

5. Onroad Mobile Sources

5.1 Introduction

The Maricopa Association of Governments (MAG) prepared the onroad mobile source emission estimates for the 2005 periodic ozone precursor emissions inventory for the eight-hour ozone Nonattainment Area (NAA) and for Maricopa County. Emission estimates were developed for both an ozone season-day and an annual total for 2005.

Emission estimates were calculated for the following eight vehicle classes: light duty gas vehicles (LDGV), light duty gas trucks of gross vehicle weight under 6000 pounds (LDGT1/LDGT2; LDGT12) and over 6000 pounds (LDGT3/LDGT4; LDGT34), heavy duty gas vehicles (HDGV), light duty diesel vehicles (LDDV), light duty diesel trucks (LDDT), heavy duty diesel vehicles (HDDV), and motorcycles (MC). Emission factors for these vehicle classes were calculated using MOBILE6.2, which is the latest version in a series of models developed by the US Environmental Protection Agency (EPA) for the purpose of estimating motor vehicle emission factors. The calculated emission factors were multiplied by the estimates of vehicle miles of travel (VMT) to generate emission estimates for onroad mobile sources.

The main references for preparing the onroad mobile source emissions inventory were as follows:

Emission Inventory Requirements for Carbon Monoxide State Implementation Plans, EPA-450/4-91-011 (US EPA, 1991).

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

Technical Guidance on the Use of MOBILE6 for Emission Inventory Preparation (US EPA, 2002).

User's Guide to MOBILE6.1 and MOBILE6.2 (Mobile Source Emission Factor Model), EPA420-R-03-010 (US EPA, 2003).

5.2 Vehicle miles of travel (VMT) estimation

MAG prepared 2005 VMT estimates for the eight-hour ozone NAA and Maricopa County. The source of data for these estimates is the 2005 Highway Performance Monitoring System (HPMS) data from the Arizona Department of Transportation (ADOT) (<http://tpd.azdot.gov/data/reports/vmt2005.php>) and the 2005 traffic assignment prepared by MAG using the EMME/2 travel demand model.

ADOT only prepares HPMS data for Maricopa County and the PM₁₀ NAA. MAG derived the 2005 VMT for the eight-hour ozone NAA from the 2005 HPMS VMT for the PM₁₀ NAA and the 2005 MAG EMME/2 traffic assignment. The output of the traffic assignment was evaluated using GIS to obtain the traffic assignment VMT for the PM-10 NAA and the eight-hour ozone NAA. The 2005 VMT for the eight-hour ozone NAA was obtained by multiplying the 2005 HPMS VMT for the PM-10 NAA by the ratio of those traffic assignment VMTs (the eight-hour ozone NAA to the PM-10 NAA). The calculation details are presented as follows:

2005 HPMS VMT for the
PM₁₀ NAA ($HPMS_{PM10}$) = 83,013,000 miles/day

2005 traffic assignment VMT
for the PM₁₀ NAA ($EMME2_{PM10}$) = 86,054,855 miles/day

2005 traffic assignment VMT for
the eight-hour ozone NAA ($EMME2_{O3}$) = 87,644,885 miles/day

$$\begin{aligned}
 \text{2005 VMT for the eight-hour ozone NAA} &= HPMS_{PM10} \times \frac{EMME2_{O3}}{EMME2_{PM10}} \\
 &= 83,013,000 \text{ miles/day} \times \frac{87,644,885}{86,054,855} \\
 &= 84,546,826 \text{ miles/day}
 \end{aligned}$$

The distribution of VMT by facility type for the eight-hour ozone NAA and Maricopa County was obtained by multiplying the VMT fraction from the 2002 HPMS by functional system (ADOT, 2003), which was provided by Michael Wade of ADOT in 2004, by the 2005 HPMS VMT for Maricopa County and the estimated 2005 VMT for the eight-hour ozone NAA. The VMT estimates by facility type for the eight-hour ozone NAA and Maricopa County are shown in Table 5.2-1.

Table 5.2-1. 2005 daily VMT by facility type (annual average daily traffic).

Facility Type	Eight-hour ozone NAA (miles/day)	Maricopa County (miles/day)
Rural Interstate	3,304,702	3,333,633
Rural Other Principal Arterial	1,885,611	1,902,118
Rural Minor Arterial	883,629	891,364
Rural Major Collector	2,569,302	2,591,796
Rural Minor Collector	293,011	295,576
Rural Local	587,171	592,311
Urban Interstate	11,406,738	11,506,599
Urban Other Freeway/Expressway	15,858,203	15,997,036
Urban Other Principal Arterial	20,129,266	20,305,490
Urban Minor Arterial	12,009,995	12,115,138
Urban Collector	7,171,295	7,234,077
Urban Local	8,447,903	8,521,861
Total	84,546,826	85,287,000

5.3 Speed estimation

The average daily vehicle speeds were developed from several sources representing the latest planning assumptions for 2005. To develop speed estimates for all facility types, except local roadways, speeds were extracted from the latest 2005 travel demand model run provided by the MAG Transportation Group in July 2006. As for the speed of local roadways, MOBILE6.2 assumes a speed of 12.9 miles per hour for local roadways. Table 5.3-1 presents average daily speeds used in the MOBILE6.2 runs.

Table 5.3–1. Average daily speeds for the 2005 periodic emissions inventory.

HPMS Facility Type	Average Daily Speed (mph)
Rural Principal Arterial – Interstate	58.0
Rural Principal Arterial – Other	29.4
Rural Minor Arterial	29.4
Rural Major Collector	26.9
Rural Minor Collector	26.9
Rural Local	12.9
Urban Principal Arterial – Interstate	50.1
Urban Freeway and Expressway	49.3
Urban Principal Arterial – Other	28.8
Urban Minor Arterial	28.8
Urban Collector	22.1
Urban Local	12.9

5.4 Monthly VMT factors

In the development of annual emissions totals for this inventory, emission factor estimates were prepared separately for each month, with month-specific meteorological and fuel data. Since average daily VMT varies by month, and the number of days in each month varies, these monthly average emission factors were weighted to more appropriately represent an annual average emission factor. Average daily VMT adjustment factors were developed from the 1998 MAG Regional Congestion Study (MAG, 2000) and these adjustment factors for each month are presented in Table 5.4–1. Similarly, the conversion of annual average day traffic to the three months of the peak ozone season utilized the monthly VMT factors listed below.

These factors indicate, as an example, that an average day in February has three percent more traffic than an average month, while an average day in June has one percent less traffic than an average day.

Table 5.4–1. Average daily VMT adjustment factors by month.

Month	Average daily VMT estimate factor	Month	Average daily VMT estimate factor
January	0.98	July	0.96
February	1.03	August	0.96
March	1.04	September	0.98
April	1.04	October	1.02
May	0.99	November	1.00
June	0.99	December	1.02

The same monthly factors were used to convert the annual average daily traffic estimates from the HPMS system to reflect an average day during the peak ozone season. The peak ozone season reflects the three consecutive months when peak ozone concentrations occur. For consistency with the 2002 periodic ozone precursors inventory, the three consecutive months selected were July through September, 2005, in accordance with EPA guidance (US EPA, 1991). Average daily VMTs during the 2005 peak ozone season for the eight-hour ozone NAA and Maricopa County are presented in Table 5.4-2.

5.5 Emission factor estimation

Volatile organic compounds (VOCs), oxides of nitrogen (NO_x) and carbon monoxide (CO) vehicle emission factors were calculated using MOBILE6.2. MOBILE6.2 is the latest version in a series of models developed by the US EPA for the purpose of estimating motor vehicle emission factors. The resulting emission factors were combined with VMT estimates to produce total emission estimates for onroad vehicles. The MOBILE6.2 runs were executed by the Maricopa Association of Governments. The contact person for the MOBILE6.2 emission estimates is Ieesuck Jung (602-254-6300).

In order to calculate vehicle emission factors for 2005 annual average day and peak ozone season, two MOBILE6.2 runs reflecting vehicles registered locally (subject to the I/M program) and those not registered locally (not participating in the I/M program) were executed using month specific fuel and temperature data for each month of the year and during the three-month period of July through September, respectively.

Table 5.4-2. Average daily VMT during 2005 peak ozone season for the eight-hour ozone NAA and Maricopa County (July–September 2005).

Facility Type	Eight-hour ozone NAA (miles/day)	Maricopa County (miles/day)
Rural Interstate	3,198,388	3,226,389
Rural Other Principal Arterial	1,824,950	1,840,926
Rural Minor Arterial	855,202	862,689
Rural Major Collector	2,486,647	2,508,416
Rural Minor Collector	283,584	286,067
Rural Local	568,281	573,256
Urban Interstate	11,039,777	11,136,426
Urban Other Freeway/Expressway	15,348,037	15,482,403
Urban Other Principal Arterial	19,481,697	19,652,252
Urban Minor Arterial	11,623,627	11,725,388
Urban Collector	6,940,591	7,001,353
Urban Local	8,176,130	8,247,708
Total	81,826,911	82,543,273

5.5.1 Emission factor model

The emission factors estimated from the MOBILE6.2 runs were combined to reflect 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 Arizona Vehicle Inspection/Maintenance (I/M) Program. It is important to note that participation in the I/M program is required for all vehicles registered in the NAA, with the exception of certain model year and vehicle classes. However, it is assumed that of the vehicles which are of an age and type subject to an I/M program, only 91.6 percent of the vehicles operating within the NAA participate in the I/M program. The remaining 8.4 percent do not participate in the program. These percentages reflect the control measures “Tougher Registration Enforcement” and “Expansion of Area A Boundaries”, described in the 2007 Eight-Hour Ozone Plan for the Maricopa County Nonattainment Area (MAG, 2007). In the absence of any additional data, this percentage split is assumed to apply directly to VMT as well.

5.5.2 *MOBILE6.2 inputs*

In order to accurately reflect the state of the I/M program in the modeling area, several MOBILE6.2 runs were performed and the emission factors from those runs were weighted together. The specific model run inputs to the MOBILE6.2 model are described in Appendix 5.

5.5.3 *MOBILE6.2 outputs*

MOBILE6.2 was executed with the inputs described above to obtain composite emission factors in grams per mile (g/mi) for VOC, NO_x, and CO. These values were obtained for the eight vehicle classes described in section 5.1 for the twelve facility types. The emission factors generated for 2005 are presented in Appendix 5. These values were subsequently used in developing emission estimates.

5.5.4 *MOBILE6.2 emission estimates*

MOBILE6.2 was used to generate onroad emission factors and a VMT mix by vehicle class and facility type. Daily VMTs (DVMTs) for an annual average day (Table 5.2–1) and for the peak ozone season (Table 5.4–2) were then multiplied by the VMT mix by vehicle class and the appropriate ozone precursor emission factor (Appendix 5) to estimate emissions. VMT mix refers to the fraction of total onroad vehicle miles of travel by a particular vehicle type.

Tables 5.5–1 and 5.5-2 show the calculated annual and ozone season-day VOC, NO_x, and CO emissions by facility type and vehicle class in the eight-hour ozone NAA and Maricopa County, respectively.

Table 5.5–1. Annual and ozone season-day onroad mobile source emissions by facility type and vehicle class in the eight-hour ozone NAA.

Facility Type	Vehicle Class	SCC	Annual (tons/year)			Ozone season day (lbs/day)		
			VOC	NO _x	CO	VOC	NO _x	CO
Rural Interstate	LDGV	2201001110	453.5	419.4	6,288.3	2,377.0	2,374.9	34,484.0
	LDGT12	2201020110	416.7	439.3	6,011.5	2,172.4	24,339.8	31,728.7
	LDGT34	2201040110	183.0	220.0	2,556.5	968.2	1,210.2	13,506.1
	HDGV	2201070110	40.7	236.4	450.6	221.2	1,242.2	2,773.0
	MC	2201080110	26.4	10.2	132.5	138.1	49.7	892.7
	LDDV	2230001110	0.6	2.3	1.8	3.4	12.2	9.1
	LDDT	2230060110	1.8	5.2	3.4	9.8	28.0	18.6
	HDDV	2230070110	40.7	2,037.2	250.8	214.8	10,806.8	1,311.3
Rural Other Principal Arterial	LDGV	2201001130	303.9	225.2	2,655.0	1,543.3	1,303.8	13,638.1
	LDGT12	2201020130	275.5	230.7	2,667.9	1,434.5	1,289.2	13,339.4
	LDGT34	2201040130	122.0	117.6	1,139.0	646.3	652.1	5,764.7
	HDGV	2201070130	32.8	108.4	240.7	174.7	569.7	1,481.0
	MC	2201080130	14.6	4.1	55.2	76.6	20.1	368.4
	LDDV	2230001130	0.5	0.8	1.1	2.4	4.3	5.6
	LDDT	2230060130	1.3	1.8	2.1	7.0	9.8	11.4
	HDDV	2230070130	36.3	647.5	167.4	191.4	3,433.5	875.7
Rural Minor Arterial	LDGV	2201001150	142.4	105.5	1,244.2	723.3	611.0	6,391.1
	LDGT12	2201020150	129.1	108.1	1,250.3	672.2	604.1	6,251.1
	LDGT34	2201040150	57.1	55.1	533.7	302.9	305.6	2,701.4
	HDGV	2201070150	15.3	50.8	112.8	81.9	266.9	694.0
	MC	2201080150	6.8	1.9	25.9	35.9	9.4	172.7
	LDDV	2230001150	0.2	0.4	0.5	1.1	2.0	2.6
	LDDT	2230060150	0.6	0.9	1.0	3.3	4.6	5.3
	HDDV	2230070150	17.0	303.4	78.5	89.7	1,609.0	410.4
Rural Major Collector	LDGV	2201001170	425.9	314.8	3,626.9	2,156.6	1,827.6	18,583.2
	LDGT12	2201020170	384.4	320.6	3,638.3	2,001.4	1,793.3	18,117.1
	LDGT34	2201040170	170.4	163.3	1,555.5	903.1	906.4	7,845.0
	HDGV	2201070170	47.6	144.9	359.3	253.5	761.1	2,211.3
	MC	2201080170	20.3	5.5	80.9	106.9	27.0	540.9
	LDDV	2230001170	0.7	1.1	1.5	3.4	5.9	7.9
	LDDT	2230060170	1.8	2.5	3.0	9.9	13.6	16.2
	HDDV	2230070170	53.2	900.2	250.2	281.1	4,773.1	1,309.0
Rural Minor Collector	LDGV	2201001190	48.6	35.9	413.7	246.0	208.4	2,119.3
	LDGT12	2201020190	43.8	36.6	415.0	228.2	204.5	2,066.1
	LDGT34	2201040190	19.4	18.6	177.4	102.9	103.3	894.7
	HDGV	2201070190	5.4	16.5	41.0	28.9	86.8	252.2
	MC	2201080190	2.3	0.6	9.2	12.2	3.1	61.6
	LDDV	2230001190	0.1	0.1	0.2	0.4	0.7	0.9
	LDDT	2230060190	0.2	0.3	0.3	1.1	1.6	1.8
	HDDV	2230070190	6.1	102.6	28.6	32.1	544.4	149.2
Rural Local	LDGV	2201001210	136.9	93.7	956.3	648.6	557.1	4,941.9
	LDGT12	2201020210	120.2	90.9	929.9	615.8	512.6	4,595.3
	LDGT34	2201040210	53.6	46.0	403.9	281.0	256.9	2,023.3
	HDGV	2201070210	19.2	29.4	172.8	99.1	154.2	1,063.4
	MC	2201080210	5.8	1.1	33.9	31.0	5.3	229.9
	LDDV	2230001210	0.2	0.3	0.5	1.1	1.7	2.7
	LDDT	2230060210	0.6	0.7	1.0	3.2	4.0	5.5
	HDDV	2230070210	20.3	264.5	116.4	107.4	1,403.8	608.6

Table 5.5–1. Annual and ozone season-day onroad mobile source emissions by facility type and vehicle class in the eight-hour ozone NAA (continued).

Facility Type	Vehicle Class	SCC	Annual (tons/year)			Ozone season day (lbs/day)		
			VOC	NO _x	CO	VOC	NO _x	CO
Urban Interstate	LDGV	2201001230	1,614.9	1,403.7	20,137.1	8,425.4	7,965.3	108,883.7
	LDGT12	2201020230	1,485.7	1,466.9	19,424.8	7,721.2	8,104.1	101,212.6
	LDGT34	2201040230	654.4	738.6	8,255.2	3,455.2	4,046.5	43,166.2
	HDGV	2201070230	146.0	769.8	1,219.3	792.1	3,999.1	7,504.0
	MC	2201080230	81.1	30.0	242.3	422.6	138.6	1,594.9
	LDDV	2230001230	2.3	6.1	5.8	11.8	31.3	29.9
	LDDT	2230060230	6.4	13.5	11.2	34.5	71.8	60.8
	HDDV	2230070230	146.3	5,458.7	754.2	772.9	28,555.2	3,945.8
Urban Other Freeway and Expressway	LDGV	2201001250	2,254.1	1,945.2	27,773.3	11,756.0	11,046.2	149,927.0
	LDGT12	2201020250	2,073.3	2,032.3	26,812.8	10,772.1	11,226.4	139,523.3
	LDGT34	2201040250	913.3	1,024.2	11,397.2	4,822.0	5,611.8	59,526.2
	HDGV	2201070250	204.4	1,063.5	1,668.6	1,107.3	5,525.5	10,266.1
	MC	2201080250	112.7	41.0	336.8	587.4	189.4	2,217.3
	LDDV	2230001250	3.2	8.3	8.0	16.5	42.5	41.5
	LDDT	2230060250	8.9	18.4	15.6	48.1	97.5	84.3
	HDDV	2230070250	204.9	7,436.3	1,041.4	1,080.8	38,896.8	5,447.9
Urban Other Principal Arterial	LDGV	2201001270	3,265.1	2,418.2	28,359.4	16,571.9	14,062.9	145,600.1
	LDGT12	2201020270	2,957.0	2,474.2	28,482.5	15,394.6	13,768.6	142,272.1
	LDGT34	2201040270	1,309.6	1,260.3	12,166.0	6,938.6	6,968.3	61,510.3
	HDGV	2201070270	354.9	1,152.7	2,624.2	1,892.6	5,988.9	16,151.1
	MC	2201080270	157.0	44.1	599.3	822.0	205.4	4,001.5
	LDDV	2230001270	5.0	8.8	11.6	25.8	45.4	60.2
	LDDT	2230060270	14.0	19.6	22.9	75.6	103.8	122.8
	HDDV	2230070270	393.8	6,943.8	1,825.7	2,079.8	36,341.7	9,551.6
Urban Minor Arterial	LDGV	2201001290	1,948.1	1,442.8	16,920.5	9,887.5	8,390.6	86,871.3
	LDGT12	2201020290	1,764.3	1,476.2	16,993.9	9,185.1	8,215.0	84,885.8
	LDGT34	2201040290	781.4	751.9	7,258.8	4,139.9	4,157.6	36,699.7
	LDDT	2201070290	211.8	687.8	1,565.8	1,129.2	3,573.2	9,636.4
	HDDV	2201080290	93.6	26.4	357.5	490.4	122.6	2,387.5
	LDDV	2230001290	3.0	5.3	6.9	15.3	27.1	35.9
	LDDT	2230060290	8.3	11.7	13.6	45.1	61.9	73.3
	HDDV	2230070290	234.9	4,142.9	1,089.3	1,240.9	21,683.0	5,699.0
Urban Collector	LDGV	2201001310	1,274.3	934.0	10,305.6	6,424.5	5,496.2	52,644.8
	LDGT12	2201020310	1,140.8	938.7	10,271.7	5,941.9	5,245.6	50,786.8
	LDGT34	2201040310	506.9	477.3	4,407.8	2,689.4	2,647.3	22,089.1
	HDGV	2201070310	153.8	388.6	1,237.1	818.3	2,018.8	7,611.5
	MC	2201080310	59.9	14.6	263.8	314.8	68.1	1,773.6
	LDDV	2230001310	2.0	3.4	4.8	10.4	17.3	24.6
	LDDT	2230060310	5.7	7.5	9.3	30.6	39.8	50.3
	HDDV	2230070310	174.2	2,661.9	858.4	919.4	13,936.0	4,490.9
Urban Local	LDGV	2201001330	1,970.5	1,348.2	13,758.2	9,331.8	8,107.5	71,101.3
	LDGT12	2201020330	1,728.8	1,307.8	13,380.0	8,860.1	7,364.5	66,114.3
	LDGT34	2201040330	771.3	661.6	5,810.7	4,042.8	3,690.6	29,111.0
	HDGV	2201070330	276.8	422.3	2,486.5	1,425.9	2,193.8	15,300.4
	MC	2201080330	84.1	15.8	487.1	445.0	73.8	3,307.4
	LDDV	2230001330	3.0	4.8	7.5	15.3	24.9	38.9
	LDDT	2230060330	8.4	10.7	14.9	45.5	56.9	80.0
	HDDV	2230070330	292.7	3,805.8	1,673.9	1,545.3	19,936.5	8,756.6

Table 5.5–2. Annual and ozone season-day onroad mobile source emissions by facility type.

Facility Type	Vehicle Class	SCC	Annual (tons/year)			Ozone season day (lbs/day)		
			VOC	NO _x	CO	VOC	NO _x	CO
Rural Interstate	LDGV	2201001110	457.5	423.1	6,343.4	2,397.7	2,387.3	34,789.9
	LDGT12	2201020110	420.3	443.1	6,064.2	2,191.4	2,444.2	32,006.5
	LDGT34	2201040110	184.7	221.9	2,578.9	976.7	1,212.9	13,624.3
	HDGV	2201070110	41.0	238.5	454.5	223.2	1,239.3	2,797.2
	MC	2201080110	26.6	10.3	133.7	139.3	47.7	900.5
	LDDV	2230001110	0.7	2.4	1.8	3.4	12.1	9.2
	LDDT	2230060110	1.8	5.3	3.5	9.9	27.9	18.8
	HDDV	2230070110	41.0	2,055.0	252.9	216.7	10,760.2	1,323.0
Rural Other Principal Arterial	LDGV	2201001130	306.5	227.2	2,678.3	1,556.9	1,320.9	13,757.6
	LDGT12	2201020130	277.9	232.8	2,691.3	1,447.1	1,294.8	13,456.2
	LDGT34	2201040130	123.1	118.6	1,149.0	652.0	655.4	5,815.2
	HDGV	2201070130	33.1	109.4	242.8	176.3	568.4	1,494.0
	MC	2201080130	14.8	4.2	55.7	77.3	19.4	371.7
	LDDV	2230001130	0.5	0.8	1.1	2.4	4.3	5.6
	LDDT	2230060130	1.3	1.8	2.1	7.1	9.8	11.5
	HDDV	2230070130	36.6	653.2	168.9	193.1	3,418.7	883.4
Rural Minor Arterial	LDGV	2201001150	143.7	106.5	1,255.1	729.6	619.0	6447.0
	LDGT12	2201020150	130.2	109.1	1,261.2	678.1	606.8	6305.8
	LDGT34	2201040150	57.7	55.6	538.4	305.5	307.2	2725.1
	HDGV	2201070150	15.5	51.3	113.8	82.6	266.4	700.1
	MC	2201080150	6.9	2.0	26.1	36.2	9.1	174.2
	LDDV	2230001150	0.2	0.4	0.5	1.1	2.0	2.6
	LDDT	2230060150	0.6	0.9	1.0	3.3	4.6	5.4
	HDDV	2230070150	17.1	306.1	79.1	90.5	1602.1	414.0
Rural Major Collector	LDGV	2201001170	429.6	317.6	3,658.6	2,175.5	1,852.9	18,745.9
	LDGT12	2201020170	387.8	323.4	3,670.1	2,018.9	1,801.5	18,275.8
	LDGT34	2201040170	171.8	164.7	1,569.1	911.0	911.1	7,913.7
	HDGV	2201070170	48.0	146.2	362.5	255.7	759.5	2,230.6
	MC	2201080170	20.6	5.6	81.6	107.9	25.9	545.7
	LDDV	2230001170	0.7	1.2	1.6	3.4	5.9	8.0
	LDDT	2230060170	1.9	2.6	3.0	10.1	13.6	16.4
	HDDV	2230070170	53.7	908.0	252.4	283.7	4,752.5	1,320.5
Rural Minor Collector	LDGV	2201001190	49.0	36.2	417.2	248.1	211.3	2,137.8
	LDGT12	2201020190	44.2	36.9	418.5	230.2	205.4	2,084.2
	LDGT34	2201040190	19.6	18.8	178.9	103.9	103.9	902.5
	HDGV	2201070190	5.5	16.7	41.3	29.2	86.6	254.4
	MC	2201080190	2.3	0.6	9.3	12.3	3.0	62.2
	LDDV	2230001190	0.1	0.1	0.2	0.4	0.7	0.9
	LDDT	2230060190	0.2	0.3	0.3	1.1	1.5	1.9
	HDDV	2230070190	6.1	103.6	28.8	32.3	542.0	150.3
Rural Local	LDGV	2201001210	138.2	94.5	964.6	654.3	568.4	4,985.2
	LDGT12	2201020210	121.2	91.7	938.1	621.2	516.4	4,635.5
	LDGT34	2201040210	54.1	46.4	407.4	283.5	258.8	2,041.1
	HDGV	2201070210	19.4	29.6	174.3	10.0	153.8	1,072.8
	MC	2201080210	5.9	1.1	34.2	31.2	5.2	231.9
	LDDV	2230001210	0.2	0.3	0.5	1.1	1.7	2.7
	LDDT	2230060210	0.6	0.8	1.0	3.2	4.0	5.6
	HDDV	2230070210	20.5	266.8	117.4	108.4	1,397.8	614.0

Table 5.5–2. Annual and ozone season-day onroad mobile source emissions by facility type and vehicle class in Maricopa County (continued).

Facility Type	Vehicle Class	SCC	Annual (tons/year)			Ozone season day (lbs/day)		
			VOC	NO _x	CO	VOC	NO _x	CO
Urban Interstate	LDGV	2201001230	1,629.0	1,416.0	20,313.3	8,499.1	8,035.0	109,836.9
	LDGT12	2201020230	1,498.7	1,479.7	19,594.8	7,788.9	8,175.1	102,098.7
	LDGT34	2201040230	660.1	745.1	8,327.4	3,485.4	4,081.9	43,544.0
	HDGV	2201070230	147.3	776.5	1,229.9	799.1	4,034.1	7,569.7
	MC	2201080230	81.8	30.2	244.4	426.3	139.8	1,608.9
	LDDV	2230001230	2.3	6.2	5.8	11.9	31.6	30.2
	LDDT	2230060230	6.4	13.7	11.4	34.7	72.4	61.3
	HDDV	2230070230	147.7	5,506.5	760.8	779.7	28,805.2	3,980.3
Urban Other Freeway and Expressway	LDGV	2201001250	2,273.8	1,962.2	28,016.4	11,858.9	11,142.8	151,239.5
	LDGT12	2201020250	2,091.4	2,050.1	27,047.5	10,866.4	11,324.6	140,744.7
	LDGT34	2201040250	921.3	1,033.1	11,496.9	4,864.1	5,661.0	6,0047.4
	HDGV	2201070250	206.2	1,072.9	1,683.3	1,117.0	5,573.9	1,0355.9
	MC	2201080250	113.7	41.3	339.7	592.6	191.1	2,236.7
	LDDV	2230001250	3.2	8.4	8.1	16.7	42.9	41.8
	LDDT	2230060250	9.0	18.6	15.8	48.5	98.4	85.1
	HDDV	2230070250	206.6	7,501.4	1,050.5	1,090.3	39,237.3	5,495.6
Urban Other Principal Arterial	LDGV	2201001270	3,293.6	2,439.3	28,607.8	16,716.9	14,186.0	146,874.8
	LDGT12	2201020270	2,982.9	2,495.9	28,731.9	15,529.4	13,889.2	143,517.7
	LDGT34	2201040270	1,321.1	1,271.3	12,272.6	6,999.4	7,029.3	62,048.8
	HDGV	2201070270	358.1	1,162.8	2,647.2	1,909.2	6,041.3	16,292.5
	MC	2201080270	158.3	44.5	604.5	829.2	207.2	4,036.5
	LDDV	2230001270	5.0	8.9	11.8	26.0	45.8	60.7
	LDDT	2230060270	14.1	19.8	23.0	76.2	104.8	123.9
	HDDV	2230070270	397.3	7,004.5	1,841.7	2,097.9	36,659.8	9,635.3
Urban Minor Arterial	LDGV	2201001290	1,965.1	1,455.4	17,068.6	9,974.0	8,464.0	87,631.9
	LDGT12	2201020290	1,779.7	1,489.2	17,142.7	9,265.5	8,286.9	85,628.9
	LDGT34	2201040290	788.2	758.5	7,322.3	4,176.1	4,194.0	37,021.0
	HDGV	2201070290	213.6	693.8	1,579.5	1,139.1	3,604.5	9,720.8
	MC	2201080290	94.5	26.6	360.7	494.7	123.6	2,408.4
	LDDV	2230001290	3.0	5.3	7.0	15.5	27.3	36.2
	LDDT	2230060290	8.4	11.8	13.7	45.5	62.5	73.9
	HDDV	2230070290	237.0	4,179.2	1,098.8	1,251.7	21,872.9	5,748.8
Urban Collector	LDGV	2201001310	1,285.4	942.2	10,395.7	6,480.7	5,544.4	53,105.7
	LDGT12	2201020310	1,150.8	946.9	10,361.6	5,994.0	5,291.6	51,231.4
	LDGT34	2201040310	511.3	481.5	4,446.4	2,712.9	2,670.5	22,282.5
	HDGV	2201070310	155.1	392.0	1,247.9	825.4	2,036.5	7,678.2
	MC	2201080310	60.4	14.7	266.2	317.6	68.6	1,789.1
	LDDV	2230001310	2.0	3.4	4.8	10.5	17.5	24.8
	LDDT	2230060310	5.7	7.6	9.4	30.9	40.2	50.7
	HDDV	2230070310	175.7	2,685.2	865.9	927.5	14,058.0	4,530.2
Urban Local	LDGV	2201001330	1,987.8	1,360.0	13,878.7	9,413.5	8,178.5	71,723.7
	LDGT12	2201020330	1,743.9	1,319.2	13,497.2	8,937.6	7,429.0	66,693.1
	LDGT34	2201040330	778.0	667.5	5,861.7	4,078.2	3,722.9	29,365.8
	HDGV	2201070330	279.3	426.0	2,508.2	1,438.4	2,213.1	15,434.4
	MC	2201080330	84.9	16.0	491.3	448.9	74.5	3,336.4
	LDDV	2230001330	3.0	4.9	7.6	15.5	25.0	39.2
	LDDT	2230060330	8.5	10.8	15.1	45.9	57.4	80.7
	HDDV	2230070330	295.2	3,839.2	1,688.6	1,558.9	20,111.1	8,833.3

5.6 Summary of ozone precursor emissions from onroad mobile sources

Tables 5.6–1 and 5.6–2 show the calculated onroad emissions for annual and ozone season-day onroad mobile source emissions by facility type in the eight-hour ozone NAA and Maricopa County, respectively.

Table 5.6–1. Annual and ozone season-day onroad mobile source emissions by facility type in the eight-hour ozone NAA.

Facility Type	Annual (tons/year)			Ozone season day (lbs/day)			
	VOC	NO _x	CO	VOC	NO _x	CO	
Rural	Interstate	1,163.1	3,370.0	15,695.5	6,104.9	18,163.7	84,723.8
	Other Principal Arterial	786.9	1,336.2	6,928.4	4,076.3	7,282.5	35,484.5
	Minor Arterial	368.6	626.2	3,246.8	1,910.3	3,412.6	16,628.6
	Major Collector	1,104.3	1,853.0	9,515.6	5,715.9	10,108.0	48,630.7
	Minor Collector	126.0	211.3	1,085.3	651.8	1,152.7	5,545.8
	Local	356.9	526.6	2,614.7	1,787.3	2,895.6	13,470.6
Urban	Interstate	4,137.2	9,887.3	50,049.9	21,635.7	52,911.8	266,397.8
	Other Principal Arterial	5,774.7	13,569.2	69,053.7	30,190.3	72,636.1	367,033.6
	Minor Arterial	8,456.4	14,321.7	74,091.7	43,800.8	77,485.0	379,269.7
	Major Collector	5,045.4	8,545.0	44,206.3	26,133.4	46,230.9	226,288.9
	Minor Collector	3,317.6	5,426.1	27,358.5	17,149.3	29,469.2	139,471.6
	Local	5,135.6	7,577.1	37,619.0	25,711.8	414,48.5	193,809.9
Totals	35,773.1	67,249.7	341,465.4	184,867.9	363,196.8	1,776,755.6	

Table 5.6–2. Annual and ozone season-day onroad mobile source emissions by facility type in Maricopa County.

Facility Type	Annual (tons/year)			Ozone season day (lbs/day)			
	VOC	NO _x	CO	VOC	NO _x	CO	
Rural	Interstate	1,173.6	3,399.6	15,832.9	6,158.3	18,131.6	85,465.4
	Other Principal Arterial	793.8	1,348.0	6,989.2	4,112.2	7,291.7	35,795.2
	Minor Arterial	371.9	631.9	3,275.2	1,926.9	3,417.2	16,774.2
	Major Collector	1,114.1	1,869.3	9,598.9	5,766.2	10,122.9	49,056.6
	Minor Collector	127.0	213.2	1,094.5	657.5	1,154.4	5,594.5
	Local	360.1	531.2	2,637.5	1,802.9	2,906.1	13,588.8
Urban	Interstate	4,173.3	9,973.9	50,487.8	21,825.1	53,375.1	268,730.0
	Other Principal Arterial	5,825.2	13,688.0	69,658.2	30,454.5	73,272.0	370,246.7
	Minor Arterial	8,530.4	14,447.0	74,740.5	44,184.2	78,163.4	382,590.2
	Major Collector	5,089.5	8,619.8	44,593.3	26,362.1	46,635.7	228,269.9
	Minor Collector	3,346.4	5,473.5	27,597.9	17,299.5	29,727.3	140,692.6
	Local	5,180.6	7,643.6	37,948.4	25,936.9	41,811.5	195,506.6
Totals	36,085.9	67,839.0	344,454.3	186,486.3	366,008.9	1,792,310.7	

Tables 5.6-3 and 5.6-4 present the same emissions by vehicle class in the eight-hour ozone NAA and Maricopa County, respectively.

Table 5.6-5 summarizes the annual and ozone season-day emissions for the pollutants VOC, NO_x, and CO from all onroad mobile sources in the eight-hour ozone NAA and Maricopa County.

Table 5.6–3. Annual and ozone season-day onroad mobile source emissions by vehicle class in the eight-hour ozone NAA.

Vehicle Class	Annual (tons/year)			Ozone season day (lbs/day)		
	VOC	NO _x	CO	VOC	NO _x	CO
LDGV	13,838.3	10,686.6	132,438.4	70,091.7	61,951.4	695,185.8
LDGT12	12,519.5	10,922.3	130,278.7	64,999.6	60,767.7	660,892.5
LDGT34	5,542.4	5,534.5	55,661.8	29,292.4	30,556.5	284,837.8
HDGV	1,508.8	5,071.2	12,178.8	8,024.7	26,380.2	74,944.5
MC	664.6	195.3	2,624.3	3,483.0	912.5	17,548.4
LDDV	20.8	41.8	50.3	107.0	215.3	259.8
LDDT	58.1	93.0	98.4	313.7	493.4	530.4
HDDV	1,620.5	34,704.8	8,134.7	8,555.7	181,919.8	42,556.5
Totals	35,773.1	67,249.7	341,465.4	184,867.9	363,196.8	1,776,755.6

Table 5.6–4. Annual and ozone season-day onroad mobile source emissions by vehicle class in Maricopa County.

Vehicle Class	Annual (tons/year)			Ozone season day (lbs/day)		
	VOC	NO _x	CO	VOC	NO _x	CO
LDGV	13,959.2	10,780.2	133,597.7	70,705.2	62,510.5	701,271.9
LDGT12	12,629.0	11,018.0	131,419.1	65,568.7	61,265.5	666,678.5
LDGT34	5,591.0	5,583.0	56,149.0	29,548.7	30,808.9	287,331.4
HDGV	1,522.1	5,115.7	12,285.2	8,095.2	26,577.4	75,600.6
MC	670.7	197.1	2,647.4	3,513.5	915.1	17,702.2
LDDV	20.9	42.3	50.8	107.9	216.8	261.9
LDDT	58.5	94.0	99.3	316.4	497.1	535.2
HDDV	1,634.5	35,008.7	8,205.8	8,630.7	183,217.6	42,929.0
Totals	36,085.9	67,839.0	344,454.3	186,486.3	366,008.9	1,792,310.7

Table 5.6–5. Summarized 2005 onroad mobile source emissions.

	Annual (tons/year)			Ozone season day (lbs/day)		
	VOC	NO _x	CO	VOC	NO _x	CO
Eight-hour Ozone NAA	35,773.1	67,249.7	341,465.4	184,867.9	363,196.8	1,776,755.
Maricopa County	36,085.9	67,839.0	344,454.3	186,486.3	366,008.9	1,792,310.

5.7 Quality assurance

5.7.1 VMT estimates

Normal quality assurance procedures, including automated and manual consistency checks, were conducted by MAG in developing the 2005 EMME/2 traffic assignment used to generate the VMT data. The VMT estimates using the MAG travel demand model have been validated against more than 3,000 traffic counts collected in 2005–2006, as well as Highway Performance Monitoring System data submitted annually by ADOT to the Federal Highway Administration.

5.7.2 Emission factor estimates

The quality assurance process performed on the MOBILE6.2 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 changes were then rechecked by the reviewer.

5.7.3 Quality review of the 2005 periodic ozone precursor emissions inventory

The draft onroad mobile source portion of the 2005 periodic ozone precursor emissions inventory was reviewed using published EPA quality review guidelines for base year emission inventories (US EPA, 1992b). The procedure review (Levels I, II, and III) included checks for completeness, consistency, and the correct use of appropriate procedures.

Additionally, the onroad mobile source emissions and annual average daily traffic VMT of the 2005 periodic emissions inventory for ozone precursors were compared with those of the 2002 periodic emissions inventory for ozone precursors for Maricopa County (MCAQD, 2004) as shown in Table 5.7-1.

While the VMT increases over time, the modeled onroad NO_x and CO emissions decrease because of the implementation of control measures designed to reduce onroad emissions of NO_x and CO, such as I/M program, cleaner gasoline, cleaner vehicle technologies, etc. It is also important to note that the 2005 baseline emissions in the periodic inventories may not match those in the Eight-Hour Ozone Maintenance Plan because of factors such as use of HPMS VMT vs. link-level VMT estimates from the MAG travel demand models, average daily speeds vs. hourly speeds, monthly/ozone season vs. episode day hourly temperatures, etc.

Table 5.7-1. Comparison of annual and ozone season-day onroad mobile source emissions and annual average daily traffic VMT in Maricopa County.

Year	Annual (tons/year)			Ozone season day (lbs/day)			Annual average daily traffic VMT (miles/day)
	VOC	NO _x	CO	VOC	NO _x	CO	
2002	31,960	79,572	352,821	180,380	437,741	2,023,444	73,579,000
2005	36,086	67,839	344,454	186,486	366,009	1,792,311	85,287,000

5.8 References

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