	B737-3	1CM004	10,513
3	AC-03	A320-2	1IA003	9,845
4	AC-04	A319-1	3CM028	6,572
5	AC-05	B757-2	4PW072	2,474
6	AC-06	B737-8	3CM033	1,847
7	AC-07	MD82	4PW070	1,241
8	AC-08	B737-5	1CM007	1,032
9	AC-09	A321-1	1IA005	901
10	AC-10	CRJ2	5GE084	452
11	AT-01	CRJ9	6GE092	4,191
12	AT-02	CRJ2	5GE084	2,380
13	AT-03	DHC8-2	PW123	1,508
14	AT-04	BEECH1900-C	PT6A6B	552
15	AT-05	CNA560-XLS	1PW037	102
16	AT-06	DHC8-1	PW120A	67
17	AT-07	CNA750	6AL022	64
18	AT-08	BEECH400	1PW037	46
19	AT-09	HS125-7	1AS002	40
20	AT-10	FAL2000	7PW080	32
21	GA-01	BEECH90	P6135A	700
22	GA-02	CNA560	1PW037	506
23	GA-03	BEECH200	PT6A42	460
24	GA-04	CNA560-XL	1PW037	367
25	GA-05	BEECH400	1PW037	327
26	GA-06	PC12	PT6A67	304
27	GA-07	CL601	1GE034	275
28	GA-08	LEAR45	1AS001	249
29	GA-09	GULF4	1RR019	218
30	GA-10	CNA172	IO320	197
31	ML-01	MIL-KC135	1CM001	154
32	ML-02	BEECH200	PT6A42	36
33	ML-03	MIL-T37	J6925A	32
34	ML-04	MIL-F18	F4044	21
35	ML-05	C101	1AS002	17
36	ML-06	PC12	PT6A67	15
37	ML-07	MIL-C130	T56A15	15
38	ML-08	MIL-T38	J855HA	12
39	ML-09	CRJ9	6GE092	8
40	ML-10	MIL-AV8B	F4026A	6

Monthly Profiles for the Four Aircraft Categories at KPHX

Profile name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air Carrier	1.000	0	0	0	0	0	0	0	0	0	0.864	0.911
Air Taxi	1.000	0	0	0	0	0	0	0	0	0	0.718	0.751
General Aviation	1.000	0	0	0	0	0	0	0	0	0	0.718	0.557
Military	0.888	0	0	0	0	0	0	0	0	0	0.824	1.000

Weekly Profile for the Four Aircraft Categories at KPHX

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0.972	0.982	0.992	1.000	0.988	0.837	0.893

Hourly Profiles by Aircraft Type at KPHX

Time	A319	A320/A321	B733	B737	B738	B752	MD82	DH8B	CRJ2	CRJ9
0:00	0.031	0.036	0.059	0.059	0.111	0.085	0.030	0.025	0.018	0.035
1:00	0.012	0.014	0.023	0.022	0.043	0.032	0.012	0.009	0.007	0.014
2:00	0.010	0.011	0.019	0.019	0.035	0.027	0.010	0.008	0.006	0.011
3:00	0.003	0.003	0.005	0.005	0.010	0.007	0.003	0.002	0.002	0.003
4:00	0.019	0.021	0.035	0.035	0.066	0.051	0.018	0.015	0.011	0.021
5:00	0.045	0.051	0.085	0.084	0.160	0.122	0.043	0.035	0.026	0.051
6:00	0.125	0.142	0.236	0.234	0.446	0.339	0.121	0.099	0.074	0.141
7:00	0.260	0.332	0.525	0.411	0.437	0.376	0.390	0.394	0.356	0.382
8:00	0.407	0.519	0.821	0.643	0.684	0.589	0.610	0.617	0.558	0.598
9:00	0.481	0.613	0.970	0.759	0.808	0.696	0.721	0.728	0.659	0.706
10:00	1.000	1.000	0.980	1.000	1.000	1.000	1.000	0.892	0.832	0.934
11:00	0.841	0.841	0.825	0.841	0.841	0.841	0.841	0.751	0.700	0.786
12:00	0.691	0.691	0.677	0.691	0.691	0.691	0.691	0.617	0.575	0.645
13:00	0.638	0.760	1.000	0.980	0.765	0.680	0.778	0.902	1.000	0.710
14:00	0.529	0.630	0.829	0.813	0.634	0.564	0.645	0.748	0.829	0.589
15:00	0.478	0.570	0.750	0.735	0.574	0.510	0.583	0.676	0.750	0.532
16:00	0.683	0.643	0.971	0.913	0.683	0.334	0.563	0.958	0.908	1.000
17:00	0.492	0.463	0.699	0.657	0.492	0.240	0.405	0.690	0.654	0.720
18:00	0.601	0.566	0.854	0.803	0.601	0.294	0.495	0.843	0.799	0.879
19:00	0.816	0.618	0.903	0.790	0.550	0.416	0.367	0.997	0.670	0.702
20:00	0.819	0.620	0.906	0.793	0.551	0.417	0.368	1.000	0.672	0.704
21:00	0.724	0.548	0.802	0.701	0.488	0.369	0.326	0.885	0.594	0.623
22:00	0.217	0.246	0.409	0.405	0.772	0.587	0.209	0.171	0.128	0.244
23:00	0.132	0.149	0.249	0.246	0.469	0.357	0.127	0.104	0.078	0.148

Total 2008 CO Seasonal Aviation Emissions for CO at KPHX (unit: metric tons)

NO.	User ID	Aircraft Type	APU(s)	GSE	Aircraft	Total
1	AC-01	Boeing 737-700 Series	3.264	168.899	103.519	275.682
2	AC-02	Boeing 737-300 Series	8.747	133.076	132.997	274.820
3	AC-03	Airbus A320-200 Series	0.877	124.620	50.110	175.607
4	AC-04	Airbus A319-100 Series	0.585	83.190	54.975	138.750
5	AC-05	Boeing 757-200 Series	0.538	31.366	26.755	58.659
6	AC-06	Boeing 737-800 Series	0.452	23.380	12.122	35.954
7	AC-07	Boeing MD-82	1.033	11.778	10.101	22.912
8	AC-08	Boeing 737-500 Series	0.859	13.063	11.320	25.242
9	AC-09	Airbus A321-100 Series	0.080	11.405	4.360	15.845
10	AC-10	Bombardier CRJ-200	0.118	2.895	3.064	6.077
11	AT-01	Bombardier CRJ-900	3.487	26.887	16.017	46.391
12	AT-02	Bombardier CRJ-200	0.622	15.243	16.160	32.025
13	AT-03	DeHavilland DHC-8-200	N/A	4.973	3.414	8.387
14	AT-04	Raytheon Beech 1900-C	N/A	5.074	4.729	9.803
15	AT-05	Cessna 560 Citation XLS	N/A	0.498	1.281	1.779
16	AT-06	DeHavilland DHC-8-100	N/A	0.221	0.211	0.432
17	AT-07	Cessna 750 Citation X	N/A	0.312	0.247	0.559
18	AT-08	Raytheon Beechjet 400	N/A	0.224	0.572	0.796
19	AT-09	Hawker HS-125 Series 700	N/A	0.195	0.179	0.374
20	AT-10	Dassault Falcon 2000	0.006	0.156	0.190	0.352
21	GA-01	Raytheon King Air 90	N/A	3.048	1.784	4.832
22	GA-02	Cessna 560 Citation V	N/A	2.469	7.299	9.768
23	GA-03	Raytheon Super King Air 200	N/A	2.003	1.813	3.816
24	GA-04	Cessna 560 Citation Excel	N/A	1.791	5.292	7.083
25	GA-05	Raytheon Beechjet 400	N/A	1.596	4.671	6.267
26	GA-06	Pilatus PC-12	N/A	1.483	1.248	2.731
27	GA-07	Bombardier Challenger 601	0.245	1.798	2.154	4.197
28	GA-08	Bombardier Learjet 45	N/A	1.212	1.475	2.687
29	GA-09	Gulfstream G400	0.195	1.390	2.169	3.754
30	GA-10	Cessna 172 Skyhawk	N/A	0.001	1.515	1.516
31	ML-01	Boeing KC-135 Stratotanker	N/A	0.069	3.030	3.099
32	ML-02	Raytheon Super King Air 200	N/A	0.157	0.125	0.282
33	ML-03	Cessna T-37 Tweet	N/A	0.014	0.433	0.447
34	ML-04	Boeing F/A-18 Hornet	N/A	0.009	0.808	0.817
35	ML-05	CASA C-101 Aviojet	N/A	0.008	0.036	0.044
36	ML-06	Pilatus PC-12	N/A	0.073	0.053	0.126
37	ML-07	Lockheed C-130 Hercules	N/A	0.007	0.116	0.123
38	ML-08	T-38 Talon	N/A	0.005	0.437	0.442
39	ML-09	Bombardier CRJ-900	0.007	0.051	0.031	0.089
40	ML-10	AV-8B Harrier	N/A	0.003	0.151	0.154

APPENDIX III

MODEL INPUTS AND OUTPUTS
FOR MICROSCALE ANALYSIS

Appendix III-i

MOVES2010b Input Data and RunSpecs

In order to calculate running emission rates for free flow links and idling emission rates for queue links, MOVES2010b was executed for each intersection using local input data for the PM peak hour in December 2025.

The MOVES2010b RunSpec summary, RunSpec, and a portion of input data for 16th St & Camelback Rd intersection are provided in this appendix as an example.

MOVES2010b RunSpec Summary (16th St & Camelback Rd Intersection)

Time Spans:
- Aggregate By: Hour
- Years: 2025
- Months: December
- Days: Weekdays
- Hours: Begin Hour: 16:00 - 16:59
  - End Hour: 16:00 - 16:59

Geographic Bounds:
- COUNTY geography
- Selection: ARIZONA - Maricopa County

On Road Vehicle Equipment:
- Diesel Fuel - Combination Long-haul Truck
- Diesel Fuel - Combination Short-haul Truck
- Diesel Fuel - Intercity Bus
- Diesel Fuel - Light Commercial Truck
- Diesel Fuel - Motor Home
- Diesel Fuel - Motorcycle
- Diesel Fuel - Passenger Car
- Diesel Fuel - Passenger Truck
- Diesel Fuel - Refuse Truck
- Diesel Fuel - School Bus
- Diesel Fuel - Single Unit Long-haul Truck
- Diesel Fuel - Single Unit Short-haul Truck
- Diesel Fuel - Transit Bus
- Gasoline - Combination Long-haul Truck
- Gasoline - Combination Short-haul Truck
- Gasoline - Intercity Bus
- Gasoline - Light Commercial Truck
- Gasoline - Motor Home
- Gasoline - Motorcycle
- Gasoline - Passenger Car
- Gasoline - Passenger Truck
- Gasoline - Refuse Truck
- Gasoline - School Bus
- Gasoline - Single Unit Long-haul Truck
- Gasoline - Single Unit Short-haul Truck
- Gasoline - Transit Bus
- Compressed Natural Gas (CNG) - Combination Long-haul Truck
- Compressed Natural Gas (CNG) - Combination Short-haul Truck
- Compressed Natural Gas (CNG) - Intercity Bus
- Compressed Natural Gas (CNG) - Light Commercial Truck
- Compressed Natural Gas (CNG) - Motor Home
- Compressed Natural Gas (CNG) - Motorcycle
- Compressed Natural Gas (CNG) - Passenger Car
- Compressed Natural Gas (CNG) - Passenger Truck
- Compressed Natural Gas (CNG) - Refuse Truck
- Compressed Natural Gas (CNG) - School Bus
- Compressed Natural Gas (CNG) - Single Unit Long-haul Truck
- Compressed Natural Gas (CNG) - Single Unit Short-haul Truck
- Compressed Natural Gas (CNG) - Transit Bus

Road Types:
- Off-Network
- Urban Unrestricted Access

Pollutants And Processes:
- Running Exhaust Carbon Monoxide (CO)
- Start Exhaust Carbon Monoxide (CO)
- Crankcase Running Exhaust Carbon Monoxide (CO)
- Crankcase Start Exhaust Carbon Monoxide (CO)
- Crankcase Extended Idle Exhaust Carbon Monoxide (CO)
- Extended Idle Exhaust Carbon Monoxide (CO)

General Output:
- Output Database Server Name: [using default]
- Output Database Name: c2_co_2025_out
- Mass Units: Grams
- Energy Units: Joules
- Distance Units: Miles
- Time Aggregate Level: Hour
- Output Emissions Breakdown Selection:
  - Road Type

Manage Input Data Sets:
- selection: / stageii_input /

MOVES2010b RunSpec (16th St & Camelback Rd Intersection)


```
<runspec>
	<description><![CDATA[C2. 16th St & Camelback Rd]]></description>
	<modelscale value="Inv"/>
	<modeldomain value="PROJECT"/>
	<geographicselections>
		<geographicselection type="COUNTY" key="4013" description="ARIZONA - Maricopa County"/>
	</geographicselections>
	<timespan>
		<year key="2025"/>
		<month id="12"/>
		<day id="5"/>
		<beginhour id="17"/>
		<endhour id="17"/>
		<aggregateBy key="Hour"/>
	</timespan>
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		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="61" sourcetypename="Combination Short-haul Truck"/>
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		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="54" sourcetypename="Motor Home"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="11" sourcetypename="Motorcycle"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="21" sourcetypename="Passenger Car"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="31" sourcetypename="Passenger Truck"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="51" sourcetypename="Refuse Truck"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="43" sourcetypename="School Bus"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="53" sourcetypename="Single Unit Long-haul Truck"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="52" sourcetypename="Single Unit Short-haul Truck"/>
		<onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="42" sourcetypename="Transit Bus"/>
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		<onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="61" sourcetypename="Combination Short-haul Truck"/>
		<onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="41" sourcetypename="Intercity Bus"/>
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		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="41" sourcetypename="Intercity Bus"/>
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		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="54" sourcetypename="Motor Home"/>
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		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="51" sourcetypename="Refuse Truck"/>
		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="43" sourcetypename="School Bus"/>
		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="53" sourcetypename="Single Unit Long-haul Truck"/>
		<onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="52" sourcetypename="Single Unit Short-haul Truck"/>
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		<geographicoutputdetail description="LINK"/>
		<outputemissionsbreakdownselection>
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			<roadtype selected="true"/>
			<sourceusetype selected="false"/>
			<movesvehicletype selected="false"/>
			<onroadscc selected="false"/>
			<offroadscc selected="false"/>
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			<engtechid selected="false"/>
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		<outputvmtdata value="true"/>
		<outputsho value="false"/>
		<outputsh value="false"/>
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		<outputshidling value="false"/>
		<outputstarts value="false"/>
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		<pmsize value="0"/>
		<outputfactors>
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			<distancefactors selected="true" units="Miles"/>
			<massfactors selected="true" units="Grams" energyunits="Joules"/>
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MOVES2010b Input Data (16th St & Camelback Rd Intersection)

[Link]

linkID	countyID	zoneID	roadTypeID	linkLength	linkVolume	linkAvgSpeed	linkDescription	linkAvgGrade
1	4013	40130	5	0.1	2,295	40	Approach Link	0
2	4013	40130	5	0.1	393	0	Queue Link	0
3	4013	40130	5	0.1	1,471	0	Queue Link	0
4	4013	40130	5	0.1	430	0	Queue Link	0
5	4013	40130	5	0.1	2,056	40	Departure Link	0
6	4013	40130	5	0.1	2,036	40	Approach Link	0
7	4013	40130	5	0.1	645	0	Queue Link	0
8	4013	40130	5	0.1	1,070	0	Queue Link	0
9	4013	40130	5	0.1	321	0	Queue Link	0
10	4013	40130	5	0.1	1,911	40	Departure Link	0
11	4013	40130	5	0.1	2,165	40	Approach Link	0
12	4013	40130	5	0.1	581	0	Queue Link	0
13	4013	40130	5	0.1	1,298	0	Queue Link	0
14	4013	40130	5	0.1	286	0	Queue Link	0
15	4013	40130	5	0.1	2,373	40	Departure Link	0
16	4013	40130	5	0.1	1,610	40	Approach Link	0
17	4013	40130	5	0.1	554	0	Queue Link	0
18	4013	40130	5	0.1	1,052	0	Queue Link	0
19	4013	40130	5	0.1	3	0	Queue Link	0
20	4013	40130	5	0.1	1,766	40	Departure Link	0

[LinkSourceTypeHour]

	SourceTypeHourFraction by SourceTypeID												
linkID	11	21	31	32	41	42	43	51	52	53	54	61	62
1	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
2	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
3	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
4	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
5	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
6	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
7	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
8	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
9	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
10	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
11	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
12	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
13	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
14	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
15	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
16	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
17	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
18	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
19	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217
20	0.0042	0.63303	0.23313	0.07789	0.00078	0.00021	0.00086	0.00025	0.02429	0.00355	0.00137	0.00828	0.01217

[FuelFormulation]

Fuel FormulationID	Fuel SubtypeID	RVP	Sulfur Level	ETOH Volume	MTBE Volume	ETBE Volume	TAME Volume	Aromatic Content	Olefin Content	Benzene Content	e200	e300	BioDiesel EsterVolume	Cetane Index	PAH Content	T50	T90
11112	12	8.5	16.4	10	0	0	0	16.0	6.4	3.7	51.6	90.3	0	0	0	190.4	298.5
21112	12	8.5	16.4	0	0	0	0	16.0	6.4	3.7	51.6	90.3	0	0	0	190.4	298.5
31012	20	0	5.6	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00

[FuelSupply]

countyID	fuelYearID	monthGroupID	fuelFormulationID	marketShare	marketShareCV
4013	2012	12	21112	0.05	0.5
4013	2012	12	11112	0.95	0.5
4013	2012	12	31012	1	0.5
4013	2012	12	30	1	0.5

[ZoneMonthHour]

monthID	zoneID	HourID	temperature	relHumidity
12	40130	17	57.5	38.2

[SourceTypeAgeDistribution]

		AgeFraction by SourceTypeID												
yearID	ageID	11	21	31	32	41	42	43	51	52	53	54	61	62
2025	0	0.0417	0.0527	0.0494	0.0539	0.0531	0.0531	0.0983	0.0983	0.0858	0.0989	0.0984	0.0983	0.0983
2025	1	0.0564	0.056	0.0494	0.051	0.0433	0.0433	0.0657	0.0657	0.0618	0.0662	0.0657	0.0657	0.0657
2025	2	0.0376	0.0513	0.0287	0.0288	0.0165	0.0165	0.0293	0.0293	0.0293	0.0294	0.0293	0.0293	0.0293
2025	3	0.082	0.0413	0.0227	0.0238	0.0268	0.0268	0.0356	0.0356	0.032	0.0355	0.0356	0.0356	0.0356
2025	4	0.0936	0.0666	0.0583	0.0603	0.0639	0.0639	0.0809	0.0809	0.0748	0.0808	0.0809	0.0809	0.0809
2025	5	0.1012	0.0776	0.0747	0.08	0.1396	0.1396	0.1364	0.1364	0.119	0.1354	0.1365	0.1364	0.1364
2025	6	0.0942	0.0775	0.0822	0.0871	0.1295	0.1295	0.1397	0.1397	0.1233	0.1386	0.1398	0.1397	0.1397
2025	7	0.077	0.073	0.0667	0.0677	0.0889	0.0889	0.0783	0.0783	0.0749	0.078	0.0783	0.0783	0.0783
2025	8	0.0563	0.0675	0.0696	0.0675	0.0576	0.0576	0.0457	0.0457	0.0522	0.0458	0.0457	0.0457	0.0457
2025	9	0.0651	0.0611	0.0576	0.055	0.0411	0.0411	0.0278	0.0278	0.036	0.028	0.0278	0.0278	0.0278
2025	10	0.0518	0.0577	0.0528	0.0499	0.0318	0.0318	0.0194	0.0194	0.0285	0.0196	0.0194	0.0194	0.0194
2025	11	0.0444	0.0516	0.0587	0.0557	0.043	0.043	0.0251	0.0251	0.0343	0.0253	0.0251	0.0251	0.0251
2025	12	0.0369	0.0484	0.0523	0.0529	0.0539	0.0539	0.059	0.059	0.0569	0.0586	0.059	0.059	0.059
2025	13	0.0303	0.0396	0.0393	0.0391	0.0498	0.0498	0.037	0.037	0.0374	0.0368	0.037	0.037	0.037
2025	14	0.0221	0.0312	0.0325	0.0317	0.0261	0.0261	0.0241	0.0241	0.0263	0.024	0.0241	0.0241	0.0241
2025	15	0.0175	0.0267	0.033	0.032	0.0258	0.0258	0.0215	0.0215	0.0246	0.0215	0.0215	0.0215	0.0215
2025	16	0.0165	0.0197	0.0238	0.0228	0.0223	0.0223	0.0127	0.0127	0.0157	0.0128	0.0127	0.0127	0.0127
2025	17	0.0132	0.0182	0.0232	0.0222	0.0218	0.0218	0.0125	0.0125	0.0154	0.0126	0.0125	0.0125	0.0125
2025	18	0.0101	0.0136	0.0206	0.0195	0.0138	0.0138	0.0084	0.0084	0.0118	0.0085	0.0084	0.0084	0.0084
2025	19	0.0094	0.0105	0.0135	0.0128	0.0085	0.0085	0.0057	0.0057	0.0079	0.0058	0.0057	0.0057	0.0057
2025	20	0.0069	0.008	0.0094	0.0089	0.0062	0.0062	0.0042	0.0042	0.0056	0.0042	0.0042	0.0042	0.0042
2025	21	0.0051	0.0069	0.0082	0.0079	0.0059	0.0059	0.0048	0.0048	0.0057	0.0048	0.0048	0.0048	0.0048
2025	22	0.0048	0.0054	0.0074	0.0072	0.0081	0.0081	0.0051	0.0051	0.0057	0.0051	0.0051	0.0051	0.0051
2025	23	0.0043	0.0044	0.0079	0.0076	0.0056	0.0056	0.0039	0.0039	0.005	0.004	0.0039	0.0039	0.0039
2025	24	0.0039	0.0036	0.0086	0.0081	0.0039	0.0039	0.003	0.003	0.0046	0.0031	0.003	0.003	0.003
2025	25	0.0036	0.0029	0.0093	0.0087	0.0027	0.0027	0.0023	0.0023	0.0043	0.0024	0.0023	0.0023	0.0023
2025	26	0.0033	0.0024	0.0102	0.0095	0.0019	0.0019	0.0017	0.0017	0.0042	0.002	0.0017	0.0017	0.0017
2025	27	0.003	0.0019	0.0107	0.0099	0.0013	0.0013	0.0013	0.0013	0.004	0.0016	0.0013	0.0013	0.0013
2025	28	0.0027	0.0016	0.0075	0.0069	0.0009	0.0009	0.001	0.001	0.0027	0.001	0.001	0.001	0.001
2025	29	0.0025	0.0013	0.0079	0.0072	0.0006	0.0006	0.0008	0.0008	0.0027	0.0008	0.0008	0.0008	0.0008
2025	30	0.0025	0.02	0.004	0.0044	0.0061	0.0061	0.0085	0.0087	0.0074	0.0091	0.0082	0.0086	0.0086

[IMCoverage]

polProcessID	stateID	countyID	yearID	sourcetypeID	fuelTypeID	IMProgramID	inspectFreq	testStandardsID	begModelYearID	endModelYearID	useIMyn	complianceFactor
101	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
101	4	4013	2025	21	1	6	2	33	1981	1995	N	95.8845
101	4	4013	2025	21	1	10	2	51	1996	2019	N	95.8845
101	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
101	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
101	4	4013	2025	31	1	10	2	51	1996	2019	N	95.8845
101	4	4013	2025	32	1	3	1	13	1967	1980	N	95.8845
101	4	4013	2025	32	1	6	2	33	1981	1995	N	95.8845
101	4	4013	2025	32	1	10	2	51	1996	2019	N	95.8845
101	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
102	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
102	4	4013	2025	21	1	6	2	33	1981	1995	N	95.8845
102	4	4013	2025	21	1	10	2	51	1996	2019	N	95.8845
102	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
102	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
102	4	4013	2025	31	1	10	2	51	1996	2019	N	95.8845
102	4	4013	2025	32	1	3	1	13	1967	1980	N	95.8845
102	4	4013	2025	32	1	6	2	33	1981	1995	N	95.8845
102	4	4013	2025	32	1	10	2	51	1996	2019	N	95.8845
102	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
112	4	4013	2025	21	1	8	2	43	1996	2019	N	95.8845
112	4	4013	2025	21	1	9	1	44	1981	1995	N	95.8845
112	4	4013	2025	31	1	8	2	43	1996	2019	N	95.8845
112	4	4013	2025	31	1	9	1	44	1981	1995	N	95.8845
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112	4	4013	2025	32	1	9	1	44	1981	1995	N	95.8845
112	4	4013	2025	52	1	7	1	41	1967	2019	N	95.8845
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113	4	4013	2025	32	1	8	2	43	1996	2019	N	95.8845
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113	4	4013	2025	52	1	7	1	41	1967	2019	N	95.8845
201	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
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201	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
201	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
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201	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
202	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
202	4	4013	2025	21	1	6	2	33	1981	1995	N	95.8845
202	4	4013	2025	21	1	10	2	51	1996	2019	N	95.8845
202	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
202	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
202	4	4013	2025	31	1	10	2	51	1996	2019	N	95.8845
202	4	4013	2025	32	1	3	1	13	1967	1980	N	95.8845
202	4	4013	2025	32	1	6	2	33	1981	1995	N	95.8845
202	4	4013	2025	32	1	10	2	51	1996	2019	N	95.8845
202	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
301	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
301	4	4013	2025	21	1	6	2	33	1981	1995	N	95.8845
301	4	4013	2025	21	1	10	2	51	1996	2019	N	95.8845
301	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
301	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
301	4	4013	2025	31	1	10	2	51	1996	2019	N	95.8845
301	4	4013	2025	32	1	3	1	13	1967	1980	N	95.8845
301	4	4013	2025	32	1	6	2	33	1981	1995	N	95.8845
301	4	4013	2025	32	1	10	2	51	1996	2019	N	95.8845
301	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
302	4	4013	2025	21	1	3	1	13	1967	1980	N	95.8845
302	4	4013	2025	21	1	6	2	33	1981	1995	N	95.8845
302	4	4013	2025	21	1	10	2	51	1996	2019	N	95.8845
302	4	4013	2025	31	1	3	1	13	1967	1980	N	95.8845
302	4	4013	2025	31	1	6	2	33	1981	1995	N	95.8845
302	4	4013	2025	31	1	10	2	51	1996	2019	N	95.8845

olProcessID	stateID	countyID	yearID	sourcetypeID	fuelTypeID	MProgramID	inspectFreq	testStandardsID	begModelYearID	endModelYearID	useIMyn	complianceFactor
302	4	4013	2025	32	1	3	1	13	1967	1980	N	95.8845
302	4	4013	2025	32	1	6	2	33	1981	1995	N	95.8845
302	4	4013	2025	32	1	10	2	51	1996	2019	N	95.8845
302	4	4013	2025	52	1	3	1	13	1967	2019	N	95.8845
101	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
101	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
101	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
101	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164
101	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
101	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
101	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
101	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
101	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
101	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032
102	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
102	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
102	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
102	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164
102	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
102	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
102	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
102	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
102	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
102	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032
112	4	4013	2025	21	1	108	2	43	1996	2021	Y	83.814
112	4	4013	2025	21	1	109	2	44	1981	1995	Y	64.12
112	4	4013	2025	31	1	108	2	43	1996	2021	Y	83.814
112	4	4013	2025	31	1	109	2	44	1981	1995	Y	64.12
112	4	4013	2025	32	1	108	2	43	1996	2021	Y	83.814
112	4	4013	2025	32	1	109	2	44	1981	1995	Y	64.12
112	4	4013	2025	52	1	107	1	41	1981	2021	Y	86.2872
113	4	4013	2025	21	1	108	2	43	1996	2021	Y	83.814
113	4	4013	2025	21	1	109	2	44	1981	1995	Y	64.12
113	4	4013	2025	31	1	108	2	43	1996	2021	Y	83.814
113	4	4013	2025	31	1	109	2	44	1981	1995	Y	64.12
113	4	4013	2025	32	1	108	2	43	1996	2021	Y	83.814
113	4	4013	2025	32	1	109	2	44	1981	1995	Y	64.12
113	4	4013	2025	52	1	107	1	41	1981	2021	Y	86.2872
201	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
201	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
201	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
201	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164
201	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
201	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
201	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
201	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
201	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
201	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032
202	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
202	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
202	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
202	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164
202	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
202	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
202	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
202	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
202	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
202	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032
301	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
301	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
301	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
301	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164
301	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
301	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
301	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
301	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
301	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
301	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032
302	4	4013	2025	21	1	103	1	13	1967	1980	Y	57.6164
302	4	4013	2025	21	1	106	2	31	1981	1995	Y	64.12
302	4	4013	2025	21	1	110	2	51	1996	2021	Y	90.0428
302	4	4013	2025	31	1	103	1	13	1967	1980	Y	57.6164

polProcessID	stateID	countyID	yearID	sourcetypeID	fuelTypeID	IMProgramID	inspectFreq	testStandardsID	begModelYearID	endModelYearID	useIMyn	complianceFactor
302	4	4013	2025	31	1	106	2	31	1981	1995	Y	64.12
302	4	4013	2025	31	1	110	2	51	1996	2021	Y	90.0428
302	4	4013	2025	32	1	103	1	13	1967	1980	Y	57.6164
302	4	4013	2025	32	1	106	2	31	1981	1995	Y	64.12
302	4	4013	2025	32	1	110	2	51	1996	2021	Y	90.0428
302	4	4013	2025	52	1	103	1	13	1967	2021	Y	87.2032

[AVFT]

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction by fuelTypeID		
				1	2	3
42	1960	2	1	0.0000	1.0000	0.0000
42	1961	2	1	0.0000	1.0000	0.0000
42	1962	2	1	0.0000	1.0000	0.0000
42	1963	2	1	0.0000	1.0000	0.0000
42	1964	2	1	0.0000	1.0000	0.0000
42	1965	2	1	0.0000	1.0000	0.0000
42	1966	2	1	0.0000	1.0000	0.0000
42	1967	2	1	0.0000	1.0000	0.0000
42	1968	2	1	0.0000	1.0000	0.0000
42	1969	2	1	0.0000	1.0000	0.0000
42	1970	2	1	0.0000	1.0000	0.0000
42	1971	2	1	0.0000	1.0000	0.0000
42	1972	2	1	0.0000	1.0000	0.0000
42	1973	2	1	0.0000	1.0000	0.0000
42	1974	2	1	0.0000	1.0000	0.0000
42	1975	2	1	0.0000	1.0000	0.0000
42	1976	2	1	0.0000	1.0000	0.0000
42	1977	2	1	0.0000	1.0000	0.0000
42	1978	2	1	0.0000	1.0000	0.0000
42	1979	2	1	0.0000	1.0000	0.0000
42	1980	2	1	0.0000	1.0000	0.0000
42	1981	2	1	0.0000	1.0000	0.0000
42	1982	2	1	0.0000	1.0000	0.0000
42	1983	2	1	0.0000	1.0000	0.0000
42	1984	2	1	0.0000	1.0000	0.0000
42	1985	2	1	0.0000	1.0000	0.0000
42	1986	2	1	0.0000	1.0000	0.0000
42	1987	2	1	0.0000	1.0000	0.0000
42	1988	2	1	0.0000	1.0000	0.0000
42	1989	2	1	0.0000	1.0000	0.0000
42	1990	2	1	0.0000	0.9930	0.0070
42	1991	2	1	0.0000	0.9820	0.0180
42	1992	2	1	0.0100	0.9440	0.0460
42	1993	2	1	0.0100	0.9140	0.0760
42	1994	2	1	0.0100	0.9050	0.0850
42	1995	2	1	0.0100	0.8370	0.1530
42	1996	2	1	0.0100	0.8920	0.0980
42	1997	2	1	0.0000	1.0000	0.0000
42	1998	2	1	0.0000	0.0000	1.0000
42	1999	2	1	0.0000	0.0000	1.0000
42	2000	2	1	0.0000	0.0000	1.0000
42	2001	2	1	0.0000	0.0000	1.0000
42	2002	2	1	0.0000	0.0000	1.0000
42	2003	2	1	0.0000	0.0800	0.9200
42	2004	2	1	0.0000	0.3971	0.6029
42	2005	2	1	0.0000	1.0000	0.0000
42	2006	2	1	0.0897	0.1282	0.7821
42	2007	2	1	0.1495	0.8505	0.0000
42	2008	2	1	0.0000	0.4796	0.5204
42	2009	2	1	0.1212	0.0303	0.8485
42	2010	2	1	0.0000	1.0000	0.0000
42	2011	2	1	0.0000	1.0000	0.0000
42	2012	2	1	0.0000	1.0000	0.0000
42	2013	2	1	0.0000	1.0000	0.0000
42	2014	2	1	0.0000	1.0000	0.0000
42	2015	2	1	0.0000	1.0000	0.0000
42	2016	2	1	0.0000	1.0000	0.0000
42	2017	2	1	0.0000	1.0000	0.0000
42	2018	2	1	0.0000	1.0000	0.0000
42	2019	2	1	0.0000	1.0000	0.0000
42	2020	2	1	0.0000	1.0000	0.0000
42	2021	2	1	0.0000	1.0000	0.0000
42	2022	2	1	0.0000	1.0000	0.0000
42	2023	2	1	0.0000	1.0000	0.0000
42	2024	2	1	0.0000	1.0000	0.0000
42	2025	2	1	0.0000	1.0000	0.0000
42	2026	2	1	0.0000	1.0000	0.0000
42	2027	2	1	0.0000	1.0000	0.0000

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction by fuelTypeID		
				1	2	3
42	2028	2	1	0.0000	1.0000	0.0000
42	2029	2	1	0.0000	1.0000	0.0000
42	2030	2	1	0.0000	1.0000	0.0000
42	2031	2	1	0.0000	1.0000	0.0000
42	2032	2	1	0.0000	1.0000	0.0000
42	2033	2	1	0.0000	1.0000	0.0000
42	2034	2	1	0.0000	1.0000	0.0000
42	2035	2	1	0.0000	1.0000	0.0000
42	2036	2	1	0.0000	1.0000	0.0000
42	2037	2	1	0.0000	1.0000	0.0000
42	2038	2	1	0.0000	1.0000	0.0000
42	2039	2	1	0.0000	1.0000	0.0000
42	2040	2	1	0.0000	1.0000	0.0000
42	2041	2	1	0.0000	1.0000	0.0000
42	2042	2	1	0.0000	1.0000	0.0000
42	2043	2	1	0.0000	1.0000	0.0000
42	2044	2	1	0.0000	1.0000	0.0000
42	2045	2	1	0.0000	1.0000	0.0000
42	2046	2	1	0.0000	1.0000	0.0000
42	2047	2	1	0.0000	1.0000	0.0000
42	2048	2	1	0.0000	1.0000	0.0000
42	2049	2	1	0.0000	1.0000	0.0000
42	2050	2	1	0.0000	1.0000	0.0000

Appendix III-ii

CAL3QHC Inputs and Outputs

This appendix contains information on the microscale intersection modeling. CAL3QHC input and output files for the Thomas Road and 27th Ave intersection were provided as an example.

Each CAL3QHC run estimates one-hour carbon monoxide concentrations. These one-hour concentrations were post-processed for eight-hour concentrations.

CAL3QHC Input

```
'Thomas Road and 27th Ave Intersection' 60. 175. 0. 0. 39 0.3048 0 1
'NE1 '   639049.4  903028.7 6.0
'NE2 '   639119.5  902927.8 6.0
'NE3 '   639505.8  902732.5 6.0
'NE4 '   639408.2  902760.7 6.0
'NE5 '   639245.4  902762.9 6.0
'NE6 '   639147.7  902834.5 6.0
'NE7 '   639708.7  902569.8 6.0
'NE8 '   639706.6  902503.6 6.0
'NE9 '   639611.1  902499.2 6.0
'NE10'   639572.0  902634.9 6.0
'NE11'   639576.3  902538.3 6.0
'NE12'   639506.9  902503.6 6.0
'NE13'   639019.7  902867.1 6.0
'NE14'   639049.0  902768.3 6.0
'NE15'   639114.1  902698.9 6.0
'NE16'   639313.8  902468.9 6.0
'NE17'   639213.9  902540.5 6.0
'NE18'   639284.5  902569.8 6.0
'NE19'   639218.3  902602.3 6.0
'NE20'   639314.8  902638.1 6.0
'NE21'   639406.0  902631.6 6.0
'NE22'   639404.9  902537.2 6.0
'NE23'   639378.9  902473.2 6.0
'NE24'   639246.5  902468.9 6.0
'NE25'   639013.2  902536.1 6.0
'NE26'   638980.6  902569.8 6.0
'NE27'   639050.1  902505.7 6.0
'NE28'   639014.3  902469.9 6.0
'NE29'   638985.0  902504.7 6.0
'NE30'   638953.5  903195.8 6.0
'NE31'   638954.6  903063.5 6.0
'NE32'   638955.7  902933.3 6.0
'NE33'   638953.5  902832.4 6.0
'NE34'   638952.4  902736.9 6.0
'NE35'   638952.4  902630.5 6.0
'NE36'   638950.3  902539.4 6.0
'NE37'   639088.1  902454.7 6.0
'NE38'   638986.1  902447.2 6.0
'NE39'   638951.3  902469.9 6.0
'Thomas Road and 27th Ave      Hour:24' 24 1 0 'c'
1
'L01:Thomas EBA  ' 'AG' 637583.8 902371.2 638903.2 902371.2 1261. 1.53 0 56
1
'L06:Thomas EBD  ' 'AG' 638903.2 902369.1 639947.0 902406.0 1818. 1.53 0 56
1
'L07:Thomas WBA  ' 'AG' 639949.2 902460.2 638901.1 902404.2 2871. 1.53 0 56
1
'L11:Thomas WBD  ' 'AG' 638900.9 902399.2 637583.8 902397.3 2051. 1.53 0 56
1
'L12:27 AVE NBA  ' 'AG' 638909.7 901073.5 638916.2 902389.9 1413. 1.53 0 56
1
'L17:27 AVE NBD  ' 'AG' 638916.3 902390.1 638911.9 903649.4 1671. 1.53 0 44
1
'L18:27 AVE EBA  ' 'AG' 638892.3 903647.3 638883.6 902389.7 1504  1.53 0 44
1
'L23:27 AVE SBD  ' 'AG' 638890.1 902389.6 638881.5 901073.5 1092. 1.53 0 44
1
'L24:27 AVE SEBD ' 'AG' 638901.2 902388.8 639740.6 901493.8  417. 1.48 0 44
2
'L02:Thomas EBRT1' 'AG' 638823.8 902368.1 638458.5 902370.9 0 12 1
90 55 5.5 196 6.25 1900 2 3
2
'L03:Thomas EBRT2' 'AG' 638821.6 902360.8 638456.3 902360.8 0 12 1
90 55 5.5 39 6.25 1900 2 3
2
'L04:Thomas EBTH ' 'AG' 638823.8 902376.4 638460.6 902376.4 0 36 3
90 55 5.5 811 6.25 1900 2 3
2
```

```
'L05:Thomas EBLT ' 'AG' 638823.1 902384.1 638462.7 902384.1 0 12 1
90 71 4.0 215 6.25 1900 2 3
2
'L08:Thomas WBRT ' 'AG' 638963.4 902429.2 639252.3 902441.7 0 12 1
90 55 5.5 673 6.25 1900 2 3
2
'L09:Thomas WBTH ' 'AG' 638968.3 902413.9 639257.2 902426.4 0 36 3
90 55 5.5 1727 6.25 1900 2 3
2
'L10:Thomas WBLT ' 'AG' 638973.1 902397.3 639262.0 902409.8 0 12 1
90 71 4.0 471 6.25 1900 2 3
2
'L13:27 AVE NBRT1' 'AG' 638932.8 902293.8 638929.7 902080.2 0 12 1
90 54 5.9 533 6.25 1900 2 3
2
'L14:27 AVE NBRT2' 'AG' 638936.7 902231.1 638935.7 902080.7 0 12 1
90 54 5.9 16 6.25 1900 2 3
2
'L15:27 AVE NBTH ' 'AG' 638917.2 902296.6 638916.9 902083.1 0 24 2
90 54 5.9 783 6.25 1900 2 3
2
'L16:27 AVE NBLT ' 'AG' 638904.7 902298.4 638900.8 902078.4 0 12 1
90 71 4.0 82 6.25 1900 2 3
2
'L19:27 AVE SBRT ' 'AG' 638864.4 902454.5 638864.4 902692.0 0 12 1
90 54 5.9 242 6.25 1900 2 3
2
'L20:27 AVE SBTH ' 'AG' 638881.0 902455.6 638881.0 902693.1 0 24 2
90 54 5.9 582 6.25 1900 2 3
2
'L21:27 AVE SBLT1' 'AG' 638895.6 902457.1 638895.6 902694.6 0 12 1
90 71 4.0 206 6.25 1900 2 3
2
'L22:27 AVE SBLT2' 'AG' 638905.5 902458.2 638905.5 902695.7 0 24 2
90 71 4.0 474 6.25 1900 2 3
1. 0. 4 1000. 0. 'Y' 10 0 36
```

CAL3QHC Output

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: Thomas Road and 27th Ave Intersection RUN: Thomas Road and 27th Ave Hour:24

DATE : 9/20/12
TIME : 14:58:29

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. L01:Thomas EBA	194335.5	275042.8	194737.7	275042.8	402.	90.	AG	1261.	1.5	0.0	17.1		
2. L06:Thomas EBD	194737.7	275042.1	195055.8	275053.3	318.	88.	AG	1818.	1.5	0.0	17.1		
3. L07:Thomas WBA	195056.5	275069.9	194737.1	275052.8	320.	267.	AG	2871.	1.5	0.0	17.1		
4. L11:Thomas WBD	194737.0	275051.3	194335.5	275050.7	401.	270.	AG	2051.	1.5	0.0	17.1		
5. L12:27 AVE NBA	194739.7	274647.2	194741.7	275048.4	401.	0.	AG	1413.	1.5	0.0	17.1		
6. L17:27 AVE NBD	194741.7	275048.5	194740.3	275432.3	384.	360.	AG	1671.	1.5	0.0	13.4		
7. L18:27 AVE EBA	194734.4	275431.7	194731.7	275048.4	383.	180.	AG	1504.	1.5	0.0	13.4		
8. L23:27 AVE SBD	194733.7	275048.4	194731.1	274647.2	401.	180.	AG	1092.	1.5	0.0	13.4		
9. L24:27 AVE SEBD	194737.1	275048.1	194992.9	274775.3	374.	137.	AG	417.	1.5	0.0	13.4		
10. L02:Thomas EBRT1	194713.5	275041.8	194695.5	275041.9	18.	270.	AG	10.	100.0	0.0	3.7	0.34	3.0
11. L03:Thomas EBRT2	194712.8	275039.6	194709.3	275039.6	4.	270.	AG	10.	100.0	0.0	3.7	0.07	0.6
12. L04:Thomas EBTH	194713.5	275044.3	194688.8	275044.3	25.	270.	AG	31.	100.0	0.0	11.0	0.47	4.1
13. L05:Thomas EBLT	194713.3	275046.7	194686.8	275046.7	27.	270.	AG	13.	100.0	0.0	3.7	0.78	4.4
14. L08:Thomas WBRT	194756.0	275060.4	195127.1	275076.5	371.	88.	AG	10.	100.0	0.0	3.7	1.16	61.9
15. L09:Thomas WBTH	194757.5	275055.8	194834.1	275059.1	77.	88.	AG	31.	100.0	0.0	11.0	0.99	12.8
16. L10:Thomas WBLT	194759.0	275050.7	195436.9	275079.8	679.	88.	AG	13.	100.0	0.0	3.7	1.72	113.1
17. L13:27 AVE NBRT1	194746.7	275019.2	194745.9	274964.7	54.	181.	AG	10.	100.0	0.0	3.7	0.90	9.1
18. L14:27 AVE NBRT2	194747.9	275000.1	194747.9	274998.6	1.	181.	AG	10.	100.0	0.0	3.7	0.03	0.2
19. L15:27 AVE NBTH	194742.0	275020.0	194741.9	274984.8	35.	180.	AG	20.	100.0	0.0	7.3	0.66	5.9
20. L16:27 AVE NBLT	194738.2	275020.6	194738.0	275010.9	10.	181.	AG	13.	100.0	0.0	3.7	0.30	1.6
21. L19:27 AVE SBRT	194725.9	275068.1	194725.9	275089.9	22.	360.	AG	10.	100.0	0.0	3.7	0.41	3.6
22. L20:27 AVE SBTH	194730.9	275068.5	194730.9	275094.7	26.	360.	AG	20.	100.0	0.0	7.3	0.49	4.4
23. L21:27 AVE SBLT1	194735.4	275068.9	194735.4	275093.6	25.	360.	AG	13.	100.0	0.0	3.7	0.75	4.1
24. L22:27 AVE SBLT2	194738.4	275069.3	194738.4	275101.8	33.	360.	AG	26.	100.0	0.0	7.3	0.86	5.4

JOB: Thomas Road and 27th Ave Intersection RUN: Thomas Road and 27th Ave Hour:24

DATE : 9/20/12
TIME : 14:58:29

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
10. L02:Thomas EBRT1	90	55	5.5	196	1900	6.25	2	3
11. L03:Thomas EBRT2	90	55	5.5	39	1900	6.25	2	3
12. L04:Thomas EBTH	90	55	5.5	811	1900	6.25	2	3
13. L05:Thomas EBLT	90	71	4.0	215	1900	6.25	2	3
14. L08:Thomas WBRT	90	55	5.5	673	1900	6.25	2	3
15. L09:Thomas WBTH	90	55	5.5	1727	1900	6.25	2	3
16. L10:Thomas WBLT	90	71	4.0	471	1900	6.25	2	3
17. L13:27 AVE NBRT1	90	54	5.9	533	1900	6.25	2	3
18. L14:27 AVE NBRT2	90	54	5.9	16	1900	6.25	2	3
19. L15:27 AVE NBTH	90	54	5.9	783	1900	6.25	2	3
20. L16:27 AVE NBLT	90	71	4.0	82	1900	6.25	2	3
21. L19:27 AVE SBRT	90	54	5.9	242	1900	6.25	2	3
22. L20:27 AVE SBTH	90	54	5.9	582	1900	6.25	2	3
23. L21:27 AVE SBLT1	90	71	4.0	206	1900	6.25	2	3
24. L22:27 AVE SBLT2	90	71	4.0	474	1900	6.25	2	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. NE1	194782.3	275243.2	1.8
2. NE2	194803.6	275212.4	1.8
3. NE3	194921.4	275152.9	1.8
4. NE4	194891.6	275161.5	1.8
5. NE5	194842.0	275162.1	1.8
6. NE6	194812.2	275184.0	1.8
7. NE7	194983.2	275103.3	1.8
8. NE8	194982.6	275083.1	1.8
9. NE9	194953.5	275081.8	1.8
10. NE10	194941.5	275123.1	1.8
11. NE11	194942.9	275093.7	1.8
12. NE12	194921.7	275083.1	1.8
13. NE13	194773.2	275193.9	1.8
14. NE14	194782.1	275163.8	1.8
15. NE15	194802.0	275142.6	1.8
16. NE16	194862.9	275072.5	1.8
17. NE17	194832.4	275094.3	1.8
18. NE18	194853.9	275103.3	1.8
19. NE19	194833.8	275113.2	1.8
20. NE20	194863.2	275124.1	1.8
21. NE21	194891.0	275122.1	1.8
22. NE22	194890.6	275093.3	1.8
23. NE23	194882.7	275073.8	1.8
24. NE24	194842.3	275072.5	1.8
25. NE25	194771.2	275093.0	1.8
26. NE26	194761.3	275103.3	1.8
27. NE27	194782.5	275083.8	1.8
28. NE28	194771.6	275072.8	1.8
29. NE29	194762.6	275083.4	1.8
30. NE30	194753.0	275294.1	1.8

JOB: Thomas Road and 27th Ave Intersection RUN: Thomas Road and 27th Ave Hour:24

DATE : 9/20/12
TIME : 14:58:29

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
31. NE31	194753.4	275253.8	1.8
32. NE32	194753.7	275214.1	1.8
33. NE33	194753.0	275183.3	1.8
34. NE34	194752.7	275154.2	1.8
35. NE35	194752.7	275121.8	1.8
36. NE36	194752.1	275094.0	1.8
37. NE37	194794.1	275068.2	1.8
38. NE38	194763.0	275065.9	1.8
39. NE39	194752.4	275072.8	1.8

JOB: Thomas Road and 27th Ave Intersection RUN: Thomas Road and 27th Ave Hour:24

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) * CONCENTRATION (PPM)

WIND ANGLE (DEGR)	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
90.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
100.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
110.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.1	0.1	0.0	0.0
120.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0
130.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0
140.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
150.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
160.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
170.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
180.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
190.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
200.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
210.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0
220.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0
230.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0
240.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0
250.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
260.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
270.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
280.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
310.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
320.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
330.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
340.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
350.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
360.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.1	0.1	0.0	0.0
DEGR.	0	0	0	0	0	0	130	100	90	0	110	90	0	0	0	110	100	110	0	0

JOB: Thomas Road and 27th Ave Intersection RUN: Thomas Road and 27th Ave Hour:24

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39
0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
10.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
90.	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1
100.	0.0	0.1	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.1
110.	0.0	0.1	0.3	0.3	0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.3
120.	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.3
130.	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.2
140.	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.2
150.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1
160.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1
170.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1
180.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2
190.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.2
200.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3	0.1
210.	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2
220.	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1
230.	0.0	0.1	0.2	0.3	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
240.	0.0	0.1	0.3	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
250.	0.0	0.1	0.2	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
260.	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
270.	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
280.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
290.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
300.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
310.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.2
320.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
330.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.1	0.2
340.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.1	0.2
350.	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.0	0.1	0.2
360.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
MAX	0.0	0.1	0.3	0.3	0.1	0.1	0.1	0.3	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.4	0.3
DEGR.	0	100	110	110	100	110	100	110	100	200	200	200	210	330	330	250	100	100	110

THE HIGHEST CONCENTRATION OF 0.40 PPM OCCURRED AT RECEPTOR REC37.

APPENDIX IV

COMMENTS AND MAG RESPONSES

Appendix IV-i

Comments and MAG Responses on the Technical Support Document in Support of the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area

EPA Comments

Comments received from the Environmental Protection Agency (EPA) in an email from Wienke Tax dated December 5, 2012

Comment: In general, the TSD is clearly written and well documented. The actual maintenance demonstration(s) was well executed and documented, and the Weight of Evidence section was impressive.

It is not entirely clear whether the TSD was intended to include all the details of the maintenance plan you are developing, or to focus mainly on the plan's technical underpinnings. To the extent possible, structuring the 2013 MAG CO maintenance plan to include the relevant portions of EPA's 1992 memorandum, "Procedures for Processing Requests to Redesignate Areas to Attainment" (the Calcagni memo) related to maintenance plans will facilitate our review and action on the plan. I have attached the Calcagni memo below for your reference. For example, related to the contingency plan required under CAA section 175A, the memo states on page 12, "For the purposes of [CAA] section 175A, a state is not required to have fully adopted contingency measures that will take effect without further action by the state in order for the maintenance plan to be approved. However, the contingency plan is considered to be an enforceable part of the SIP and should ensure that the contingency measures are adopted expediently once they are triggered." I did not see a reference to a trigger mechanism in the description of the contingency measures in the TSD.

MAG Response: Thank you very much for the EPA's positive feedback and comments on the Technical Support Document (TSD) in support of the 2013 MAG Carbon Monoxide Maintenance Plan.

As for the EPA comments provided by the email dated on December 6, 2012 regarding the TSD, MAG will address the comments in the 2013 MAG Carbon Monoxide Maintenance Plan since the TSD was intended to focus on the plan's technical underpinnings: The 2013 MAG Carbon Monoxide Maintenance Plan document will address the relevant portions of EPA's 1992 memorandum. The description on the trigger mechanism of the contingency measures will be provided in the plan.

APPENDIX B

APPENDIX B

EXHIBIT 1

Public Hearing Process Documentation

CERTIFICATION OF HOLDING OF PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

I affirm that a public hearing was held jointly by the Arizona Department of Environmental Quality and the Maricopa Association of Governments (MAG) starting at 5:30 p.m. Tuesday, February 19, 2013 at the MAG Offices, Saguaro Room, 302 North 1st Avenue, Phoenix, Arizona and that the hearing was held in accordance with the Arizona open meeting laws and 40 CFR 51.102 (d) to receive public comment on the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area.

February 19, 2013
Date

Lindy Bauer
Lindy Bauer, ~~MAG~~
Environmental Director

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

Personally appeared before me the above-named Lindy Bauer known to me to be the same person who executed the foregoing instrument and to be the Environmental Director for the Maricopa Association of Governments and acknowledged to me that she executed the same as her free act.

SUBSCRIBED AND SWORN TO before me on this 19th day of February 2013.

VALERIE DAY
Notary Public - State of Arizona
MARICOPA COUNTY
My Commission Expires
August 15, 2016

Valerie Day
Notary Public

My Commission Expires:

August 15, 2016

PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA
February 19, 2013
at 5:30 p.m.
MAG Offices, Saguaro Room
302 N. 1st Avenue, Second Floor Phoenix,Arizona 85003

The Arizona Department of Environmental Quality (ADEQ) and Maricopa Association of Governments (MAG) will jointly conduct a public hearing on the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. The purpose of the hearing is to receive public comments.

In accordance with Section 175A(b) of the Clean Air Act, the MAG 2013 Carbon Monoxide Maintenance Plan has been prepared. There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996. The modeling analysis in the maintenance plan demonstrates that the standards will continue to be met through 2025.

The draft document is available for public review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday and on the MAG website at www.azmag.gov. Public comments are welcome at the hearing, or may be submitted in writing by 5:30 p.m. on February 19, 2013 to Lindy Bauer at the address below. After considering the public comments, the MAG Regional Council may take action on the maintenance plan on March 27, 2013. The ADEQ may then adopt the plan for submittal to the Environmental Protection Agency.

Contact person: Lindy Bauer, MAG (602) 254-6300 302 N. 1st Avenue, Suite 300 Phoenix, AZ 85003 Fax: (602) 254-6490 E-mail: lbauer@azmag.gov

Pub: January 18, 2013

AFFIDAVIT OF PUBLICATION

THE ARIZONA REPUBLIC

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

Tabitha Weaver, being first duly sworn, upon oath deposes and says: That she is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic

January 18, 2013

Sworn to before me this
18st day of
January A.D. 2013

MANUEL VARGAS
Notary Public - State of Arizona
MARICOPA COUNTY
My Commission Expires
November 30, 2015

Notary Public

MARICOPA
ASSOCIATION of
GOVERNMENTS

302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
E-mail: mag@azmag.gov ▲ Web site: www.azmag.gov

January 18, 2013

TO: Interested Parties for Air Quality

FROM: Lindy Bauer, Environmental Director

SUBJECT: PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

Public Hearing
February 19, 2013 at 5:30 p.m.
MAG Offices, Saguaro Room
302 North 1st Avenue, Second Floor
Phoenix, Arizona 85003

The Arizona Department of Environmental Quality and Maricopa Association of Governments (MAG) will jointly conduct a public hearing on the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area on February 19, 2013 at 5:30 p.m. The purpose of this hearing is to receive public comments.

In accordance with Section 175A(b) of the Clean Air Act, the MAG 2013 Carbon Monoxide Maintenance Plan has been prepared. There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996. The modeling analysis in the maintenance plan demonstrates that the standards will continue to be met through 2025.

For your information and convenience, a copy of the public hearing notice is enclosed. The draft document is available for public review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website at www.azmag.gov.

Attachment

PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

February 19, 2013 at 5:30 p.m.
MAG Offices, Saguaro Room
302 N. 1st Avenue, Second Floor
Phoenix, Arizona 85003

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Contact person: Lindy Bauer, MAG (602) 254-6300
302 N. 1st Avenue, Suite 300
Phoenix, AZ 85003
Fax: (602) 254-6490
E-mail: lbauer@azmag.gov

TITLE VI
LETTER EXAMPLE

MARICOPA ASSOCIATION of GOVERNMENTS

302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
E-mail: mag@azmag.gov ▲ Web site: www.azmag.gov

January 18, 2013

Ms. Cynthia Zwick
Director
Arizona Community Action Association
2700 North 3rd Street, Suite 3040
Phoenix, AZ 85004-1122

Dear Ms. Zwick:

You are cordially invited to a public hearing on the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. The hearing will be held jointly by the Arizona Department of Environmental Quality and Maricopa Association of Governments (MAG) on Tuesday, February 19, 2013 at 5:30 p.m. in the Saguaro Room at the MAG Offices, 302 North 1st Avenue, Second Floor, Phoenix, Arizona, 85003. The purpose of this hearing is to receive public comments. Written and verbal comments are welcomed at the public hearing. After considering public comments, the MAG Regional Council may take action on the plan on March 27, 2013.

In accordance with Section 175A(b) of the Clean Air Act, the MAG 2013 Carbon Monoxide Maintenance Plan has been prepared. There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996. The modeling analysis in the maintenance plan demonstrates that the standards will continue to be met through 2025.

The draft document is available for review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website at www.azmag.gov. We hope to see you or your representative at the hearing and to include your input in future planning efforts. For your convenience, a copy of the public hearing notice is attached. If you have any questions or would like to set up a time for us to meet with your organization, please call me at (602) 254-6300.

Sincerely,

Lindy Bauer

Lindy Bauer
Environmental Director

Attachment

PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

February 19, 2013 at 5:30 p.m.
MAG Offices, Saguaro Room
302 N. 1st Avenue, Second Floor
Phoenix, Arizona 85003

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MARICOPA
ASSOCIATION of
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Phone (602) 254-6300 ▲ FAX (602) 254-6490
E-mail: mag@azmag.gov ▲ Web site: www.azmag.gov

January 18, 2013

TO: Leslie Rogers, Federal Transit Administration
Karla Petty, Federal Highway Administration
John Halikowski, Arizona Department of Transportation
Henry Darwin, Arizona Department of Environmental Quality
Neal Young, City of Phoenix Public Transit Department
Stephen Banta, Valley Metro/RPTA
William Wiley, Maricopa County Air Quality Department
Al Larson, Central Arizona Governments
Donald Gabrielson, Pinal County Air Quality Control District
Gregory Nudd, U.S. Environmental Protection Agency, Region IX

FROM: Lindy Bauer, Environmental Director

SUBJECT: TRANSMITTAL OF THE DRAFT MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

The Maricopa Association of Governments (MAG) has prepared the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. The draft document is available for review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m., Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website. Any comments are requested by 5:30 p.m. on February 19, 2013.

In accordance with Section 175A(b) of the Clean Air Act, the MAG 2013 Carbon Monoxide Maintenance Plan has been prepared. There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996. The modeling analysis in the maintenance plan demonstrates that the standards will continue to be met through 2025.

On February 19, 2013, a public hearing will be held jointly by the Arizona Department of Environmental Quality (ADEQ) and MAG at the MAG Offices, Saguaro Room, Second Floor, Phoenix, Arizona at 5:30 p.m. After considering public comments, the MAG Regional Council may take action on the plan on March 27, 2013. The ADEQ may then adopt the plan for submittal to the EPA. If you have any questions, please do not hesitate to contact me at (602) 254-6300.

cc: Eric Massey, Arizona Department of Environmental Quality
Scott Omer, Arizona Department of Transportation

PUBLIC HEARING ON THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

February 19, 2013 at 5:30 p.m.
MAG Offices, Saguaro Room
302 N. 1st Avenue, Second Floor
Phoenix, Arizona 85003

The Arizona Department of Environmental Quality (ADEQ) and Maricopa Association of Governments (MAG) will jointly conduct a public hearing on the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. The purpose of the hearing is to receive public comments.

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Phoenix, AZ 85003
Fax: (602) 254-6490
E-mail: lbauer@azmag.gov

PUBLIC HEARING ON THE
MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN
FOR THE MARICOPA COUNTY AREA

Phoenix, Arizona
February 19, 2013
5:30 p.m.

PREPARED FOR:

Maricopa Association of Governments
(ORIGINAL)

REPORTED BY:

Debora Mitchell
Arizona CCR No. 50768

OTTMAR
Ottmar & Associates, Inc.
2800 North Central Avenue, Suite150
Phoenix, AZ 85004
T 602.485.1488
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Toll free 1.866.485.1444

MARICOPA ASSOCIATION OF GOVERNMENTS 2013 Carbon Monoxide Maintenance Plan Public Hearing, taken on February 19, 2013, commencing at 5:30 p.m. at Maricopa Association of Governments, 302 North 1st Avenue, Saguaro Room, Phoenix, Arizona, before Debora Mitchell, an Arizona Certified Reporter, in and for the County of Maricopa, State of Arizona.

APPEARANCES:

Ms. Lindy Bauer, Maricopa Association of Governments

Ms. Diane Arnst, Arizona Department of Environmental Quality

(Commencement of Public Hearing at 5:30 p.m.)

* * * * *

MS. BAUER: Good evening. My name is Lindy Bauer with the Maricopa Association of Governments, and I would like to welcome those if you that came to our public hearing on the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. This public hearing is being jointly held by the Arizona Department of Environmental Quality and Maricopa Association of Governments to receive public comments on the draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area.

Those driving to the meeting and parked in the garage can have their tickets validated by MAG staff. The public hearing will begin with some introductory remarks by the Arizona Department of Environmental Quality and then an overview presentation by the MAG staff.

Following the presentation, hearing participants are invited to make comments for the public record. A court reporter is present to provide an official record of the hearing. Written comments are also welcomed at the hearing.

For those participants who wish to speak, please fill out a form on the table and place it in the box. If you need to speak early to meet a bus schedule, please tell the MAG staff, and we will accommodate your request.

As you come up to the podium, please state some information for the formal record, your name, and who you represent. I'd like to note that we have a timer to assist the public in their presentations. We have a three-minute time limit. When two minutes have elapsed, the yellow light will come on notifying the speaker that they have one minute to sum up. At the end of the three-minute time period, the red light will come on.

And now we will have some introductory remarks from the Arizona Department of Environmental Quality.

MS. ARNST: My name is Diane Arnst, and I am the manager of the legal support section at the Arizona Department of Environmental Quality. I am here to express support and confidence that this maintenance plan will continue to prevent any violations of the common monoxide standard, which has been met for more than 16 years.

MS. BAUER: Thank you very much, Diane.

And now we will move on to the presentation on the MAG 2013 Carbon Monoxide Maintenance Plan.

Thank you very much. It is a real pleasure to present this carbon monoxide maintenance plan. As you will soon see, we have been clean from this pollutant for several years. Carbon monoxide is a colorless, odorless, tasteless gas. Carbon monoxide used to be a problem here during the winter months; however, the region has met the standard and has been clean for several years.

To give you an overview, in April of 2005, the Environmental Protection Agency approved the revised MAG 1999 Serious Area Carbon Monoxide Plan. This plan demonstrated attainment of the standard in the year 2000. At the same time, the EPA also approved the MAG 2003 Carbon Monoxide Redesignation Request and Maintenance Plan. This plan demonstrated maintenance of the standard through 2015.

At the same time, the EPA also redesignated the Maricopa County Nonattainment Area to attainment status. We then became a maintenance area. There have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour carbon monoxide standard since 1996.

The carbon monoxide maintenance area encompasses 1,882 square miles. There are 13 carbon monoxide monitors in the region; 12 of these are inside of the maintenance area. Now, MAG closely tracks the air quality monitor data. Over the years there has been tremendous progress in reducing this pollutant. Several measures have been implemented by the local governments, the state, and the federal government.

As you can see, in 1984 there were 86 days of exceedances of the carbon monoxide standard. And look at all of the zeros. We have been clean for several years. Carbon monoxide concentrations have also decreased significantly. In 2012, the second-highest eight-hour concentration is 2.5 parts per million against a standard of 9. This is less than a third of the carbon monoxide standard. So this region at the monitors is way below the standard.

The MAG 2013 Carbon Monoxide Maintenance Plan is designed to meet the requirements of Section 175(b) of the Clean Air Act. The Clean Air Act requires an additional plan demonstrating maintenance of the standard for ten years beyond the initial ten-year period. This maintenance plan is due eight years from the point of when EPA redesignated this region to attainment. This was April 8, 2013, which is coming up shortly. We must demonstrate maintenance of the standard ten years after 2015, or by 2025.

The 2008 carbon monoxide emissions inventory serves as the base for this plan. As you can see, 64.5 percent of the carbon monoxide emissions are coming from onroad sources, cars and trucks for the most part. And then you can see, 31.2 percent is also coming from nonroad equipment and vehicles. Only a very small part is due to point sources and area sources.

Our general approach for this plan has been to rely on the measures from our prior Serious Area Carbon Monoxide Plan and Maintenance Plan that had been approved by the EPA. There are ten measures in this maintenance plan. Most are related to the vehicle emissions inspection program because this pollutant is very much tailpipe related. Then in addition there are the clean burning fireplace ordinances. And I want to point out that expansion of the Area A boundaries, this was previously a contingency measure. However, for this plan, it has been moved over to the maintenance side.

The carbon monoxide maintenance plan also includes contingency measures. There are three of them, and these again are tied to the vehicle emissions testing program: the gross polluter option, increased waiver repair limit options, and reinstatement of the vehicle emissions program for motorcycles.

I would like to point out that in November of 2012, the EPA proposed to approve a plan submitted by the Arizona Department of Environmental Quality that will eliminate the requirement for motorcycles to be tested in the vehicle emissions testing program. DEQ made a commitment to reinstate the program if there is a violation of the carbon monoxide standard. So these are the three contingency measures that have benefits above and beyond what is already in the plan, above and beyond the other ten measures.

Now, MAG performed a series of analyses on the measures for this plan. Again, the carbon monoxide standard, the second-highest monitored value each year should not exceed 35 parts per million for the one-hour standard, 9 parts per million for the eight-hour average.

Three different analyses were performed: a comparison of the emission inventories, scaling maximum concentrations, and intersection analysis. In addition, there were two weight of the evidence evaluations conducted where we examined actual air quality trends and meteorological data. The results: the maximum 2025 eight-hour carbon monoxide concentration is 4 parts per million. This is less than half the standard.

Now, the air quality analysis produces a pie chart in 2025 assuming that we will be at 4 parts per million. And as you can see in this pie chart, the total tonnage has been reduced greatly from the 901 tons down to 639.6 metric tons per day.

This pie chart also produces a motor vehicles emissions budget for transportation conforming purposes of 559.4 metric tons per day. We use the motor vehicle emission budget to test our transportation plans to ensure that transportation plans, programs, and projects will not contribute to air-quality violations.

Now, at this point, I would like to point out that we have made an adjustment to the point source category due to converting English tons to metric tons. This amounts to 1.8 tons added to the point source category. This is insignificant since the 1.8 tons equates to .28 percent of the 639.6 tons. I would also like to mention that from this point forward, the plan will reflect this change to accommodate the conversion.

And now in conclusion, I would like to go over the schedule for this plan. On January 18, 2013, the document became available for public review. Tonight we are having the public hearing. On February 28 the MAG Air Quality Technical Advisory Committee is anticipated to make a recommendation on the plan following the consideration of public comments. The MAG Management Committee will meet on March 13, 2013, and will be making a recommendation to the MAG Regional Council.

The Mag Regional Council, the decision-making body of MAG, will meet on March 27, 2013. It is anticipated that MAG will then submit the plan to the Arizona Department of Environmental Quality and the Environmental Protection Agency on March 29. And this is before the plan is actually due on April 8, 2013.

This concludes my presentation this evening. And now we would welcome any comments that anyone has. We will open it up for public comment. Thank you very much.

(Call to the public.)

MS. BAUER: At this time there appears not to be any public comments or anyone wishing to address us on the MAG 2013 Carbon Monoxide Maintenance Plan. The Maricopa Association of Governments appreciates your interest in regional air-quality issues, and I would like to thank you for coming this evening. I will now close the public hearing. Thank you.

(Conclusion of public hearing at 5:43 p.m.)

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

BE IT KNOWN that the foregoing transcript was taken before me, Debora Mitchell, a Certified Court Reporter, in and for the County of Maricopa, State of Arizona; that the foregoing proceedings were taken down by me using the Voice Writing method and translated into text via speech recognition under my direction; and that the foregoing typewritten pages are a full, true, and accurate transcript of all proceedings, all done to the best of my ability.

I FURTHER CERTIFY that I am in no way related to any of the parties hereto, nor am I in any way interested in the outcome hereof.

DATED at Phoenix, Arizona, this 20th day of February, 2013.

Debra Mitchell

Debora Mitchell - Digital Signature

AZ Certified Reporter No. 50768

MARICOPA ASSOCIATION of GOVERNMENTS

302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
mag@mag.maricopa.gov

Meeting: Public Hearing on the MAG 2013 Carbon Monoxide Maintenance Plan

Room: Saguaro Room

Date: February 19, 2013

PLEASE SIGN IN BELOW:

NAME	ORGANIZATION/AFFILIATION	MAILING ADDRESS
Diane Arnst	ADEQ	Arnst.Diane@ azdeq.gov
Corky Martinkovic	Maricopa Co. Air Quality Dept.	CorkyMartinkovic@ mail.maricopa.gov

MARICOPA ASSOCIATION of GOVERNMENTS

302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
mag@mag.maricopa.gov

Meeting: Public Hearing on the MAG 2013 Carbon Monoxide Maintenance Plan

Room: Saguaro Room

Date: February 19, 2013

PLEASE SIGN IN BELOW:

NAME	ORGANIZATION/AFFILIATION	MAILING ADDRESS
Matt Poppen	MAG	mpoppen@azmag.gov
Taejoo Shin	MAG	tshin@azmag.gov
Dean Giles	MAG	dgiles@azmag.gov
Randy Sedlacek	MAG	rsedlacek@azmag.gov

RESPONSE TO PUBLIC COMMENTS ON THE
DRAFT MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE
MARICOPA COUNTY AREA
RECEIVED AFTER THE PUBLIC HEARING COMMENT PERIOD

The Maricopa Association of Governments (MAG) appreciates the comments made by the public on the Draft MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. These comments were received after the public hearing comment period.

COMMENTS FROM CHARLES S. MARSHALL (Written comments submitted on March 21, 2013 by email)

<u>Comment:</u> The MAG 2013 Carbon Monoxide Maintenance Plan bases its conclusions on the data collected at various air quality monitoring stations within Maricopa County. One of the largest contributors to the carbon monoxide emissions is the Imsamet aluminum recycling plant in Goodyear at the corner of Estrella Parkway and MC 85, yet there is no monitoring station within miles of this facility. The MAG 2013 Carbon Monoxide Maintenance Plan should reevaluate the location of the monitoring stations on an annual or biannual basis and add stations as required due to the growth of the county population and concern for the public's health. Before the adoption of the MAG 2013 Carbon Monoxide Maintenance Plan, provisions should be made to monitor the area adjacent to the Imsamet site. The last time an inventory of carbon monoxide emissions was taken from the plant was early 2000 when the only health risk was to the cotton fields. There is commercial retail, spring training camps, residential subdivisions, and public facilities close to the site today that were not there ten years ago. Please consider a motion at your meeting to amend the plan with a new monitoring location near the site.

<u>Response:</u> Thank you for taking the time to comment on the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. Since the Maricopa County Air Quality Department (MCAQD) maintains and operates the air quality monitoring network and issues air quality permits, these comments were submitted to the MCAQD for consideration and a response.

According to the Maricopa County Air Quality Department, the assessment, operation and maintenance of the monitoring network is an element of an infrastructure air program and, under the Clean Air Act and federal regulations, must meet specific requirements and deadlines that are independent of any nonattainment or, as is the case for carbon monoxide (CO), maintenance plan. MCAQD's 2010 five year network assessment and 2011 annual monitoring network review may be accessed on the MCAQD website at http://www.maricopa.gov/aq/divisions/monitoring/network.aspx. Both the annual monitoring network and the periodic assessment were made available for public inspection for 30 days and then discussed in a public meeting prior to submitting them to EPA. Specifically, the federal regulations at 40 CFR 58.10(a) contain requirements for agencies to adopt and submit to EPA an annual monitoring network plan that provides for the establishment and maintenance of an air quality surveillance system. 40 CFR 58.10(d) further requires a periodic network assessment once every five years to determine whether:

1. The monitoring network meets its required objectives,

2. Whether sties should be added or changed, and
3. If sites are no longer needed and can be terminated.

The 2010 network assessment found CO levels are uniformly low as compared to the National Ambient Air Quality Standards (NAAQS) across Maricopa County and concluded it was not necessary to add any new CO monitoring sites.

The commenter also describes the Imsamet aluminum recycling plant (Imsamet) as one of the largest contributors to CO emissions. However, concentrations of CO in the Maricopa County Maintenance Area are associated almost exclusively with high traffic congestion. Further, the CO maintenance plan utilized the 2008 Carbon Monoxide Periodic Emission Inventory (PEI) (see Appendix A, Exhibit 1) which includes emissions from Imsamet. In the PEI, only major sources of any of the NAAQS pollutants are listed individually under the point source chapter consistent with the federal Air Emission Reporting Requirements (AERR). Since Imsamet is not a major source, it is not listed individually consistent with the current AERR requirements. Under county regulations specified in its air quality permit, Imsamet submits an emissions report each year and conducts an annual performance test that includes testing for CO. Imsamet passed its latest test in October 2012. These reports are available for review at MCAQD.

COMMENTS FROM DIANNE BARKER (Verbal comments at the March 27, 2013 MAG Regional Council Meeting)

<u>Comment:</u> I am glad to hear that a lot of carbon monoxide was assigned to motor vehicles. Before, it was businesses. I support that. I was not at the public hearing.

<u>Response:</u> Thank you for your comments. The MAG 2013 Carbon Monoxide Maintenance Plan is based upon the 2008 Carbon Monoxide Emissions Inventory. According to the inventory, the primary sources of carbon monoxide are: onroad (64.5 percent); nonroad (31.2 percent), area (4.2 percent), and point sources (0.1 percent).

<u>Comment:</u> I wanted to point out that I did file timely on MAG's TIP and for it being out of conformity for air quality for ozone, particulates, and carbon monoxide and it is not fiscally constrained. You won't see this because MAG hasn't gotten back to me. I had asked for it to be on the next agenda of the Management Committee. No one has answered me. My recourse is to go to the Federal Highway Administration because I have to be heard and considered.

<u>Response:</u> On March 26, 2013, a response to your comments on a conformity assessment for an amendment to the FY 2011-2015 MAG Transportation Improvement Program and MAG Regional Transportation Plan 2010 Update was transmitted to you in an email from Jason Stephens, MAG. In the response to your comments, MAG indicated that the EPA-approved emissions budgets that are required to be used for this conformity analysis are discussed in the February 8, 2013 conformity consultation memorandum. The U.S. Environmental Protection Agency approved the MAG 2003 Carbon Monoxide Maintenance Plan and 2006 emissions budget for carbon monoxide of 699.7 metric tons per day and a 2015 budget of 662.9 metric tons per day effective on April 8, 2005. The Environmental Protection Agency approved the MAG 2007 Eight-Hour Ozone Plan including the

emissions budget for volatile organic compounds (VOC) of 67.9 metric tons per day and the emissions budget for nitrogen oxides (NOx) of 138.2 metric tons per day effective on July 13, 2012. In addition, EPA approved the Revised MAG 1999 Serious Area Particulate Plan for PM-10 and the PM-10 emissions budget of 59.7 metric tons per day effective on August 26, 2002. The modeling results indicate that for each pollutant and each modeled year, the regional emissions from the proposed amendment, considered together with the TIP and Regional Transportation Plan 2010 Update, are less than the EPA-approved motor vehicle emissions budgets for carbon monoxide, eight-hour ozone precursors (VOC and NOx), and particulate matter (PM-10).

Comment: Since we have not had violations of the carbon monoxide standard for a long time, maybe we need to put the monitors out there where we have been having all of the accidents. It is congested and polluted.

Response: Based upon the air quality monitoring data, there have been no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour carbon monoxide standard since 1996. Effective April 8, 2005, the Environmental Protection Agency redesignated the Maricopa County nonattainment area to attainment status. In 2012, the 2nd highest eight-hour carbon monoxide concentration at the monitors was 2.5 parts per million, which is less than 1/3 of the standard. The air quality modeling results in MAG 2013 Carbon Monoxide Maintenance Plan indicate a maximum 2025 eight-hour concentration of 4.0 parts per million against a standard of 9.0.

According to the Maricopa County Air Quality Department, the assessment, operation and maintenance of the monitoring network is an element of an infrastructure air program and, under the Clean Air Act and federal regulations, must meet specific requirements and deadlines that are independent of any nonattainment or, as is the case for carbon monoxide (CO), maintenance plan. MCAQD's 2010 five year network assessment and 2011 annual monitoring network review may be accessed on the MCAQD website at http://www.maricopa.gov/aq/divisions/monitoring/network.aspx. Both the annual monitoring network and the periodic assessment were made available for public inspection for 30 days and then discussed in a public meeting prior to submitting them to EPA. Specifically, the federal regulations at 40 CFR 58.10(a) contain requirements for agencies to adopt and submit to EPA an annual monitoring network plan that provides for the establishment and maintenance of an air quality surveillance system. 40 CFR 58.10(d) further requires a periodic network assessment once every five years to determine whether:

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The 2010 network assessment found CO levels are uniformly low as compared to the National Ambient Air Quality Standards (NAAQS) across Maricopa County and concluded it was not necessary to add any new CO monitoring sites.

Lindy Bauer

From: Dennis Smith
Sent: Thursday, March 21, 2013 10:22 AM
To: Lindy Bauer
Subject: FW: Council agenda item 11

Dennis Smith
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MARICOPA ASSOCIATION of GOVERNMENTS azmag.gov

From: webmaster@azmag.gov [mailto:webmaster@azmag.gov]
Sent: Thursday, March 21, 2013 10:20 AM
To: Dennis Smith
Subject: Council agenda item 11

Subject: Council agenda item 11

To: Dennis Smith

Name of Sender: Charles F Marshall
Email Address: charshall@cox.net
Organization: Goodyear Citizen
City/State: Goodyear,AZ
Phone: 623-386-3110

Sent: 3/21/2013 10:19:31 AM

Dear MAG Chair Marie Lopez Rogers and MAG Council Member Mayor Georgia Load, (CC: Dennis Smith via MAG Web site) This email is in reference to one of the "Items Proposed to be Heard" during the MAG Regional Council meeting scheduled for March 27, 2013. Item number eleven (11.) "MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area" bases its conclusions on the data collected at various air quality monitoring stations within Maricopa County. One of the largest contributors to the carbon monoxide emissions is the Imsamet aluminum recycling plant in Goodyear at the corner of Estrella Parkway and MC 85, yet there is no monitoring station within miles of this facility. In the spirit of the Clean Air Act, I would expect the MAG 2013 Carbon Monoxide Maintenance Plan to reevaluate the location of the monitoring stations on an annual or biannual basis and add stations as required due to the growth of the county population and concern for the public's health. Therefore, before adoption of the MAG 2013 Carbon Monoxide

Maintenance Plan for the Maricopa County Area I suggest provisions be made to monitor the area adjacent to the Imsamet site. To my knowledge the last time an inventory of carbon monoxide emissions was taken from this plant was in the early 2000 time frame when the only health risk was to the cotton fields. There is commercial retail, spring training camps, residential subdivisions, and public facilities close to the site today that were not there ten years ago. Please consider a motion at your meeting to amend the plan with a new monitoring location near the site. Sincerely, Charles F Marshall

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APPENDIX B

EXHIBIT 2

Certification of Adoption

RESOLUTION TO ADOPT THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

WHEREAS, the Maricopa Association of Governments (MAG) is a Council of Governments composed of twenty-five cities and towns within Maricopa County and the contiguous urbanized area, the County of Maricopa, the Gila River Indian Community, the Salt River Pima-Maricopa Indian Community, Fort McDowell Yavapai Nation, Arizona Department of Transportation, and Citizens Transportation Oversight Committee; and

WHEREAS, the Governor of Arizona designated MAG as the regional air quality planning agency and metropolitan planning organization for transportation in Maricopa County; and

WHEREAS, the Maricopa County nonattainment area was reclassified by the U.S. Environmental Protection Agency as a Maintenance Area for carbon monoxide in 2005 in accordance with the Clean Air Act; and

WHEREAS, the Maricopa County Maintenance Area has had no violations of the one-hour carbon monoxide standard since 1984 and no violations of the eight-hour standard since 1996; and

WHEREAS, MAG has prepared the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area, including the modeling maintenance demonstration through 2025; and

WHEREAS, A.R.S. 49-406 H. requires that the governing body of the metropolitan planning organization adopt the maintenance area plan.

NOW THEREFORE, BE IT RESOLVED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS REGIONAL COUNCIL as follows:

SECTION 1. That the MAG Regional Council adopts the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area.

SECTION 2. That the MAG Regional Council authorizes the submission of the plan to the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency.

PASSED AND ADOPTED BY THE REGIONAL COUNCIL OF THE MARICOPA ASSOCIATION OF GOVERNMENTS THIS TWENTY-SEVENTH DAY OF MARCH 2013.

MARICOPA ASSOCIATION OF GOVERNMENTS
INCORPORATED
OCT. 29, 1967
ARIZONA

Marie Lopez Rogers
Chair, MAG Regional Council
Mayor of Avondale

ATTEST:

Dennis W. Smith
Executive Director, MAG

CERTIFICATION OF ADOPTION OF THE MAG 2013 CARBON MONOXIDE MAINTENANCE PLAN FOR THE MARICOPA COUNTY AREA

An Excerpt from the March 27, 2013 MAG Regional Council Meeting Minutes

Mayor Mark Mitchell moved to adopt the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area. Mayor Michael LeVault seconded, and the motion passed unanimously.

I certify that on March 27, 2013, the MAG Regional Council adopted the MAG 2013 Carbon Monoxide Maintenance Plan for the Maricopa County Area.

Dennis Smith
MAG Executive Director

03/27/13
Date