
Maricopa County
Air Quality Department

# 2014 Periodic Emissions Inventory for Ozone Precursors

for the
Maricopa County, Arizona, Eight-Hour Ozone Nonattainment Area

September 2016

# 2014 Periodic Emissions Inventory for Ozone Precursors for the Maricopa County 8-hour Ozone Nonattainment Area

**September 2016**

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# 2014 Periodic Emissions Inventory for Ozone Precursors for the Maricopa County 8-hour Ozone Nonattainment Area

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# 1. Introduction

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## 1.1 Overview

This 2014 periodic emissions inventory for ozone precursors has been developed to meet requirements set forth in Title I of the Clean Air Act Amendments of 1990 (CAAA), which requires the development of a baseline emissions inventory and periodic revisions for areas that fail to meet the National Ambient Air Quality Standards (NAAQS). A portion of Maricopa County is classified as nonattainment for the 8-hour ozone standard.

This inventory includes emission estimates for three ozone precursors: volatile organic compounds (VOCs), carbon monoxide (CO) and nitrogen oxides ($NO_x$). VOC is defined by Maricopa County's Rule 100 as "any organic compound which participates in atmospheric photochemical reactions, except the non-precursor organic compounds". The inventory provides emission estimates from point, area, nonroad mobile, onroad mobile, and biogenic sources. Note that totals shown in 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 2014 Periodic Emissions Inventory for Ozone Precursors for Maricopa County. Point, area, and some nonroad mobile source emission estimates were prepared by MCAQD. The Maricopa Association of Governments (MAG) prepared the emission estimates for onroad mobile, biogenic, and the majority of nonroad mobile sources. 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. Chapter authors and quality assurance/quality control (QA/QC) contacts.**

| Chapter | Author(s) | QA/QC contact person(s) |
|---|---|---|
| 2. Point sources | Bob Downing, MCAQD 602-506-6790 | Eric Raisanen, MCAQD 602-506-6790<br><br>Matt Poppen, MAG 602-254-6300 |
| 3. Area (nonpoint) sources | Eric Raisanen, Tom Ekren and Dena Konopka, MCAQD 602-506-6790 | Bob Downing, MCAQD 602-506-6790<br><br>Matt Poppen, MAG 602-254-6300 |
| 4. Nonroad mobile sources | Taejoo Shin, MAG 602-254-6300<br><br>Bob Downing, MCAQD 602-506-6790 | Bob Downing, MCAQD 602-506-6790<br><br>Matt Poppen, MAG 602-254-6300 |
| 5. Onroad mobile sources | Taejoo Shin, MAG 602-254-6300 | Matt Poppen, MAG 602-254-6300 |
| 6. Biogenic sources | Taejoo Shin, MAG 602-254-6300 | Matt Poppen, MAG 602-254-6300 |

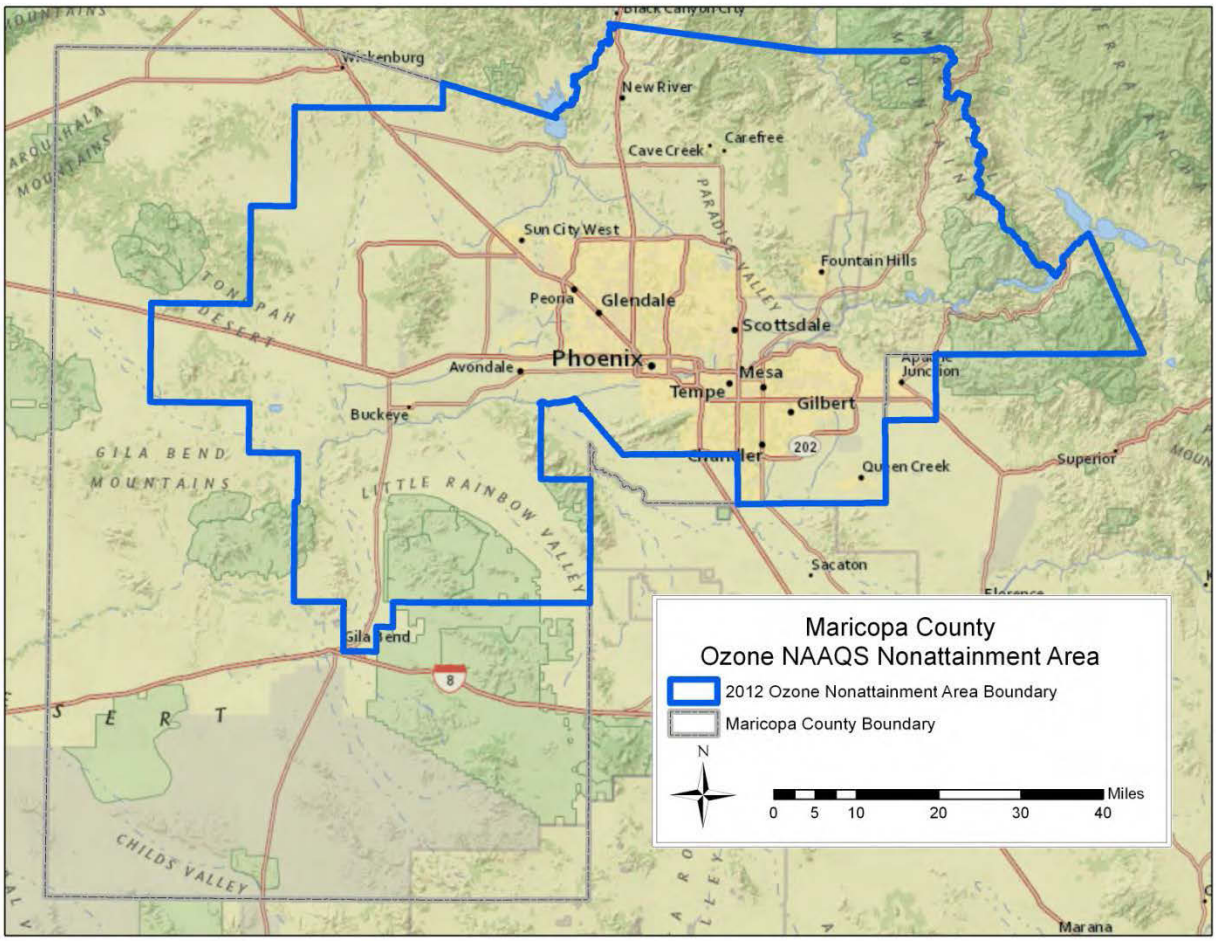
## 1.3 Temporal scope

Both annual and ozone season-day emissions were estimated for the year 2014, for both Maricopa County and the 8-hour ozone nonattainment area (NAA). The 3-month peak ozone season for the Maricopa County nonattainment area has been defined as the June–August timeframe, which encompasses the period during which the region experiences the highest monitored ozone concentrations, the highest average Air Quality Index (AQI) values, and the most frequent exceedances of the 8-hour ozone NAAQS.

## 1.4 Geographic scope

This inventory includes emission estimates for Maricopa County and for the Maricopa County 8-hour ozone nonattainment area. Maricopa County encompasses approximately 9,223 square miles of land area, while the Maricopa County 8-hour ozone nonattainment area is approximately 5,018 square miles or about 54 percent of the Maricopa County land area.[1] A portion of the southeastern boundary of the 8-hour ozone nonattainment area includes areas of Pinal County totaling 48 square miles or 0.96% of the nonattainment area. A map of Maricopa County and the 8-hour ozone nonattainment area is provided in Figure 1.4–1.

**Figure 1.4–1. Map of Maricopa County and the 8-hour ozone nonattainment area.**




1. In May 2012, EPA designated a new 8-hour ozone nonattainment area based on the 2008 8-hour ozone NAAQS (*77 **FR 30088***, May 12, 2012). The previous 8-hour ozone nonattainment area was based on the 1997 8-hour ozone NAAQS. The 2012 nonattainment area boundary was used for the 2011 and this 2014 inventory, as it is expected to be used as a base-year inventory for a future State Implementation Plan.

## 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 nonattainment area and vice versa. (For example, county-level emissions from residential natural gas usage in Maricopa County were apportioned to the nonattainment area using the ratio of total population 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 profile*

The demographic data provided by MAG included population, employment data, and single family/multi-family splits for calendar year 2014, for both Maricopa County and the 8-hour ozone nonattainment area. Table 1.5–1 provides an overview of the key demographic data used in this report. As noted throughout the text, these data are frequently used to derive estimates of activity or emissions within the 8-hour ozone nonattainment area from county-level calculations. It is important to note, however, that the nonattainment area includes a portion of Pinal County, AZ as shown in Figure 1.4–1. Thus in some cases (e.g., those source categories calculated based on total population), the multiplier used to derive nonattainment area estimates from County-level values may be greater than 1, and thus the resulting NAA emission totals are larger than the County-level estimates from which they are derived.

**Table 1.5–1. Demographic profile of Maricopa County and the 8-hour ozone NAA.**

| Demographic variable | Maricopa County | 8-hr ozone NAA | NAA% relative to County |
|---|---|---|---|
| **1. Population:** | | | |
| Resident population | 4,008,651 | 4,040,182 | 100.79% |
| Non-resident population | 319,784 | 324,968 | 101.62% |
| **Total population:** | **4,328,435** | **4,365,150** | **100.85%** |
| **2. Employment:** | | | |
| –Retail employment * | 385,678 | 385,426 | 99.93% |
| –Office employment * | 462,139 | 461,824 | 99.93% |
| –Public employment * | 132,436 | 133,352 | 100.69% |
| –Other employment * | 181,060 | 179,924 | 99.37% |
| ***All commercial/institutional employment:*** | ***1,161,313*** | ***1,160,526*** | ***99.93%*** |
| Industrial employment | 334,326 | 331,137 | 99.37% |
| Construction | 24,808 | 24,583 | 99.09% |
| Work at home | 101,244 | 101,653 | 100.40% |
| Non site-based | 128,193 | 128,068 | 99.90% |
| **Total employment:** | **1,749,884** | **1,746,474** | **99.81%** |
| **3. Household split:** | | | |
| Single-family | 77% | 77% | |
| Multi-family | 23% | 23% | |
| **Total households:** | **100%** | **100%** | |

* These four categories comprise the "commercial/institutional" employment sector.

### *1.5.2 Land-use data*

The land-use data used in this report have been developed by the Maricopa Association of Governments (MAG), which provided 2014 land-use data. Table 1.5–2 presents a listing of the land use categories used, and the acreages of each land-use type within Maricopa County and the 8-hour ozone nonattainment area.

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

| Land use category | Acreage within Maricopa County | Acreage within 8-hour ozone NAA | % relative to County |
|---|---|---|---|
| General/active open space/golf course (e.g., parks) | 212,662 | 213,795 | 100.53% |
| Passive/restricted open space, washes | 2,602,364 | 1,175,442 | 45.17% |
| Lakes | 12,286 | 12,286 | 100.00% |
| Agriculture | 267,894 | 157,478 | 58.78% |
| Vacant (e.g., developable land) | 2,053,015 | 918,426 | 44.74% |

## 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 8-hour ozone nonattainment area, respectively. Since all facilities identified as point sources are located within the 8-hour ozone nonattainment area, the emission values for the two areas are equal. A detailed breakdown of emissions calculations for all point sources is contained in Chapter 2.

**Table 1.6–1. Annual and season-day emissions from point sources in Maricopa County and the 8-hour ozone nonattainment area (including emission reduction credits).**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| Geographic area | VOC | $NO_x$ | CO | VOC | $NO_x$ | CO |
| Maricopa County | 1,041.8 | 1,647.6 | 1,375.1 | 6,281 | 14,074 | 12,163 |
| 8-hr ozone NAA | 1,041.8 | 1,647.6 | 1,375.1 | 6,281 | 14,074 | 12,163 |

### *1.6.2 Area (nonpoint) 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. Emissions from stationary sources that were not identified as point sources in this report have

been included in the area source inventory. Examples of area source categories include residential wood burning, commercial cooking, waste incineration and wildfires.

Tables 1.6–2 and 1.6–3 summarize annual and season-day emissions of the chief area source categories, for Maricopa County and the 8-hour ozone nonattainment area, respectively. A detailed breakdown of emissions calculations for each area source category is contained in Chapter 3.

**Table 1.6–2. Annual and season-day emissions from area sources in Maricopa County.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Fuel combustion | 1,679.8 | 4,931.9 | 10,710.0 | 1,806 | 30,016 | 14,997 |
| Industrial processes | 1,723.9 | 531.6 | 1,619.1 | 12,484 | 3,095 | 11,160 |
| Solvent use | 29,522.2 | 0.0 | 0.0 | 172,914 | 0 | 0 |
| Storage/transport | 3,594.9 | 0.0 | 0.0 | 19,734 | 0 | 0 |
| Waste treatmt/disposal | 124.0 | 41.5 | 225.6 | 881 | 249 | 1,596 |
| Misc. area sources | 132.1 | 128.1 | 3,060.5 | 736 | 800 | 17,410 |
| **All area sources:** | **36,777.0** | **5,633.2** | **15,615.2** | **208,555** | **34,160** | **45,163** |

**Table 1.6–3. Annual and season-day emissions from area sources in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Fuel combustion | 1,689.7 | 4,916.2 | 10,769.1 | 1,783 | 29,505 | 14,839 |
| Industrial processes | 1,715.6 | 531.6 | 1,624.3 | 12,412 | 3,100 | 11,127 |
| Solvent use | 29,510.2 | 0.0 | 0.0 | 172,431 | 0 | 0 |
| Storage/transport | 3,592.9 | 0.0 | 0.0 | 19,718 | 0 | 0 |
| Waste treatmt/disposal | 196.6 | 40.5 | 76.9 | 1,499 | 226 | 421 |
| Misc. area sources | 132.8 | 128.5 | 3,079.4 | 761 | 828 | 17,859 |
| **All area sources:** | **36,837.9** | **5,616.9** | **15,549.7** | **208,605** | **33,660** | **44,246** |

### *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. Tables 1.6–4 and 1.6–5 summarize annual and season-day emissions from nonroad mobile sources, for Maricopa County and the 8-hour ozone nonattainment area, respectively. A detailed breakdown of emissions calculations for each source category is contained in Chapter 4.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Agricultural equipment | 5.7 | 286.9 | 262.2 | 49 | 2,473 | 2,311 |
| Airport GSE (+APU) | 77.3 | 293.7 | 2,211.4 | 409 | 1,575 | 11,710 |
| Commercial equipment | 1,144.0 | 1,175.6 | 29,670.3 | 7,851 | 7,198 | 198,568 |
| Construction & mining | 454.4 | 10,495.7 | 12,531.9 | 3,203 | 72,485 | 88,728 |
| Industrial equipment | 115.1 | 1,263.3 | 3,956.0 | 733 | 7,645 | 25,053 |
| Lawn & garden | 2,937.5 | 589.9 | 44,389.3 | 25,208 | 4,194 | 403,992 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance | 0.3 | 7.7 | 15.2 | 2 | 53 | 108 |
| Recreational equipment | 1,271.8 | 62.4 | 6,501.1 | 15,408 | 713 | 84,058 |
| Aircraft | 1,761.8 | 2,391.1 | 10,688.0 | 9,284 | 12,603 | 57,583 |
| Locomotives | 137.5 | 2,478.3 | 421.8 | 754 | 13,580 | 2,311 |
| **All nonroad sources:** | **8,287.7** | **19,143.1** | **111,801.8** | **70,378** | **124,946** | **904,107** |

**Table 1.6–5. Annual and season-day emissions from nonroad mobile sources in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Agricultural equipment | 3.3 | 168.7 | 154.1 | 29 | 1,454 | 1,358 |
| Airport GSE (+APU) | 76.1 | 290.5 | 2,174.9 | 404 | 1,559 | 11,526 |
| Commercial equipment | 1,134.9 | 1,166.2 | 29,432.3 | 7,788 | 7,140 | 196,975 |
| Construction & mining | 450.3 | 10,400.5 | 12,418.3 | 3,174 | 71,827 | 87,923 |
| Industrial equipment | 114.1 | 1,253.1 | 3,924.2 | 727 | 7,584 | 24,852 |
| Lawn & garden | 2,962.4 | 594.9 | 44,765.8 | 25,422 | 4,229 | 407,419 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance | 0.3 | 7.8 | 15.3 | 2 | 53 | 109 |
| Recreational equipment | 572.0 | 28.1 | 2,924.0 | 6,930 | 321 | 37,807 |
| Aircraft | 1,719.2 | 2,384.3 | 10,494.4 | 9,080 | 12,571 | 56,545 |
| Locomotives | 91.0 | 1,621.2 | 265.3 | 498 | 8,883 | 1,454 |
| **All nonroad sources:** | **7,505.9** | **18,013.6** | **107,723.4** | **61,531** | **118,049** | **855,654** |

### *1.6.4 Onroad mobile sources*

Emissions from onroad mobile sources were calculated for Maricopa County and the 8-hour ozone nonattainment area. A detailed description of emissions calculations is contained in Chapter 5. Table 1.6–6 summarizes annual and season-day emissions from onroad mobile sources in Maricopa County and the 8-hour ozone nonattainment area, respectively.

**Table 1.6–6. Annual and season-day emissions from onroad mobile sources in Maricopa County and the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 19,308.7 | 34,219.1 | 210,239.1 | 118,683 | 182,273 | 1,279,788 |
| 8-hr ozone NAA | 19,162.5 | 32,380.6 | 209,281.7 | 117,999 | 172,963 | 1,273,697 |

### *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 8-hour ozone nonattainment 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 MEGAN2.1. MEGAN2.1 was used to compute biogenic emissions in Maricopa County and the 8-hour ozone nonattainment area. Annual and season-day emissions from biogenic sources are shown in Table 1.6–7 for Maricopa County and the 8-hour ozone nonattainment area.

**Table 1.6–7. Annual and season-day emissions from biogenic sources in Maricopa County and the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 187,065.9 | 987.9 | 23,099.4 | 2,380,298 | 11,235 | 300,222 |
| 8-hr ozone NAA | 102,301.8 | 587.2 | 13,154.5 | 1,321,018 | 6,768 | 173,438 |

### *1.6.6 Summary of all source categories*

Tables 1.6–8 and 1.6–9 provide summary totals of annual and season-day emissions from all emission sources in Maricopa County and the 8-hour ozone nonattainment area, respectively.

**Table 1.6–8. Annual and season-day emissions from all source categories in Maricopa County.**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| **POINT SOURCES:** | 702.3 | 1,604.6 | 1,360.8 | 4,421 | 13,839 | 12,084 |
| Emission reduction credits (ERCs) | 266.1 | 14.1 | 14.3 | 1,458 | 77 | 78 |
| Potential ERCs | 73.3 | 28.8 | | 402 | 158 | |
| **ALL POINT SOURCES:** | **1,041.8** | **1,647.6** | **1,375.1** | **6,281** | **14,074** | **12,163** |
| | | | | | | |
| **AREA (NONPOINT) SOURCES:** | | | | | | |
| ***Fuel combustion:*** | | | | | | |
| Industrial distillate oil: boilers | 1.0 | 96.1 | 24.0 | 6 | 616 | 154 |
| Industrial distillate oil: engines | 134.5 | 1,934.4 | 416.3 | 862 | 12,400 | 2,669 |
| Industrial natural gas | 40.7 | 740.1 | 621.7 | 261 | 4,744 | 3,985 |
| Industrial liquefied petroleum gas | 1.9 | 52.1 | 29.2 | 12 | 334 | 187 |
| Comm./inst. distillate oil: boilers | 0.0 | 2.8 | 0.7 | 0 | 18 | 4 |
| Comm./inst. distillate oil: engines | 0.3 | 4.4 | 1.0 | 2 | 28 | 6 |
| Comm./inst. natural gas | 62.0 | 1,126.8 | 946.5 | 397 | 7,223 | 6,068 |
| Residential distillate oil | 0.0 | 0.3 | 0.1 | 0 | 3 | 1 |
| Residential natural gas | 45.5 | 777.0 | 330.7 | 249 | 4,258 | 1,812 |
| Residential LPG | 1.6 | 41.5 | 11.8 | 15 | 391 | 111 |
| Residential wood combustion | 1,392.2 | 156.3 | 8,328.1 | 0 | 0 | 0 |
| **All Fuel Combustion:** | **1,679.8** | **4,931.9** | **10,710.0** | **1,806** | **30,016** | **14,997** |

**Table 1.6–8. Annual and season-day emissions from all source categories in Maricopa County (continued).**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| ***Industrial Processes:*** | | | | | | |
| Chemical manufacturing | 69.1 | | | 535 | | |
| Commercial cooking | 233.5 | | 666.3 | 1,279 | | 3,651 |
| Bakeries | 112.4 | | | 661 | | |
| Secondary metal production | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |
| Rubber/plastic product manufacturing | 928.8 | | | 7,763 | | |
| Fabricated metal product mfg. | 19.2 | | | 92 | | |
| Electrical equipment manufacturing | 223.6 | 24.3 | 7.5 | 1,280 | 135 | 41 |
| Industrial processes, NEC | 71.4 | 452.2 | 273.7 | 407 | 2,478 | 1,532 |
| **All Industrial Processes:** | **1,723.9** | **531.6** | **1,619.1** | **12,484** | **3,095** | **11,160** |
| | | | | | | |
| ***Solvent Use:*** | | | | | | |
| Architectural coatings | 5,215.8 | | | 31,748 | | |
| Auto refinishing | 958.3 | | | 5,251 | | |
| Traffic markings | 441.0 | | | 4,478 | | |
| Factory finished wood | 193.6 | | | 1,616 | | |
| Wood furniture | 666.4 | | | 1,052 | | |
| Metal furniture: SIC 25 | 59.8 | | | 3,622 | | |
| Paper: SIC 26 | 51.3 | | | 325 | | |
| Metal cans: SIC 341 | 183.2 | | | 279 | | |
| Machinery and equipment: SIC 35 | 58.2 | | | 996 | | |
| Large appliances: SIC 363 | 35.5 | | | 316 | | |
| Electronic/other electrical: SIC 36 | 4.2 | | | 193 | | |
| Motor vehicles: SIC 371 | 183.0 | | | 23 | | |
| Aircraft surface coating | 65.8 | | | 473 | | |
| Marine: SIC 373 | 3.5 | | | 358 | | |
| Railroad: SIC 374 | 5.1 | | | 19 | | |
| Miscellaneous surface coating | 160.9 | | | 1,309 | | |
| Industrial maintenance coatings | 301.0 | | | 875 | | |
| Other special-purpose coatings | 12.0 | | | 1,636 | | |
| Degreasing | 291.9 | | | 1,923 | | |
| Dry cleaning | 10.3 | | | 79 | | |
| Graphics arts | 297.4 | | | 2,308 | | |
| Miscellaneous industrial solvent use | 201.1 | | | 1,443 | | |
| Personal care products | 4,013.2 | | | 21,990 | | |
| Household products | 4,414.5 | | | 24,189 | | |
| Automotive aftermarket products | 2,729.0 | | | 14,950 | | |
| Coatings and related products | 1,906.3 | | | 10,445 | | |
| Adhesives and sealants | 1,143.8 | | | 6,257 | | |
| FIFRA-regulated products | 3,571.7 | | | 19,571 | | |
| Miscellaneous products, NEC | 140.5 | | | 770 | | |
| Cutback asphalt | 1,004.8 | | | 21,844 | | |
| Emulsified asphalt | 828.2 | | | 18,004 | | |
| Agricultural pesticides | 371.0 | | | 2,033 | | |
| **All Solvent Use:** | **29,522.2** | | | **172,914** | | |

**Table 1.6–8. Annual and season-day emissions from all source categories in Maricopa County (continued).**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| ***Storage/Transport:*** | | | | | | |
| Residential portable gas cans | 443.1 | | | 2,428 | | |
| Commercial portable gas cans | 382.0 | | | 2,093 | | |
| Bulk terminals | 91.0 | | | 493 | | |
| Bulk plants | 36.2 | | | 229 | | |
| Gas stations Stage I:submerged fill | 369.9 | | | 2,027 | | |
| Gas stations Stage I:bal. submerged fill | 646.9 | | | 3,545 | | |
| Underground tank breathing/emptying | 764.8 | | | 4,191 | | |
| Airports: aviation gasoline Stage I | 673.6 | | | 3,691 | | |
| Airports: aviation gasoline Stage II | 33.3 | | | 182 | | |
| Truck: gasoline (tank trucks in transit) | 50.0 | | | 274 | | |
| Pipeline gasoline | 66.2 | | | 363 | | |
| Volatile organic liquids storage/transpt | 37.8 | | | 218 | | |
| **All Storage/Transport:** | **3,594.9** | | | **19,734** | | |
| | | | | | | |
| ***Waste Treatment/Disposal:*** | | | | | | |
| On-site incineration | 0.2 | 3.0 | 0.7 | 1 | 19 | 5 |
| Open burning | 18.2 | 8.1 | 172.2 | 140 | 62 | 1,325 |
| Landfills | 36.6 | 9.9 | 14.6 | 158 | 54 | 80 |
| Publicly owned treatment works | 58.9 | | | 453 | | |
| Leaking underground storage tanks | 2.5 | | | 75 | | |
| Other waste | 7.7 | 20.6 | 38.1 | 54 | 113 | 186 |
| **All Waste Treatment/Disposal:** | **124.0** | **41.5** | **225.6** | **881** | **249** | **1,596** |
| | | | | | | |
| ***Miscellaneous Area Sources:*** | | | | | | |
| Backyard barbeques | 52.8 | 60.5 | 2,819.9 | 289 | 332 | 15,451 |
| Structure fires | 15.5 | 2.0 | 84.5 | 76 | 11 | 414 |
| Aircraft engine testing | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |
| Vehicle fires | 10.6 | 1.3 | 41.2 | 58 | 7 | 226 |
| Crematories, human | 0.4 | 10.7 | 0.6 | 3 | 77 | 5 |
| Crematories, animal | 0.1 | 5.6 | 0.3 | 1 | 49 | 3 |
| Accidental releases | 10.1 | 0.2 | 0.4 | 2 | 0 | 0 |
| Hospitals | 33.4 | | | 201 | | |
| Wildfires | 4.5 | 2.0 | 94.8 | 29 | 13 | 606 |
| Prescribed fires | 0.2 | 0.2 | 1.8 | 51 | 51 | 607 |
| **All Miscellaneous Area Sources:** | **132.1** | **128.1** | **3,060.5** | **736** | **800** | **17,410** |
| | | | | | | |
| **ALL AREA SOURCES:** | **36,777.0** | **5,633.2** | **15,615.2** | **208,555** | **34,160** | **45,163** |

**Table 1.6–8. Annual and season-day emissions from all source categories in Maricopa County (continued).**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| **NONROAD MOBILE SOURCES:** | | | | | | |
| Agricultural equipment | 5.7 | 286.9 | 262.2 | 49 | 2,473 | 2,311 |
| Airport GSE (+APU) | 77.3 | 293.7 | 2,211.4 | 409 | 1,575 | 11,710 |
| Commercial equipment | 1,144.0 | 1,175.6 | 29,670.3 | 7,851 | 7,198 | 198,568 |
| Construction & mining equipment | 454.4 | 10,495.7 | 12,531.9 | 3,203 | 72,485 | 88,728 |
| Industrial equipment | 115.1 | 1,263.3 | 3,956.0 | 733 | 7,645 | 25,053 |
| Lawn and garden equipment | 2,937.5 | 589.9 | 44,389.3 | 25,208 | 4,194 | 403,992 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance equipment | 0.3 | 7.7 | 15.2 | 2 | 53 | 108 |
| Recreational equipment | 1,271.8 | 62.4 | 6,501.1 | 15,408 | 713 | 84,058 |
| Aircraft | 1,761.8 | 2,391.1 | 10,688.0 | 9,284 | 12,603 | 57,583 |
| Locomotives | 137.5 | 2,478.3 | 421.8 | 754 | 13,580 | 2,311 |
| **ALL NONROAD MOBILE:** | **8,287.7** | **19,143.1** | **111,801.8** | **70,378** | **124,946** | **904,107** |
| **ALL ONROAD MOBILE:** | **19,308.7** | **34,219.1** | **210,239.1** | **118,683** | **182,273** | **1,279,788** |
| ALL BIOGENIC SOURCES: | **187,065.9** | **987.9** | **23,099.4** | **2,380,298** | **11,235** | **300,222** |
| **TOTAL, ALL SOURCE CATEGORIES:** | **252,480.9** | **61,630.9** | **362,130.7** | **2,784,194** | **366,687** | **2,541,442** |

**Table 1.6–9. Annual and season-day emissions from all sources in the 8-hour ozone NAA.**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| **POINT SOURCES:** | 702.3 | 1,604.6 | 1,360.8 | 4,421 | 13,839 | 12,084 |
| Emission Reduction Credits (ERCs) | 266.1 | 14.1 | 14.3 | 1,458 | 77 | 78 |
| Potential ERCs | 73.3 | 28.8 | | 402 | 158 | |
| **ALL POINT SOURCES:** | **1,041.8** | **1,647.6** | **1,375.1** | **6,281** | **14,074** | **12,163** |
| **AREA (NONPOINT) SOURCES:** | | | | | | |
| ***Fuel combustion:*** | | | | | | |
| Industrial distillate oil: boilers | 1.0 | 95.3 | 23.8 | 6 | 611 | 153 |
| Industrial distillate oil: engines | 133.4 | 1,918.9 | 413.0 | 855 | 12,301 | 2,647 |
| Industrial natural gas | 40.4 | 734.2 | 616.7 | 259 | 4,706 | 3,953 |
| Industrial liquefied petroleum gas | 1.9 | 51.7 | 29.0 | 12 | 332 | 186 |
| Comm./inst. distillate oil: boilers | 0.0 | 2.8 | 0.7 | 0 | 18 | 4 |
| Comm./inst. distillate oil: engines | 0.3 | 4.4 | 1.0 | 2 | 28 | 6 |
| Comm./inst. natural gas | 61.9 | 1,126.0 | 945.9 | 397 | 7,218 | 6,063 |
| Residential distillate oil | 0.0 | 0.3 | 0.1 | 0 | 0 | 0 |
| Residential natural gas | 45.8 | 783.2 | 333.3 | 251 | 4,291 | 1,826 |
| Residential LPG | 1.6 | 41.8 | 11.8 | 0 | 0 | 0 |
| Residential wood combustion | 1,403.2 | 157.6 | 8,393.8 | 0 | 0 | 0 |
| **All Fuel Combustion:** | **1,689.7** | **4,916.2** | **10,769.1** | **1,783** | **29,505** | **14,839** |
| ***Industrial processes:*** | | | | | | |
| Chemical manufacturing | 68.6 | | | 531 | | |
| Commercial cooking | 235.3 | | 671.5 | 1,289 | | 3,680 |
| Bakeries | 111.5 | | | 656 | | |
| Secondary metal production | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |

**Table 1.6–9. Annual and season-day emissions from all sources in the 8-hr ozone NAA (continued).**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| ***Industrial processes (continued):*** | | | | | | |
| Rubber/plastic product manufacturing | 921.4 | | | 7,701 | | |
| Fabricated metal product mfg. | 19.0 | | | 91 | | |
| Electrical equipment manufacturing | 223.6 | 24.3 | 7.5 | 1,280 | 140 | 42 |
| Industrial processes, NEC | 70.3 | 452.2 | 273.7 | 397 | 2,478 | 1,470 |
| **All Industrial Processes:** | **1,715.6** | **531.6** | **1,624.3** | **12,412** | **3,100** | **11,127** |
| ***Solvent use:*** | | | | | | |
| Architectural coatings | 5,260.0 | | | 32,017 | | |
| Auto refinishing | 950.6 | | | 5,209 | | |
| Traffic markings | 437.5 | | | 4,442 | | |
| Factory finished wood | 192.1 | | | 1,603 | | |
| Wood furniture | 661.1 | | | 5,085 | | |
| Metal furniture: SIC 25 | 59.3 | | | 456 | | |
| Paper: SIC 26 | 50.8 | | | 391 | | |
| Metal cans: SIC 341 | 181.8 | | | 1,398 | | |
| Machinery and equipment: SIC 35 | 57.7 | | | 444 | | |
| Large appliances: SIC 363 | 35.2 | | | 271 | | |
| Electronic/other electrical: SIC 36 | 4.2 | | | 32 | | |
| Motor vehicles: SIC 371 | 181.5 | | | 1,396 | | |
| Aircraft surface coating | 65.8 | | | 473 | | |
| Marine: SIC 373 | 3.4 | | | 26 | | |
| Railroad: SIC 374 | 5.1 | | | 39 | | |
| Miscellaneous surface coating | 159.6 | | | 1,299 | | |
| Industrial maintenance coatings | 298.6 | | | 2,297 | | |
| Other special-purpose coatings | 11.9 | | | 92 | | |
| Degreasing | 289.5 | | | 1,908 | | |
| Dry cleaning | 10.4 | | | 80 | | |
| Graphics arts | 295.1 | | | 1,908 | | |
| Miscellaneous industrial solvent use | 199.5 | | | 1,431 | | |
| Personal care products | 4,047.3 | | | 22,177 | | |
| Household products | 4,452.0 | | | 24,395 | | |
| Automotive aftermarket products | 2,752.1 | | | 15,080 | | |
| Coatings and related products | 1,922.5 | | | 10,534 | | |
| Adhesives and sealants | 1,153.5 | | | 6,320 | | |
| FIFRA-regulated products | 3,602.1 | | | 19,737 | | |
| Miscellaneous products, NEC | 141.7 | | | 776 | | |
| Cutback asphalt | 992.3 | | | 5,437 | | |
| Emulsified asphalt | 817.9 | | | 4,482 | | |
| Agricultural pesticides | 218.1 | | | 1,195 | | |
| **All Solvent Use:** | **29,510.2** | | | **172,431** | | |
| ***Storage/transport:*** | | | | | | |
| Residential portable gas cans | 446.6 | | | 2,447 | | |
| Commercial portable gas cans | 385.1 | | | 2,110 | | |
| Bulk terminals | 91.0 | | | 493 | | |
| Bulk plants | 36.2 | | | 229 | | |
| Gas stations Stage I:submerged fill | 369.9 | | | 2,027 | | |
| Gas stations Stage I:bal. submerged fill | 646.9 | | | 3,545 | | |
| Underground tank breathing/emptying | 764.8 | | | 4,191 | | |

**Table 1.6–9. Annual and season-day emissions from all sources in the 8-hr ozone nonattainment area (continued).**

| | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Section** | **VOC** | **NOx** | **CO** | **VOC** | **NOx** | **CO** |
| ***Storage/transport (cont'd):*** | | | | | | |
| Airports: aviation gasoline Stage I | 667.5 | | | 3,658 | | |
| Airports: aviation gasoline Stage II | 33.0 | | | 181 | | |
| Truck: gasoline (tank trucks in transit) | 50.0 | | | 274 | | |
| Pipeline gasoline | 66.2 | | | 363 | | |
| Volatile organic liquids storage/transpt | 35.7 | | | 201 | | |
| **All Storage/Transport:** | **3,592.9** | | | **19,718** | | |
| ***Waste treatment/disposal:*** | | | | | | |
| On-site incineration | 0.1 | 2.9 | 0.7 | 1 | 19 | 5 |
| Open burning | 90.4 | 4.3 | 9.6 | 695 | 33 | 74 |
| Landfills | 36.6 | 12.7 | 28.5 | 217 | 70 | 157 |
| Publicly owned treatment works | 59.3 | | | 456 | | |
| Leaking underground storage tanks | 2.5 | | | 75 | | |
| Other waste | 7.7 | 20.6 | 38.1 | 54 | 105 | 186 |
| **All Waste Treatment/Disposal:** | **196.6** | **40.5** | **76.9** | **1,499** | **226** | **421** |
| ***Misc. area sources:*** | | | | | | |
| Backyard barbeques | 53.2 | 61.0 | 2,842.1 | 291 | 334 | 15,573 |
| Structure fires | 15.6 | 2.0 | 85.2 | 77 | 10 | 418 |
| Aircraft engine testing | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |
| Vehicle fires | 10.6 | 1.3 | 41.6 | 58 | 7 | 228 |
| Crematories, human | 0.4 | 10.7 | 0.6 | 3 | 73 | 4 |
| Crematories, animal | 0.1 | 5.6 | 0.3 | 1 | 49 | 3 |
| Accidental releases | 10.1 | 0.2 | 0.4 | 2 | 16 | 0 |
| Hospitals | 33.7 | | | 202 | | |
| Wildfires | 4.3 | 1.9 | 90.4 | 37 | 17 | 792 |
| Prescribed fires | 0.2 | 0.2 | 1.8 | 63 | 62 | 743 |
| **All Miscellaneous Area Sources:** | **132.8** | **128.5** | **3,079.4** | **761** | **828** | **17,859** |
| **ALL AREA SOURCES:** | **36,837.9** | **5,616.9** | **15,549.7** | **208,605** | **33,660** | **44,246** |
| **NONROAD MOBILE SOURCES:** | | | | | | |
| Agricultural equipment | 3.3 | 168.7 | 154.1 | 29 | 1,454 | 1,358 |
| Airport GSE (+APU) | 76.1 | 290.5 | 2,174.9 | 404 | 1,559 | 11,526 |
| Commercial equipment | 1,134.9 | 1,166.2 | 29,432.3 | 7,788 | 7,140 | 196,975 |
| Construction & mining equipment | 450.3 | 10,400.5 | 12,418.3 | 3,174 | 71,827 | 87,923 |
| Industrial equipment | 114.1 | 1,253.1 | 3,924.2 | 727 | 7,584 | 24,852 |
| Lawn and garden equipment | 2,962.4 | 594.9 | 44,765.8 | 25,422 | 4,229 | 407,419 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance equipment | 0.3 | 7.8 | 15.3 | 2 | 53 | 109 |
| Recreational equipment | 572.0 | 28.1 | 2,924.0 | 6,930 | 321 | 37,807 |
| Aircraft | 1,719.2 | 2,384.3 | 10,494.4 | 9,080 | 12,571 | 56,545 |
| Locomotives | 91.0 | 1,621.2 | 265.3 | 498 | 8,883 | 1,454 |
| **ALL NONROAD MOBILE:** | **7,505.9** | **18,013.6** | **107,723.4** | **61,531** | **118,049** | **855,654** |
| **ALL ONROAD MOBILE:** | **19,162.5** | **32,380.6** | **209,281.7** | **117,999** | **172,963** | **1,273,697** |
| **BIOGENIC SOURCES:** | **102,301.8** | **587.2** | **13,154.5** | **1,321,018** | **6,768** | **173,438** |
| **TOTAL, ALL SOURCE CATEGORIES:** | **166,849.8** | **58,245.8** | **347,084.4** | **1,715,433** | **345,514** | **2,359,198** |

# 2. Point Sources

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## 2.1 Introduction and scope

This inventory of ozone precursors (VOC, $NO_x$, and CO) is one of two 2014 emissions inventory reports being prepared to meet US EPA reporting requirements. This inventory has been developed concurrently with a similar inventory for $PM_{10}$ and related pollutants ($PM_{2.5}$, $NO_x$, $SO_x$, and $NH_3$) as part of Maricopa County's requirements under the respective State Implementation Plans (SIPs).

In addition to preparing a periodic emissions inventory for the 8-hour ozone nonattainment area (NAA) as a commitment under the current 8-hour ozone SIP, the federal Air Emission Reporting Requirements (AERR; US EPA, 2015) rule 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 Emissions Inventory (NEI) for calendar year 2014.

## 2.2 Identifying point sources

In order to provide consistency among various inventories, it was decided to standardize the definition of a "point source" by adopting the designation of point sources as outlined in the *Federal Register* notice for the original 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… [T]his 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)

This chapter contains several tables that provide information on emissions from large stationary point sources. Table 2.2–1 provides an alphabetical listing of all point sources and their location. Table 2.4–1 shows the annual and ozone season-day emissions of VOC, $NO_x$ and CO for those point sources that reported emissions of one or more of these pollutants in 2014. Table 2.5–1 lists emission reduction credits for the area, while Table 2.7–1 summarizes point source emission totals for both Maricopa County and the 8-hour ozone nonattainment area. Note that the totals shown in tables may not equal the sum of individual values due to independent rounding.

The Maricopa County Air Quality Department (MCAQD) identified point sources within the county through its electronic permit system database, EMS, and the 2014 annual emissions reports submitted to the department. A total of 19 stationary sources were identified as point sources using the definition described in Section 2.1 above. 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 |
|---|---|---|---|---|---|
| 3313 | 221112 | APS West Phoenix Power Plant | 4606 W Hadley St | Phoenix | 85043 |
| 43063 | 221112 | Arlington Valley LLC | 39027 W Elliot Rd | Arlington | 85322 |
| 1218 | 562212 | Butterfield Station Facility | 40404 S 99th Ave | Mobile | 85239 |
| 127771 | 331111 | CMC Steel Fabricators Inc. | 11444 E Germann Rd | Mesa | 85212 |
| 44439 | 221112 | Gila River Power Station | 1250 E Watermelon | Gila Bend | 85337 |
| 4173 | 562212 | Glendale Mun Sanitary Landfill | 11480 W Glendale Av | Glendale | 85301 |
| 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 |
| 1879 | 562212 | Northwest Regional Landfill | 19401 W Deer Valley | Surprise | 85387 |
| 1331 | 337122 | Oak Canyon Manufacturing Inc. | 3021 N 29th Dr. | Phoenix | 85017 |
| 52382 | 221112 | Ocotillo Power Plant | 1500 E University Dr. | Tempe | 85281 |
| 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 Av | Glendale | 85303 |
| 3317 | 221112 | SRP Kyrene Generating Station | 7005 S Kyrene Rd | Tempe | 85283 |
| 1210 | 337122 | Trendwood Inc. | 2402 S 15th Ave | Phoenix | 85007 |

Note: All facilities listed above are also located within the 8-hour ozone nonattainment area.

## 2.3 Procedures for estimating emissions from point sources

Annual and season-day emission estimates were calculated from annual source emissions 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 source tests, AP–42, engineering calculations, or manufacturers' specifications.

MCAQD distributes annual emissions survey forms to most facilities for which MCAQD has issued an operating permit, including all Title V and synthetic minor facilities. All facilities are required to report detailed information on stacks, control devices, operating schedules, and process-level information concerning their annual activities. Detailed instructions accompany the emissions reporting forms, and include examples and explanations on how to complete the annual emissions reporting forms that facilities must submit to MCAQD. (See Appendix A for a copy of the instructions accompanying the annual emissions inventory forms.)

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 ("RE") 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 emissions inventory has evolved from the observation that regulatory programs may be less than 100 percent effective for some source categories. Rule effectiveness 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 rule effectiveness for a variety of emissions sources and source categories. For processes that claimed emissions reductions through the use of a control device, rule effectiveness was quantified separately for Title V and non-Title V sources. Overall RE values of 90.44% (for Title V processes) and 89.00% (for non-Title V processes) were calculated, and applied to 2014 process-level emissions information where applicable. Appendix B provides further details on the methods and data used in computing these rule effectiveness rates.

## 2.4 Detailed overview of point source emissions

Table 2.4–1 provides a summary of annual and season-day emissions from all 19 facilities that have been categorized as point sources (all of which are located within the 8-hour ozone nonattainment area). Sources for which rule effectiveness has been applied are noted. Emissions values of "0.0" and "0" for annual and season-day emissions denote quantities below the level of significance (0.05 tons/yr and 0.5 lbs/day, respectively).

**Table 2.4–1. Annual and season-day emissions from point sources, by facility.**

| | | | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|---|
| **ID #** | **Business name** | | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| 3313 | APS West Phoenix Power Plant | * | 17.9 | 441.5 | 81.5 | 136 | 3,200 | 684 |
| 43063 | Arlington Valley LLC | * | 12.7 | 75.8 | 33.5 | 138 | 825 | 366 |
| 1218 | Butterfield Station Facility | * | 5.0 | 16.7 | 25.3 | 28 | 103 | 141 |
| 127771 | CMC Steel Fabricators Inc. | * | 25.5 | 42.7 | 561.0 | 243 | 405 | 5,377 |
| 44439 | Gila River Power Station | * | 12.6 | 216.3 | 68.5 | 109 | 1,900 | 614 |
| 4173 | Glendale Mun. Sanitary Landfill | * | 2.3 | 13.0 | 74.5 | 4 | 71 | 409 |
| 44186 | Mesquite Power Operations LLC | | 22.1 | 190.5 | 56.8 | 151 | 1,362 | 428 |
| 43530 | New Harquahala Gen Co. | | 4.5 | 38.8 | 28.1 | 79 | 707 | 521 |
| 20706 | New Wincup Holdings Inc. | | 156.5 | 11.4 | 2.6 | 860 | 66 | 15 |
| 1879 | Northwest Regional Landfill | * | 48.5 | 21.1 | 96.4 | 89 | 116 | 530 |
| 1331 | Oak Canyon Inc. | | 100.6 | | | 774 | | |
| 52382 | Ocotillo Power Plant | | 4.5 | 76.4 | 13.0 | 32 | 609 | 103 |
| 42956 | Redhawk Generating Facility | | 6.0 | 153.5 | 156.8 | 48 | 1,072 | 1,104 |
| 303 | Rexam Beverage Can Co. | * | 117.3 | 4.8 | 4.1 | 670 | 25 | 21 |
| 3315 | Santan Generating Station | | 7.9 | 211.8 | 100.5 | 71 | 2,174 | 937 |
| 4175 | SFPP LP Phoenix Terminal | * | 114.2 | 3.6 | 8.2 | 627 | 23 | 48 |
| 3316 | SRP Agua Fria Generating Stn. | | 2.0 | 44.6 | 29.5 | 38 | 765 | 581 |
| 3317 | SRP Kyrene Generating Station | | 1.6 | 42.0 | 20.4 | 11 | 415 | 204 |
| 1210 | Trendwood Inc. | * | 40.6 | | | 313 | | |
| | **Totals:** | | **702.3** | **1,604.6** | **1,360.8** | **4,421** | **13,839** | **12,084** |

* = Facility for which rule effectiveness has been applied to one or more reported processes.

## 2.5 Emission reduction credits (ERCs)

A major source or major modification planned in a nonattainment 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 increased emissions 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.

In order for these emission reductions to be available in the future for offsetting, they must: (1) be explicitly included and quantified as growth in projection-year inventories required in rate of progress plans or attainment demonstrations that were based on 1990 actual inventories, and (2) meet the requirements outlined in MCAQD Rule 240 (renamed "Federal Major New Source Review [NSR]" in early 2016). Table 2.5–1 provides a list of emission reduction credits for VOC, $NO_x$, and CO.

**Table 2.5–1. Available Emissions Reduction Credits (ERCs) as of December 31, 2014.**

| | | Emission reduction credits (tons/yr) | | |
|---|---|---|---|---|
| **Facility name** | **Reduction date** | **VOC** | **$NO_x$** | **CO** |
| Freescale Semiconductor, Inc. | 3/1/2004 | 17.1 | 9.8 | 14.3 |
| Intel Corporation | 3/4/2005 | 178.33 | | |
| Madison 51, LLC (Thornwood) | 10/8/2012 | 53.1 | | |
| Penn Racquet Sports Inc. | 3/6/2009 | | 4.34 | |
| Woodstuff Manufacturing Inc. | 11/30/2007 | 17.6 | | |
| **Totals:** | | **266.13** | **14.14** | **14.3** |

A number of facilities have been identified as potential sources of ERCs for $NO_x$ or VOC, in addition to those listed in Table 2.5–1. The companies listed in Table 2.5–2 below are permitted facilities that have permanently closed since 2011, and whose annual emissions history indicates that the facility is a potential source of the source of additional ERCs. This list is provided here in order to maintain the availability of these emissions in this periodic inventory in the event that sufficient documentation can be secured to confirm the emissions reductions.

**Table 2.5–2. Potential sources of emission reduction credits for VOC or $NO_x$.**

| Permit no. | Facility name | City, ZIP | Potential ERCs (tons/yr) VOC | Potential ERCs (tons/yr) $NO_x$ |
|---|---|---|---|---|
| 100087 | Di-Matrix Precision Manufacturing | Phoenix, 85040 | 17.4 | |
| 110178 | Saint Gobain Solar Glass Facility | Goodyear, 85338 | 9.9 | |
| 020005 | Jabil | Tempe, 85281 | 8.5 | |
| 010233 | All Pro Industrial Finishes | Tempe, 85281 | 8.4 | |
| 150049 | Artisan Natural Stone Products LLP | Phoenix, 85034 | 7.8 | |
| 010240 | Wells Cargo Inc./Haulmark Industries Inc. | Phoenix, 85043 | 6.0 | |
| 110195 | Crown Custom Millwork LLC | Phoenix, 85085 | 5.0 | |
| 990152 | Wickenburg Oil Company LLC | Wickenburg, 85390 | 4.2 | |
| 020189 | American Case & Pedestal Mfg. Co. | Phoenix, 85009 | 4.0 | |
| 990254 | Benchmark Electronics Phoenix, Inc. | Phoenix, 85023 | 2.1 | |
| 090003 | Phoenix San-Man Inc. | Buckeye, 85326 | | 9.9 |
| 010143 | Gro-Well Brands Inc. | Phoenix, 85009 | | 8.3 |
| 970349 | Cemex – Central Ave. Plant | Phoenix, 85041 | | 7.5 |
| 090298 | Phoenix Brick Yard | Phoenix, 85007 | | 3.1 |
| | **Totals:** | | **73.3** | **28.8** |

## 2.6 Quality assurance/quality control procedures

### *2.6.1 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 Emissions 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 A). The EI Unit asks sources to verify and update the data. The EI Unit also holds numerous workshops each spring to assist businesses in completing EI forms. The general data flow for data collection and inventory preparation is shown in Figure 2.6–1.

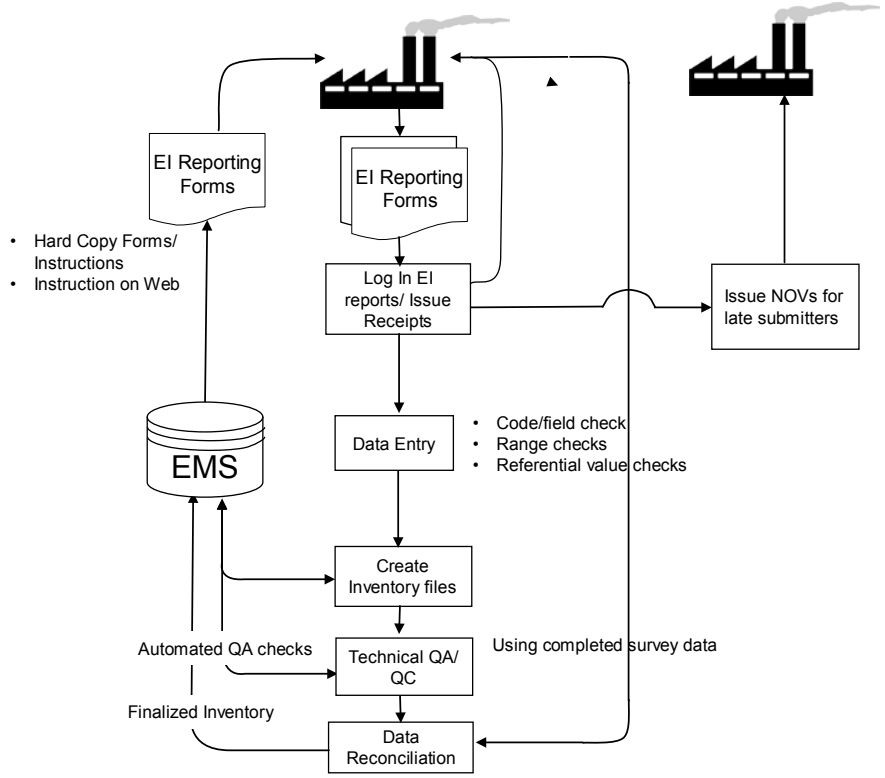


**Figure 2.6–1. Data flow for annual point source emissions inventory reporting.**

### *2.6.2 Submission processing*

Submitted EI reports are logged in as they are received, and receipts are issued for any emissions fees paid. The data are input "as received" into the department's data base. During data entry, a variety of 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 completeness of required data, and
- checking the report for calculation errors. This includes annual throughput, emission factors, unit conversion factors (e.g., therms to MMCF), capture efficiency, primary / secondary control device efficiency, and any offsite recycling credits claimed.

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 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 EPA.

To prepare the inventory for submittal to the National Emissions Inventory (NEI), the EI Unit has developed a series of MS-Access queries to extract data from EMS; and to append or convert codes, units of measure, etc., in order to create staging tables that adhere to the EPA's Consolidated Emissions Reporting Schema (CERS). These tables are then converted to XML files using EPA's Bridge conversion tool for submittal to the EPA's Emissions Inventory System (EIS).

### *2.6.3 Analysis of annual point source emissions data for this inventory*

Air quality planning staff 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. Quality assurance checks were conducted by checking all emissions reports submitted to MCAQD for the year 2014 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 2014 annual emissions report.

## 2.7 Summary of all point source emissions

Table 2.7–1 below summarizes annual and season-day emissions from all point sources, including the existing and potential emission reduction credits listed above in Tables 2.5–1 and 2.5–2 respectively, for both Maricopa County and the 8-hour ozone nonattainment area.

**Table 2.7–1. Annual and season-day point source emissions (including all emission reduction credits).**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1,041.8 | 1,647.6 | 1,375.1 | 6,281 | 14,074 | 12,163 |
| 8-hr ozone NAA | 1,041.8 | 1,647.6 | 1,375.1 | 6,281 | 14,074 | 12,163 |

## 2.8 References

US EPA, 2008. Air Emissions Reporting Requirements. 73 Fed. Reg. 76539 (Dec. 17, 2008). *https://federalregister.gov/a/E8-29737*

US EPA, 2015. Revisions to the Air Emissions Reporting Requirements: Revisions to Lead (Pb) Reporting Threshold and Clarifications to Technical Reporting Details. 80 Fed. Reg. 8787 (Feb. 19, 2015). *https://federalregister.gov/a/2015-03470*

# 3. Area (Nonpoint) Sources

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## 3.1 Scope and methodology

This chapter considers all stationary sources which are too small or too numerous to be treated as point sources. A variety of US EPA guidance materials were evaluated to identify area source categories meriting inclusion in this inventory, including the 2014 National Emissions Inventory (NEI) website (US EPA, 2016); documentation of the development of the previous NEI in 2011 (US EPA, 2015); and the document "Introduction to Area Source Inventory Development" (US EPA, 2001a). In addition, permit and emissions data in the MCAQD's Environmental Management System (EMS) database were analyzed to identify critical point and area source categories. Some source categories were deemed "insignificant" because there are no large production facilities and/or very few small sources, and thus emissions from these categories were not quantified.

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

- For those source categories with detailed emissions data available from most or all of the significant sources in the category (e.g., aircraft engine testing), annual and season-day emissions were calculated based on detailed process-level and operational data provided by these sources.
- 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 those source categories in which some representative facilities submit annual emissions reports (e.g., bakeries), these detailed data were used to develop a per-employee emission factor, which was then used along with County-level employment data from the US Census to "scale up" those emissions reported from the subset of surveyed facilities, to reflect emissions from the entire source category.
- For a small number of particularly ubiquitous or diverse categories (e.g., consumer solvent use), emissions estimated using published or recommended per-capita (or per-employee) emission factors.
- Emissions estimates for some categories were obtained from County-level emissions estimates developed by US EPA for use in the 2014 National Emissions Inventory, or by using related emissions estimation tools developed by US EPA (e.g., residential wood combustion).

The specific emissions estimation method(s) used for each source category, including the derivation and application of rule effectiveness, are described in greater detail in the respective sections. Emissions estimates for several source categories were conducted by staff from the consulting firm ERG (www.erg.com) under a contract with MCAQD.

## 3.2 Fuel combustion

### *3.2.1 Industrial fuel combustion*

#### *3.2.1.1 Industrial distillate oil*

Annual emissions from industrial distillate oil combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). US EPA developed separate estimates for emissions from external combustion sources (boilers) and internal combustion engines, for each county nationwide. Annual emissions for the 8-hour ozone nonattainment area were estimated by apportioning Maricopa

County's emissions to the nonattainment area, using the ratio of industrial employment (99.20%) as a surrogate. See Section 1.5.1 for a discussion of the employment data used. Annual emissions for Maricopa County and 8-hour ozone nonattainment area are presented in Table 3.2–1.

**Table 3.2–1. Annual emissions (tons/yr) from area-source industrial distillate oil combustion.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Boilers | 1.0 | 96.1 | 24.0 | 1.0 | 95.3 | 23.8 |
| Engines | 134.5 | 1,934.4 | 416.3 | 133.4 | 1,918.9 | 413.0 |
| **Totals:** | **135.5** | **2,030.5** | **440.3** | **134.4** | **2,014.2** | **436.8** |

To calculate season-day emissions, it was assumed that industrial combustion of distillate oil occurs six days per week, and is relatively uniform throughout the year. Thus annual emissions were divided by 312 (= 6 days/week × 52 weeks/year) to derive emissions for an ozone season day. Season-day emissions for Maricopa County and the 8-hour ozone nonattainment area are presented in Table 3.2–2.

**Table 3.2–2. Season-day emissions (lbs/day) from area-source industrial distillate oil combustion.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Boilers | 6 | 616 | 154 | 6 | 611 | 153 |
| Engines | 862 | 12,400 | 2,669 | 855 | 12,301 | 2,647 |
| **Totals:** | **868** | **13,016** | **2,823** | **861** | **12,912** | **2,800** |

### *3.2.1.2 Industrial natural gas*

Annual emissions from industrial natural gas combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). To calculate season-day emissions, it was assumed that industrial natural gas combustion occurs six days per week, and is relatively uniform throughout the year. Thus annual emissions were divided by 312 (= 6 days/week × 52 weeks/year) to derive emissions for an ozone season day.

Emissions for the 8-hour ozone nonattainment area were estimated by apportioning County-level emissions to the nonattainment area, using the ratio of industrial employment (99.20%) as a surrogate. See Section 1.5.1 for a discussion of the employment data used. Annual and season-day emissions for Maricopa County and the 8-hour ozone NAA are shown in Table 3.2–3.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 40.7 | 740.1 | 621.7 | 261 | 4,744 | 3,985 |
| 8-hr ozone nonattainment area | 40.4 | 734.2 | 616.7 | 259 | 4,706 | 3,953 |

#### *3.2.1.3 Industrial liquefied petroleum gas (LPG)*

Annual emissions from industrial LPG combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). To calculate season-day emissions, it was assumed that industrial LPG combustion occurs six days per week, and is relatively uniform throughout the year. Thus annual emissions were divided by 312 (= 6 days/week × 52 weeks/year) to derive emissions for an ozone season day.

Emissions for the 8-hour ozone nonattainment area were estimated by apportioning County-level emissions to the nonattainment area, using the ratio of industrial employment (99.20%) as a surrogate. See Section 1.5.1 for a discussion of the employment data used. Annual and season-day emissions for Maricopa County and the 8-hour ozone NAA are shown in Table 3.2–4.

**Table 3.2–4. Annual and season-day emissions from area-source industrial LPG combustion.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1.9 | 52.1 | 29.2 | 12 | 334 | 187 |
| 8-hr ozone nonattainment area | 1.9 | 51.7 | 29.0 | 12 | 332 | 186 |

### *3.2.2 Commercial/institutional fuel combustion*

#### *3.2.2.1 Commercial/institutional distillate oil*

Annual emissions from commercial/institutional distillate oil combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). US EPA develops separate estimates for emissions from external combustion sources (boilers) and internal combustion engines, for each county nationwide.

Annual emissions for the 8-hour ozone nonattainment area were estimated by apportioning Maricopa County's emissions to the nonattainment area, using the ratio of commercial/ institutional employment (99.93%) as a surrogate. See Section 1.5.1 for a discussion of the employment data used. Annual emissions for Maricopa County and 8-hour ozone nonattainment area are presented in Table 3.2–5.

**Table 3.2–5. Annual emissions (tons/yr) from area-source commercial/institutional distillate oil combustion.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Boilers | 0.0 | 2.8 | 0.7 | 0.0 | 2.8 | 0.7 |
| Engines | 0.3 | 4.4 | 1.0 | 0.3 | 4.4 | 1.0 |
| **Totals:** | **0.3** | **7.2** | **1.7** | **0.3** | **7.2** | **1.7** |

To calculate season-day emissions, it was assumed that industrial combustion of distillate oil occurs six days per week, and is relatively uniform throughout the year. Thus annual emissions were divided by 312 (= 6 days/week × 52 weeks/year) to derive emissions for an ozone season day. Season-day emissions for Maricopa County and the 8-hour ozone nonattainment area are presented in Table 3.2–6.

**Table 3.2–6. Season-day emissions (lbs/day) from area-source commercial/institutional distillate oil combustion.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Boilers | 0 | 18 | 4 | 0 | 18 | 4 |
| Engines | 2 | 28 | 6 | 2 | 28 | 6 |
| **Totals:** | **2** | **46** | **10** | **2** | **46** | **10** |

*3.2.2.2 Commercial/institutional natural gas*

Annual emissions from commercial/institutional natural gas combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). To calculate ozone season-day emissions, it was assumed that commercial/institutional natural gas combustion occurs six days per week, and is relatively uniform throughout the year. Thus annual emissions were divided by 312 (= 6 days/week × 52 weeks/year) to derive emissions for an ozone season day.
Emissions for the 8-hour ozone nonattainment area were estimated by apportioning County-level emissions to the nonattainment area, using the ratio of commercial/institutional employment (99.93%) as a surrogate. See Section 1.5.1 for a discussion of the employment data used.
Annual and season-day emissions for Maricopa County and the 8-hour ozone nonattainment area are presented in Table 3.2–7.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 62.0 | 1,126.8 | 946.5 | 397 | 7,223 | 6,068 |
| 8-hr ozone nonattainment area | 61.9 | 1,126.0 | 945.9 | 397 | 7,218 | 6,063 |

### *3.2.3 Residential fuel combustion*

*3.2.3.1 Residential distillate oil*

Annual emissions from residential distillate oil combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). The 2014 NEI utilized 2013 state-level fuel consumption data from Energy Information Administration's (EIA) State Energy Data System (SEDS) (EIA, 2016). State-level emissions were calculated using the EIA data and allocated to the counties based on state-level and county-level data on number of housing units using a specific type of fuel for residential heating from the U.S. Census Bureau. ERG reviewed potential sources of activity data for 2014

to update the emission estimates for Maricopa County. Fuel consumption data for 2014 are available from EIA's SEDS, but the 2014 residential distillate fuel consumption data for Arizona were unchanged from the 2013 data that were used in the 2014 NEI.

Ozone season-day emissions would normally be calculated by dividing ozone season emissions by heating degree days (i.e. the number of degrees per day that the daily average temperature is below 65 °F). However, data obtained from National Oceanic and Atmospheric Administration (NOAA, 2016) indicated that there were no heating degree days reported during the 2014 ozone season (June–August). Therefore, ozone season-day emissions from residential distillate oil combustion are assumed to be zero.

Annual and season-day emissions within the 8-hour ozone nonattainment area were calculated by multiplying county totals by the ratio of total resident population in the nonattainment area to the total resident population in the county (100.79%). See Section 1.5.1 for a discussion of the population data used. The resulting annual and season-day emissions estimates are presented in Table 3.2–8.

**Table 3.2–8. Annual and season-day emissions from residential distillate oil combustion.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 0.0 | 0.3 | 0.1 | 0 | 3 | 1 |
| 8-hr ozone nonattainment area | 0.0 | 0.3 | 0.1 | 0 | 0 | 0 |

*3.2.3.2 Residential natural gas*

All natural gas suppliers in Maricopa County were surveyed to gather information regarding the volume of natural gas sold in 2014, by user category, within the county. Annual emissions from residential natural gas combustion were calculated by multiplying residential natural gas sales in 2014 (16,532.9 MMCF) by EPA-recommended emission factors from WebFIRE (US EPA, 2015).

Ozone season-day emissions were calculated by first summing monthly reported natural gas usage during the ozone season months (June–August; 1,979.5 MMCF) to derive a total ozone season emissions value. Activity for this source category was assumed to occur evenly, both on a weekly and annual basis. Total ozone-season emissions were thus divided by the total days (92) during the ozone season to derive season-day emissions.

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying county-level emissions by the ratio of total resident population in the nonattainment area to the total resident population in the county (100.79%). See Section 1.5.1 for a discussion of the population data used. Table 3.2–9 below summarizes annual and ozone season-day emissions from residential natural gas combustion for both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.2–9. Annual and season-day emissions from residential natural gas combustion.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 45.5 | 777.0 | 330.7 | 118 | 2,023 | 861 |
| 8-hr ozone nonattainment area | 45.8 | 783.2 | 333.3 | 119 | 2,038 | 867 |

### *3.2.3.3 Residential liquefied petroleum gas (LPG)*

Annual emissions from residential LPG combustion were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). The 2014 NEI utilized 2013 state-level fuel consumption data from Energy Information Administration's (EIA) State Energy Data System (SEDS). ERG reviewed potential sources of activity data for 2014 to update the emission estimates for Maricopa County. Fuel consumption data for 2014 are available from EIA's SEDS (EIA 2016) and indicate 1,004,000 barrels of LPG consumed in the residential sector in Arizona. State-level emissions were then allocated to Maricopa County based on the ratio of housing units that utilize LPG at the county-level to state-level. Data used in the 2014 NEI indicate that approximately 15% of all households using LPG in the state of Arizona are located in Maricopa County.

Ozone season emissions would normally be calculated by applying the ratio of heating degree days (HDD) in the ozone season (June-August) to total annual HDD. However, data obtained from National Oceanic and Atmospheric Administration (NOAA, 2016) indicated that there were no heating degree days reported during the 2014 ozone season (June–August). Thus, ozone season-day emissions from residential LPG combustion are assumed to be zero.

Annual and season-day emissions within the 8-hour ozone nonattainment area were calculated by multiplying county-level emission estimates by the nonattainment-area/county ratio of total resident population (100.79%). See Section 1.5.1 for a discussion of the population data used. Table 3.2–10 summarizes annual and ozone season-day emissions from residential LPG combustion for both the county and the 8-hour ozone nonattainment area.

**Table 3.2–10. Annual and season-day emissions from residential LPG combustion.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1.6 | 41.5 | 11.8 | 15 | 391 | 111 |
| 8-hr ozone nonattainment area | 1.6 | 41.8 | 11.8 | 0 | 0 | 0 |

### *3.2.3.4 Residential kerosene*

County-level emission estimates that were developed for use in US EPA's 2014 National Emissions Inventory (NEI) were obtained and reviewed (US EPA, 2016). The 2014 NEI utilized 2013 state-level fuel consumption data from Energy Information Administration's (EIA) State Energy Data System (SEDS) (EIA, 2016). The 2013 fuel consumption data for Arizona indicated no kerosene consumption in the residential sector; therefore, the 2014 NEI emission estimates for Arizona and Maricopa County were also zero.

ERG reviewed available activity data sources for 2014 at the state-level and county-level. Review of Arizona data downloaded from SEDS for 2014 (EIA 2016) indicated zero consumption of kerosene in the residential sector for the entire state of Arizona (and Maricopa County). Since the available activity data indicates that there is no kerosene consumption in the residential sector for Arizona, the emissions from this source category are considered to be zero.

#### *3.2.3.5 Residential wood combustion*

Annual emissions from residential wood combustion were derived from the county-level estimates prepared by EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). County-level annual emissions by appliance type are shown in Table 3.2–11.

**Table 3.2–11. Annual emissions from residential wood combustion (RWC) in Maricopa County, by appliance type (from EPA's RWC emissions-estimation tool).**

| | | Annual emissions (tons/yr) | | |
|---|---|---|---|---|
| **SCC** | **Appliance type** | **VOC** | **$NO_x$** | **CO** |
| 2104008210 | Woodstove: fireplace inserts; non-EPA certified | 143.5 | 19.7 | 1,130.9 |
| 2104008220 | –Fireplace inserts; EPA certified; non-catalytic | 198.4 | 10.5 | 864.2 |
| 2104008230 | –Fireplace inserts; EPA certified; catalytic | 29.4 | 5.6 | 345.3 |
| 2104008310 | –Freestanding, non-EPA certified | 10.9 | 1.5 | 75.8 |
| 2104008320 | –Freestanding, EPA certified, non-catalytic | 592.0 | 31.3 | 2,578.0 |
| 2104008330 | –Freestanding, EPA certified, catalytic | 166.2 | 31.6 | 1,950.3 |
| 2104008400 | –Pellet-fired, general | 138.5 | 18.5 | 964.0 |
| 2104008610 | Hydronic heater: outdoor | 10.4 | 18.0 | 75.3 |
| 2104008700 | Outdoor wood burning device, NEC | 4.0 | 0.6 | 31.5 |
| 2104009000 | Residential firelog | 98.9 | 19.2 | 312.6 |
| **Totals:** | | **1,392.2** | **156.3** | **8,328.1** |

Ozone season-day emissions would normally be calculated by dividing ozone season emissions by heating degree days (i.e. the number of degrees per day that the daily average temperature is below 65 °F). However, data obtained from National Oceanic and Atmospheric Administration (NOAA, 2016) indicated that there were no heating degree days reported during the 2014 ozone season (June–August). Therefore, ozone season-day emissions from residential wood combustion are assumed to be zero.

Annual and season-day emissions within the 8-hour ozone nonattainment area were calculated by multiplying county-level emissions totals by the ratio of total population in the nonattainment area to the total population in the county (100.79%). See Section 1.5.1 for a further discussion of the population data used. Table 3.2–12 summarizes annual and season-day emissions from residential wood combustion for both the county and the 8-hour ozone nonattainment area.

**Table 3.2–12. Annual and season-day emissions from residential wood combustion.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1,392.2 | 156.3 | 8,328.1 | 0 | 0 | 0 |
| 8-hr ozone nonattainment area | 1,403.2 | 157.6 | 8,393.8 | 0 | 0 | 0 |

## 3.3 Industrial processes

### *3.3.1 Chemical manufacturing*

Historically, emissions from chemical manufacturing were calculated for the periodic emissions inventory by the "scaling up" method as described elsewhere in this report. However, the sample size for the 2014 periodic emissions inventory was not large enough to calculate an accurate and reliable result. Therefore, data from the 2011 periodic emissions inventory (MCAQD, 2014) were grown to 2014 based on industrial employment levels for those two years.

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the percentage industrial employment within the nonattainment area. See Section 1.5.1 for a discussion of the employment data used. Table 3.3–1 summarizes annual and season-day emissions from chemical manufacturing in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.3–1. Annual and season-day VOC emissions from area-source chemical manufacturing.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 69.1 | 535 |
| 8-hr ozone nonattainment area | 68.6 | 531 |

### *3.3.2 Food and kindred products*

#### *3.3.2.1 Commercial cooking*

Emissions from commercial cooking were estimated for five types of commercial cooking equipment using county-level estimates prepared for use in U.S. EPA's 2014 National Emissions Inventory (NEI) data and documentation (U.S. EPA, 2016). The 2014 NEI estimates were developed using 2013 activity data from the U.S. Census Bureau. The equipment types for which emissions were estimated included: chain-driven charbroilers, under-fired charbroilers, deep-fat fryers, flat griddles, and clamshell griddles.

Maricopa County population data for 2013 and 2014 were obtained from the Arizona Department of Administration (ADOA, 2016). The population data indicated population growth of 1.6% from 2013 to 2014. This growth factor was then applied to the county-level estimates from the 2014 NEI to develop emission estimates for Maricopa County for 2014. The 2014 NEI estimates for the commercial cooking source category did not include $NO_x$.

Commercial cooking activity is assumed to occur uniformly throughout the year. Therefore, average season-day emissions were developed by dividing the annual emissions by 365 (i.e., ozone season-day emissions are the same as average season-day emissions). The results are shown in Table 3.3–2.

**Table 3.3–2. Annual and season-day emissions from commercial cooking equipment in Maricopa County.**

| | Annual emissions (tons/yr) | | Ozone season-day emissions (lbs/day) | |
|---|---|---|---|---|
| **Equipment type** | **VOC** | **CO** | **VOC** | **CO** |
| Chain-driven charbroilers | 44.3 | 148.1 | 243 | 811 |
| Under-fired charbroilers | 146.3 | 478.4 | 801 | 2,622 |
| Deep-fat fryers | 22.9 | | 125 | |
| Flat griddles | 19.3 | 39.8 | 106 | 218 |
| Clamshell griddles | 0.8 | | 4 | |
| **Totals:** | **233.5** | **666.3** | **1,279** | **3,651** |

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the county totals by the ratio of total resident population in the nonattainment area to the total resident population in the county (100.79%). 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 the 8-hour ozone nonattainment area.

**Table 3.3–3. Annual and season-day emissions from commercial cooking equipment in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | Ozone season-day emissions (lbs/day) | |
|---|---|---|---|---|
| **Equipment type** | **VOC** | **CO** | **VOC** | **CO** |
| Chain-driven charbroilers | 44.7 | 149.2 | 245 | 818 |
| Under-fired charbroilers | 147.4 | 482.2 | 808 | 2,642 |
| Deep-fat fryers | 23.0 | | 126 | |
| Flat griddles | 19.4 | 40.1 | 106 | 220 |
| Clamshell griddles | 0.8 | | 4 | |
| **Totals:** | **235.3** | **671.5** | **1,289** | **3,680** |

### *3.3.2.2 Bakeries*

Emissions from area-source bakeries were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources and County-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. (Where employment estimates were provided as a range of values, the midpoint was used.) CBP estimates for Maricopa County employment in NAICS codes 311812 and 31183 (Commercial Bakeries and Tortilla Manufacturing) to total 2,401 persons. There were no point sources in this category, thus all emissions from this source category are reported as area sources. Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals.

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county. Results are summarized in Table 3.3–4. See section 1.5.1 for a discussion of the employment data used.

**Table 3.3–4. Annual and season-day VOC emissions from area-source bakeries.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 112.4 | 661 |
| 8-hr ozone nonattainment area | 111.5 | 656 |

### *3.3.3 Secondary metal production*

Annual and season-day emissions from secondary metal production facilities were derived from annual emissions reports from permitted sources. As this category consists primarily of foundries, it was assumed that there were no significant unpermitted sources within Maricopa County. Since all facilities considered in this section are located within the 8-hour ozone nonattainment area, total emission values for the county and the nonattainment area from secondary metal production are equal. Annual and season-day emissions are shown in Table 3.3–5.

**Table 3.3–5. Annual and season-day emissions from area-source secondary metal production.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| Geographic area | VOC | $NO_x$ | CO | VOC | $NO_x$ | CO |
| Maricopa County | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |
| 8-hr ozone nonattainment area | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |

### *3.3.4 Rubber and plastic product manufacturing*

Emissions from area-source rubber and plastic product manufacturing facilities were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources, and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category. The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. Where CBP employment estimates were presented as a range, the midpoint values were chosen for these calculations. Table 3.3–6 lists the NAICS codes and employment data used to calculate emissions from rubber and plastic product manufacturing facilities.

**Table 3.3–6. County employment for rubber and plastic product manufacturing, by NAICS code.**

| NAICS | NAICS description | Employment |
|---|---|---|
| 325211 | Plastics material and resin manufacturing | 199 |
| 326199 | All other plastic product manufacturing | 2,120 |
| 326212 | Tire retreading | 61 |
| 326299 | All other rubber product manufacturing | 140 |
| 332313 | Plate work manufacturing | 85 |
| 336413 | Other aircraft parts and aux. equipment manufacturing | 1,257 |
| 339113 | Surgical appliance and supplies manufacturing | 372 |
| 339115 | Ophthalmic goods manufacturing | 90 |
| 42313 | Tire and tube merchant wholesalers | 397 |
| 42393 | Recyclable material merchant wholesalers | 1,558 |
| 44131 | Automotive parts and accessories stores | 3,613 |
| 44132 | Tire dealers | 2,455 |
| **Total:** | | **12,347** |

Some facilities in this category have been categorized as point sources, and thus their emissions are accounted for in Chapter 2. To avoid double-counting, reported total employment at individual point sources is subtracted from estimated County employment levels.
Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county. See Section 1.5.1 for a discussion of the employment data used. Table 3.3–7 below summarizes annual and season-day emissions from area source rubber and plastic product manufacturing.

**Table 3.3–7. Annual and season-day VOC emissions from area-source rubber and plastic product manufacturing.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 928.8 | 7,763 |
| 8-hr ozone nonattainment area | 921.4 | 7,701 |

### *3.3.5 Fabricated metal products manufacturing*

Emissions from fabricated metal products manufacturing were calculated by the "scaling up" method as described in EPA emission inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. CBP employment data for NAICS code 332 (fabricated metal products manufacturing) indicated that there were 14,662 employees in this industry in Maricopa County.

Since there were no point sources in this category, an area-source employment estimate of 14,662 was used to "scale up" emissions reported from those facilities surveyed in 2014.

Season-day emissions are calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the percentage of industrial employment within the nonattainment area. See Section 1.5.1 for a discussion of the employment data used. Table 3.3–8 summarizes annual and season-day emissions from fabricated metal products manufacturing in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.3–8. Annual and season day VOC emissions from area-source fabricated metal products manufacturing.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 19.2 | 92 |
| 8-hr ozone nonattainment area | 19.0 | 91 |

### *3.3.6 Electrical equipment manufacturing*

Annual and season-day emissions from electric equipment manufacturing were derived from annual emissions 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.

As all facilities addressed in this source category are located within the 8-hour ozone nonattainment area, emission totals for both areas are equal. Annual and season-day emissions are shown in Table 3.3–9.

**Table 3.3–9. Annual and season-day emissions from area-source electric equipment manufacturing.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| Geographic area | VOC | $NO_x$ | CO | VOC | $NO_x$ | CO |
| Maricopa County | 223.6 | 24.3 | 7.5 | 1,280 | 135 | 41 |
| 8-hr ozone nonattainment area | 223.6 | 24.3 | 7.5 | 1,280 | 140 | 42 |

### *3.3.7 Industrial processes not elsewhere classified*

Annual area-source emissions from other industrial processes not elsewhere classified (NEC) were derived primarily 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. Ozone season-day emissions were calculated based on operating schedule information provided by individual facilities through MCAQD's annual emissions reporting

program. Emissions estimates for the 8-hour ozone nonattainment area were derived using data on the location of the facilities that report other industrial processes.

In addition, emissions from ADEQ-permitted sources are included in this category due to a lack of specificity regarding the nature of the reported emissions. As a conservative estimate, all of these emissions were assumed to occur within the 8-hour ozone nonattainment area. Estimates of total emissions from this source category are presented in Table 3.3–10.

**Table 3.3–10. Annual and season-day emissions from industrial processes not elsewhere classified.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 71.4 | 452.2 | 273.7 | 407 | 2,478 | 1,532 |
| 8-hr ozone nonattainment area | 70.3 | 452.2 | 273.7 | 397 | 2,478 | 1,470 |

## 3.4 Solvent use

### *3.4.1 Surface coating*

#### *3.4.1.1 Architectural coatings*

VOC emissions from architectural coatings were calculated using a per-capita emission factor developed and used by EPA for the 2008 NEI (US EPA, Date. 2008 NEI Version 3 Technical Support Documentation, supporting Data and Summaries). Because Maricopa County Rule 335 contains an emission limit for coatings, the "controlled" VOC emission factor (2.41 lbs/person) was used.

Annual VOC emissions for architectural coating for both Maricopa County and the 8-hour ozone nonattainment area were calculated by multiplying the per-capita emission factor by the county and nonattainment area population values. See Section 1.5.1 for a discussion of the population data used.

Ozone season-day emissions were developed using default assumptions from EIIP (US EPA, 1995a). The seasonal factor for ozone season architectural coating activity was assumed to be 28 percent of annual activity. In addition, it was assumed that coating use may take place 7 days a week during the ozone season. Thus, season-day emissions were calculated by multiplying annual VOC emissions by the seasonal factor and then dividing the results by 92 days per season. Table 3.4–1 presents the assumptions used as well as annual and season-day VOC emissions from architectural coatings for Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–1. Annual and season-day VOC emissions from architectural coating.**

| **Geographic area** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
|---|---|---|
| Maricopa County | 5,215.8 | 31,748 |
| 8-hr ozone nonattainment area | 5,260.0 | 32,017 |

### *3.4.1.2 Auto refinishing*

Annual emissions from auto refinishing were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). Activity for this source category is assumed to occur uniformly throughout the year and take place 7 days per week. Thus, season-day emissions were estimated by dividing annual emissions by 365 days/year. Annual and season-day emissions for the 8-hour ozone nonattainment area were derived by applying the ratio of industrial employment in the nonattainment area and Maricopa County (99.20%). (See Section 1.5.1 for a discussion of the employment data used). Emissions for both Maricopa County and the nonattainment area are shown in Table 3.4–2.

**Table 3.4–2. Annual and season-day VOC emissions from auto refinishing.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 958.3 | 5,251 |
| 8-hr ozone nonattainment area | 950.6 | 5,209 |

### *3.4.1.3 Traffic markings*

Annual emissions from traffic markings were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). Ozone season-day emissions during the ozone season for Maricopa County and the 8-hour ozone nonattainment area were calculated assuming 33 percent of annual activity occurred during the ozone season (13 weeks per year) and a typical activity level of 5 days per week (US EPA, 1997). Annual and season-day emissions in the 8-hour ozone nonattainment area were calculated by applying the ratio of industrial employment in the nonattainment area to county-level emission calculations (99.20%). (See Section 1.5.1 for a discussion of employment data used).

**Table 3.4–3. Annual and season-day VOC emissions from traffic markings.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 441.0 | 4,478 |
| 8-hr ozone nonattainment area | 437.5 | 4,442 |

### *3.4.1.4 Factory-finished wood*

Emissions from factory-finished wood coating were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources, and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. Where CBP employment estimates were presented as a range, the midpoint value was chosen for these calculations. Table 3.4–4 shows the NAICS codes and employment data used to calculate emissions from factory-finished wood surface coating.

**Table 3.4–4. County employment for factory-finished wood coating, by NAICS code.**

| NAICS | NAICS description (and employment range) | Employment |
|---|---|---|
| 321911 | Wood window & door manufacturing | 283 |
| 321918 | Other millwork | 129 |
| 337212 | Custom architectural woodwork & millwork mfg. | 591 |
| 337215 | Showcase, partition, shelving & locker manufacturing | 233 |
| 337920 | Blind & shade manufacturing (100–249) | 175 |
| **Total:** | | **1,411** |

Since there were no point sources in this category, the area-source employment estimate was used to "scale up" emissions reported from those facilities surveyed in 2014.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county (99.20%). See Section 1.5.1 for a discussion of the employment data used. Table 3.4–5 summarizes annual and season-day VOC emissions from factory-finished wood surface coating in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–5. Annual and season-day VOC emissions from area-source factory-finished wood surface coating.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 193.6 | 1,616 |
| 8-hr ozone nonattainment area | 192.1 | 1,603 |

### *3.4.1.5 Industrial surface coating*

Annual emissions from industrial surface coating were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Industrial surface coating is assumed to occur uniformly throughout the year, therefore, it was assumed that 25% of annual activity occurs during the ozone season, and that activity occurs 7 days/week. Thus, season-day emissions were estimated by multiplying annual emissions by 25% then dividing the result by 92 days. Annual and season-day emissions in the 8-hour ozone nonattainment area were calculated by applying the ratio of industrial employment in the non-attainment area to county-level emission calculations (99.20%). (See Section 1.5.1 for a discussion of the employment data used). Results are shown in Table 3.4–6 below.

**Table 3.4–6. Annual and season-day VOC emissions from industrial surface coating.**

| | Maricopa County | | 8-hour ozone NAA | |
|---|---|---|---|---|
| **Product category** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
| Wood furniture | 666.4 | 1,052 | 661.1 | 1,044 |
| Metal furniture: SIC 25 | 59.8 | 3,622 | 59.3 | 3,593 |
| Paper: SIC 26 | 51.3 | 325 | 50.8 | 322 |
| Metal cans: SIC 341 | 183.2 | 279 | 181.8 | 276 |
| Machinery and equipment: SIC 35 | 58.2 | 996 | 57.7 | 988 |
| Large appliances: SIC 363 | 35.5 | 316 | 35.2 | 314 |
| Electronic & other electrical: SIC 36 | 4.2 | 193 | 4.2 | 191 |
| Motor vehicles: SIC 371 | 183.0 | 23 | 181.5 | 23 |
| Marine: SIC 373 | 3.5 | 358 | 3.4 | 355 |
| Railroad: SIC 374 | 5.1 | 19 | 5.1 | 19 |

#### *3.4.1.6 Aircraft surface coating*

Emissions from aircraft surface coating facilities were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources, and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. CBP employment data for NAICS code 3364 (Aerospace Product and Parts Manufacturing) indicated that there were 12,272 employees in this industry in Maricopa County. Since there were no point sources in this category, an area-source employment estimate of 12,272 was used to "scale up" emissions reported from those facilities surveyed in 2014.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county (99.57%). See Section 1.5.1 for a discussion of the employment data used.

Table 3.4–7 summarizes annual and season-day emissions from aircraft surface coating in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–7. Annual and season-day VOC emissions from area-source aircraft surface coating.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 65.8 | 473 |
| 8-hr ozone nonattainment area | 65.8 | 473 |

### *3.4.1.7 Miscellaneous surface coating*

Area-source VOC emissions from miscellaneous surface coating were estimated by a "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions and employment data from Maricopa County permitted facilities to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category

The typical "scale-up" methodology was revised slightly for this source category for a number of reasons. First, miscellaneous surface coating activity occurs, at some level, across an exceptionally broad spectrum of industries, both industrial and commercial/institutional. Additionally, annual emissions reports may be inconsistent in how activities are reported, and it is uncertain if all relevant activities are categorized as "miscellaneous surface coating" vs. some other category (e.g., manufacturing). Estimating total emissions from miscellaneous surface coating based on county employment by NAICS code (for which employment data are often presented only as a broad range), or all industrial employment (including industries which have little or no miscellaneous surface coating activities) would therefore be misleading and lead to an over-estimate of area-source emissions from this source category. Instead, the list of Standard Industrial Classification (SIC) codes used by facilities that reported miscellaneous surface coating activities was conservatively assumed to represent the "universe" of businesses that could possibly have significant miscellaneous surface coating activity. To avoid double-counting, employment at point sources was subtracted from total employment within these SIC categories.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county (99.2%). See Section 1.5.1 for a discussion of the employment data used.

Table 3.4–8 summarizes annual and season-day VOC emissions from area-source miscellaneous surface coating in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–8. Annual and season-day VOC emissions from miscellaneous surface coating.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 201.1 | 1,443 |
| 8-hr ozone nonattainment area | 159.6 | 1,299 |

### *3.4.2 Degreasing*

Area-source VOC emissions from degreasing were estimated by a "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions and employment data from Maricopa County permitted facilities to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The typical "scale-up" methodology was revised slightly for this source category for a number of reasons. First, degreasing activity occurs at some level across a wide spectrum of industries, both industrial and commercial/ institutional. Additionally, annual emissions reports may be inconsistent in how activities are reported and it is uncertain if all relevant activities are categorized as "degreasing" vs. some other category (e.g., manufacturing). Estimating total emissions from degreasing based on county employment by NAICS code (for which employment data are often presented only as a broad range), or all industrial employment (including industries which have little or no degreasing activities) would therefore be misleading and lead to an overestimate of area-source emissions from this source category.

Instead, the list of SIC codes used by businesses that reported degreasing activities was conservatively assumed to represent the "universe" of businesses that could possibly have significant degreasing activity. To avoid double-counting, employment at point sources was subtracted from total employment within these SIC.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the percentage of industrial employment within the nonattainment area. See Section 1.5.1 for a discussion of the employment data used.

Table 3.4–9 summarizes annual and season-day emissions from area-source degreasing in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–9. Annual and season-day VOC emissions from area-source degreasing.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 291.9 | 1,923 |
| 8-hr ozone nonattainment area | 289.5 | 1,908 |

### *3.4.3 Dry cleaning*

Annual emissions from dry cleaning facilities were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). Based on operating schedule information provided in the facilities' historic annual emissions reports, it is assumed that operations occur evenly throughout the year, 5 days per week, thus season-day emissions were derived by dividing the annual total emissions by 260 (= 5 days/week × 52 weeks/yr).

Annual and season-day emissions estimates for the 8-hour ozone nonattainment area were calculated by multiplying county-level emissions by the ratio of Maricopa County population to nonattainment area population. See Section 1.5.1 for a discussion of the population data used. Table 3.4–10 summarizes the annual and season-day VOC emissions from dry cleaning.

**Table 3.4–10. Annual and season-day VOC emissions from dry cleaning.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 10.3 | 79 |
| 8-hr ozone nonattainment area | 10.4 | 80 |

### *3.4.4 Graphic arts*

Emissions from graphic arts were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources, and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The most recent data from the US Census Bureau's County Business Patterns (CBP), covering employment in 2013, were used. The CBP employment data for NAICS code 32311 (printing) indicated that there were 3,265 employees in this industry in Maricopa County. Since there were no point sources in this category, an area-source employment estimate of 3,265 was used to "scale up" emissions reported from those facilities surveyed in 2014.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county (99.2%). See Section 1.5.1 for a discussion of the employment data used. Table 3.4–11 summarizes annual and season-day emissions from graphic arts in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–11. Annual and season-day VOC emissions from area-source graphic arts sources.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 297.4 | 2,308 |
| 8-hr ozone nonattainment area | 295.1 | 1,908 |

### *3.4.5 Miscellaneous industrial solvent use*

Area-source VOC emissions from miscellaneous industrial solvent use were estimated by a "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions and employment data from Maricopa County permitted facilities to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category.

The typical "scale-up" methodology was revised slightly for this source category for a number of reasons. First, miscellaneous industrial solvent use occurs at some level across a wide spectrum of industries. Additionally, annual emissions reports may be inconsistent in how activities are reported, and it is uncertain if all relevant activities are categorized as "miscellaneous industrial solvent use" vs. some other category (e.g., manufacturing of a specific product). Estimating total emissions from miscellaneous industrial solvent use based on county employment by NAICS code (for which employment data are often presented only as a broad range), or all industrial employment (including industries which have little or no solvent use activities) would therefore be misleading and lead to an significant under- or overestimates of area-source emissions from this source category.

Instead, the list of SIC codes used by businesses that reported miscellaneous industrial solvent use activities was conservatively assumed to represent the "universe" of businesses that could possibly have significant miscellaneous industrial solvent use activity. To avoid double-counting, employment at facilities treated as point sources (and addressed in Chapter 2) was subtracted from total employment within these SICs.

Ozone season-day emissions were calculated in the same method as annual emissions, using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of industrial employment in the nonattainment area to industrial employment in the county. See Section 1.5.1 for a discussion of the employment data used. Table 3.4–12 summarizes annual and season-day VOC emissions from area-source miscellaneous industrial solvent use in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–12. Annual and season-day VOC emissions from area-source miscellaneous industrial solvent use.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 201.1 | 1,443 |
| 8-hr ozone nonattainment area | 199.5 | 1,431 |

### *3.4.6 Consumer and commercial products*

Annual emissions from consumer and commercial products were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016). Consumer and commercial products include the following seven product categories: personal care products, household products, automotive aftermarket products, adhesives and sealants, products regulated under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), coatings and related products, and miscellaneous products. Emissions from consumer and commercial products were assumed to occur uniformly throughout the year, and occurs 7 days per week. Thus season-day emissions were estimated by dividing annual emissions by 365.

Emissions in the 8-hour ozone nonattainment were based on County-level emissions estimates, and then applying the ratio of total resident population in the nonattainment area to that of Maricopa County (100.85%). See Section 1.5.1 of this report for a discussion of the population data used. Results are shown in Table 3.4–13.

**Table 3.4–13. Annual and season-day VOC emissions from consumer and commercial products.**

| | Maricopa County | | 8-hour ozone NAA | |
|---|---|---|---|---|
| Product category | Annual emissions (tons/yr) | Season-day emissions (lbs/day) | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
| Personal care | 4,013.2 | 21,990 | 4,047.3 | 22,177 |
| Household | 4,414.5 | 24,189 | 4,452.0 | 24,395 |
| Automotive aftermarket | 2,729.0 | 14,953 | 2,752.1 | 15,080 |
| Coatings and related | 1,906.3 | 10,445 | 1,922.5 | 10,534 |
| Adhesives/sealants | 1,143.8 | 6,267 | 1,153.5 | 6,320 |
| FIFRA-regulated | 3,571.7 | 19,571 | 3,602.1 | 19,737 |
| Miscellaneous | 140.5 | 770 | 141.7 | 776 |
| **Totals:** | **17,918.8** | **98,185** | **18,071.1** | **99,020** |

### *3.4.7 Asphalt application*

Asphalt is applied to pave, seal, and repair surfaces such as roads, parking lots, drives, walk-ways, roofs, and airport runways. Asphalt application emissions were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Ozone season-day emissions were calculated by multiplying annual emissions for the ozone-season (June–August) then dividing by 92 days. As a conservative assumption, annual and season-day emissions for the 8-hour ozone nonattainment area are assumed to be equal to Maricopa County emissions.

**Table 3.4–14. Annual and season-day VOC emissions from asphalt use, by type.**

| | Maricopa County | | Eight-hour ozone NAA | |
|---|---|---|---|---|
| Asphalt type | Annual emissions (tons/yr) | Season-day emissions (lbs/day) | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
| Cutback | 1,004.8 | 21,844 | 992.3 | 21,572 |
| Emulsified | 828.2 | 18,004 | 817.9 | 17,780 |

### *3.4.8 Agricultural pesticides*

Annual emissions from agricultural pesticide usage within Maricopa County were obtained directly from the county-level emission estimates developed for use in the US Environmental Protection Agency's 2014 National Emissions Inventory (NEI) data and documentation (US EPA, 2016). US EPA estimated that 371.0 tons of VOCs were emitted from agricultural pesticide usage in Maricopa County in 2014.

The 2014 NEI used activity data obtained from USGS for 2012 (i.e., county-level pesticide usage for 2012). The 2014 NEI data indicated that approximately 1,589,288 lbs of active ingredient in agricultural pesticides were applied in Maricopa County in 2012. Due to a lack of available data

on temporal resolution, ozone season-day emissions for Maricopa County were calculated by dividing annual emissions by 365 days as activity is assumed to occur uniformly throughout the year.

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying county totals by the ratio of agricultural land acreage in the nonattainment area to the agricultural land acreage in Maricopa County (58.8%). See Section 1.5.2 for a discussion of the land-use data used to allocate emissions to the 8-hour ozone nonattainment area. Table 3.4–15 presents the annual and ozone season-day VOC estimates for Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.4–15. Annual and season-day VOC emissions from agricultural pesticide application.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 371.0 | 2,033 |
| 8-hr ozone nonattainment area | 218.1 | 1,195 |

## 3.5 Storage and transport

### *3.5.1 Portable fuel containers*

Annual Maricopa County emissions from area source portable fuel containers (PFCs) were initially obtained from the county-level emission estimates developed for use in the U.S. Environmental Protection Agency's 2014 National Emissions Inventory (NEI) (US EPA, 2016). These calculations identify a total of seven mechanisms by which emissions can be generated from PFCs:

- Emissions associated with filling PFCs at the gas pump:
  - Displacement of the vapor within the PFCs, and
  - Spillage of gasoline while filling the PFCs
- Emissions associated with transporting PFCs:
  - Spillage of gasoline during transport
- Emissions (adjusted for changes in ambient temperature) associated with storage of the gasoline in PFCs:
  - Emissions due to evaporation (i.e., diurnal emissions), and
  - Emissions due to permeation.

Two additional sources of emissions associated with using PFCs to refuel pieces of nonroad equipment are considered by the NONROAD model (described in Chapter 4) and thus not addressed here:

- Displacement of the vapor within nonroad equipment, and
- Spillage of gasoline while filling nonroad equipment.

During review of the 2014 NEI documentation for the portable fuel containers source category, it was identified that the state-level emissions were allocated to counties based on the ratio of county fuel consumption to state fuel consumption. ERG reviewed potential data sources and identified recent county-level motor gasoline sales data available through the Arizona Department of Transportation (ADOT, 2016). These data are developed for every fiscal year (July 1

through June 30) starting from 1990 to present (2015 is the most recent year for which data are available). Using these data, the state-level emissions were re-allocated to the counties. The ADOT motor gasoline fuel sales data indicated that approximately 59.1% of Arizona state motor gasoline sales occurred in Maricopa County.

Ozone season-day emissions for the county were calculated by dividing annual emissions by 365 days as activity is assumed to occur uniformly throughout the year. Annual and ozone season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the county totals by the ratio of total resident population in the nonattainment area to total resident population in the county. See Section 1.5.1 for a discussion of the population data used. Table 3.5–1 presents the annual and season-day VOC estimates for Maricopa County and for the 8-hour ozone nonattainment area.

**Table 3.5–1. Annual and season-day VOC emissions from portable fuel containers (PFCs).**

| | Maricopa County | | 8-hour ozone NAA | |
|---|---|---|---|---|
| **Emissions source** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
| **Residential PFCs:** | | | | |
| Permeation | 99.0 | 542 | 99.7 | 546 |
| Evaporation/diurnal | 111.0 | 608 | 111.9 | 613 |
| Spillage during transport | 192.6 | 1,055 | 194.1 | 1,064 |
| Vapor displacement in PFCs | 34.9 | 191 | 35.2 | 193 |
| Spillage at pump | 5.6 | 31 | 5.7 | 31 |
| **Subtotal, residential PFCs** | **443.1** | **2,428** | **446.6** | **2,447** |
| | | | | |
| **Commercial PFCs:** | | | | |
| Permeation | 4.3 | 24 | 4.4 | 24 |
| Evaporation/diurnal | 3.5 | 19 | 3.6 | 20 |
| Spillage during transport | 262.7 | 1,440 | 264.8 | 1,451 |
| Vapor displacement in PFCs | 100.6 | 551 | 101.4 | 556 |
| Spillage at pump | 10.8 | 59 | 10.9 | 60 |
| Displacement during refueling of nonroad equipment* | | | | |
| Spillage during refueling of nonroad equipment* | | | | |
| **Subtotal, commercial PFCs** | **382.0** | **2,093** | **385.1** | **2,110** |
| **Totals:** | **825.2** | **4,522** | **831.7** | **4,557** |

*These activities are included in the MOVES2014a model emissions calculations, described in Chapter 4.

### *3.5.2 Bulk plants*

Emissions from this source category were calculated from annual emissions inventory reports from all bulk plants located within the county. It is assumed that there are no unpermitted bulk plants in Maricopa County. Bulk plants are characterized as having a throughput below 7.2 MMgal/year. Ozone season-day emissions were calculated based on operating schedule

information provided in the facilities' annual emissions reports. Since all facilities considered in this section are located within the 8-hour ozone nonattainment area, total emission values for the county and the 8-hour ozone nonattainment area are equal.

**Table 3.5–2. Annual and season-day VOC emissions from bulk plants.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 36.2 | 229 |
| 8-hr ozone nonattainment area | 36.2 | 229 |

### *3.5.3 Bulk terminals*

Emissions from this source category were calculated from annual emissions inventory reports from all bulk terminals located within the county. Bulk terminals are characterized as having a throughput above 7.2 MMgal/year. It is assumed that there are no unpermitted bulk terminals in Maricopa County. To avoid double-counting, emissions from bulk terminals that were treated as point sources (totaling 118.8 tons/yr) are reported in Chapter 2. Ozone season-day emissions were calculated based on operating schedule information provided in the facilities annual emissions reports. Since all facilities considered in this section are located within the 8-hour ozone nonattainment area, total emission values for the county and the 8-hour ozone nonattainment area are equal.

**Table 3.5–3. Annual and season-day VOC emissions from bulk terminals.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 91.0 | 493 |
| 8-hr ozone nonattainment area | 91.0 | 493 |

### *3.5.4 Gasoline service stations*

Stage I emissions from gasoline distribution emissions can be characterized as "Stage I" emissions, which are generated when gasoline vapors are displaced from storage tanks during unloading of gasoline from tank trucks at service stations. Stage II emissions are the refueling emissions that occur during the transfer of gasoline from storage tanks at service stations to vehicle fuel tanks (i.e., vehicle refueling and spillage emissions). The MOVES2010b model that was used to calculate onroad emissions includes estimation of these Stage II emissions. Therefore, these emissions are addressed in Chapter 5 as part of the onroad mobile sources emissions and are not addressed here as an area source.

Stage I VOC emissions from gasoline service station unloading were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Ozone season-day emissions were calculated by multiplying annual emissions for the ozone-season (June–August) then dividing by 92 days. As a conservative assumption, annual and season-day emissions for the 8-hour ozone nonattainment area are assumed to be equal to

Maricopa County emissions. Table 3.5–4 summarizes Stage I annual and season-day emissions in Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.5–4. Annual and season-day VOC emissions from gas service stations (Stage I), by fill type.**

| | Maricopa County | | 8-hour ozone NAA | |
|---|---|---|---|---|
| **Fill type** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
| Submerged filling | 369.9 | 8,041 | 369.9 | 8,041 |
| Balanced submerged filling | 646.9 | 14,063 | 646.9 | 14,063 |
| **Totals:** | **1,016.8** | **22,104** | **1,016.8** | **22,104** |

### *3.5.5 Gasoline stations underground tanks, breathing/emptying*

Breathing losses are the expulsion of vapor from a tank vapor space that has expanded or contracted because of daily changes in temperature and barometric pressure; these emissions occur in the absence of any liquid level change in the tank. Emptying losses occur when the air that is drawn into the tank during liquid removal saturates with hydrocarbon vapor and expands, thus exceeding the fixed capacity of the vapor space and overflowing through the pressure vacuum valve.

Gasoline stations underground tanks, breathing/emptying emissions from gasoline service station unloading were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Ozone season-day emissions were calculated by multiplying annual emissions for the ozone-season (June–August) then dividing by 92 days. As a conservative assumption, annual and season-day emissions for the 8-hour ozone nonattainment area are assumed to be equal to Maricopa County emissions.

**Table 3.5–5. Annual and season-day VOC emissions from gasoline service stations underground tank, breathing and emptying.**

| **Geographic area** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
|---|---|---|
| Maricopa County | 764.8 | 16,327 |
| 8-hr ozone nonattainment area | 764.8 | 16,327 |

### *3.5.6 Aviation gasoline*

Aviation gasoline is used by small reciprocating, piston-engine aircraft in civil aviation. Commercial and military aviation rarely use aviation gasoline. Aviation gasoline is shipped to airports and is filled into bulk terminals, and then into tanker trucks. The displacement of vapors during the transfer of gasoline from tank trucks to storage tanks, and vice versa falls under the definition of Stage I. Stage II involves the transfer of fuel from the tanker trucks into general aviation aircraft.

Annual emissions from aviation gasoline Stage I and Stage II were initially obtained from the U.S. Environmental Protection Agency's county-level emissions estimates prepared for use in the 2014 National Emissions Inventory (US EPA, 2016). Table 3.5–6 shows US EPA 2014 estimated VOC emissions from aviation gasoline for Maricopa County. During review of the 2014 NEI documentation, it was observed that aviation gasoline consumption data used in EPA's estimates for the NEI had been obtained from U.S. Energy Information Administration's (EIA) State Energy Data System (SEDS). These data included state-level aviation gasoline consumption for 2013 (i.e., aviation gasoline consumption for Arizona was 139,000 bbls).

ERG identified updated state-level aviation gasoline consumption data for 2014 from EIA's SEDS (EIA, 2015). ERG modified EPA's calculation spreadsheet for aviation gasoline Stage I and Stage II source categories using the updated EIA data for 2014 (i.e., aviation gasoline consumption for Arizona was 206,000 bbls). Due to a lack of available data on temporal resolution, daily emissions were assumed to be equal throughout the year and were calculated by dividing annual emissions by 365 days/year. Annual and season-day VOC emissions estimates for aviation gasoline Stage I and Stage II sources in Maricopa County are presented in Table 3.5–6.

**Table 3.5–6. Annual and season-day VOC emissions from aviation gasoline for Maricopa County.**

| Fueling stage | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Aviation Gasoline Stage I | 673.6 | 3,691 |
| Aviation Gasoline Stage II | 33.3 | 182 |

Annual and season-day emission in the 8-hour ozone nonattainment area were calculated by multiplying county totals by the percentage of general aviation operations that occurred within the nonattainment area in 2014 (99.1%). (See Table 4.11–1 of this report for general aviation aircraft operational data used.) Annual and season-day emissions from aviation gasoline for both Maricopa County and the 8-hour ozone nonattainment area are presented in Table 3.5–7.

**Table 3.5–7. Annual and season-day VOC emissions from aviation gasoline (avgas).**

| | Maricopa County | | Eight-hour ozone NAA | |
|---|---|---|---|---|
| Emissions source | Annual emissions (tons/yr) | Season-day emissions (lbs/day) | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
| Avgas Stage I | 673.6 | 3,691 | 667.5 | 3,658 |
| Avgas Stage II | 33.3 | 182 | 33.0 | 181 |
| **Totals:** | **706.9** | **3,873** | **700.5** | **3,839** |

### *3.5.7 Gasoline tank trucks in transit*

Emissions from tank trucks in transit occur when gasoline vapor evaporates from (1) loaded tank trucks during transportation of gasoline from bulk terminals/plants to service stations, and (2) empty tank trucks returning from service stations to bulk terminals/plants. Annual VOC

emissions from gasoline trucks in transit were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Ozone season-day emissions were calculated by multiplying annual emissions for the ozone-season (June–August) then dividing by 92 days. As a conservative assumption, annual and season-day emissions for the 8-hour ozone nonattainment area are assumed to be equal to Maricopa County emissions. Results are shown in Table 3.5–8.

**Table 3.5–8. Annual and season-day VOC emissions from gasoline trucks in transit.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 50.0 | 1,087 |
| 8-hr ozone nonattainment area | 50.0 | 1,087 |

### *3.5.8 Pipeline gasoline*

Pipeline emissions result from the valves and pumps found at pipeline pumping stations and from the valves, pumps, and storage tanks at pipeline breakout stations. Annual VOC emissions from gasoline pipelines were derived from the county-level estimates prepared by US EPA for use in the National Emissions Inventory (NEI) for 2014 (US EPA, 2016).

Ozone season-day emissions were calculated by multiplying annual emissions for the ozone-season (June–August) then dividing by 92 days. As a conservative assumption, annual and season-day emissions for the 8-hour ozone nonattainment area are assumed to be equal to Maricopa County emissions.

**Table 3.5–9. Annual and season-day VOC emissions from pipeline gasoline.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 66.2 | 1,439 |
| 8-hr ozone nonattainment area | 66.2 | 1,439 |

### *3.5.9 Volatile organic liquid (VOL) storage and transport*

Emissions from this source category were calculated by summing reported VOC emissions from volatile organic liquid storage/transfer emissions inventory reports. It is assumed that there are no significant unpermitted volatile organic liquid storage/transfer facilities in Maricopa County. To avoid double-counting, emissions from those facilities treated as point sources (totaling 2.5 tons/yr) are addressed in Chapter 2. Ozone season-day emissions were calculated based on operating schedule information provided in the facilities annual emissions reports.

**Table 3.5–10. Annual and season-day VOC emissions from volatile organic liquid storage and transport.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 37.8 | 218 |
| 8-hr ozone nonattainment area | 35.7 | 201 |

## 3.6 Waste treatment and disposal

### *3.6.1 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 3.7.5.

Historically, emissions from on-site incinerator were determined from annual emissions inventory reports. It was assumed that all incinerators were surveyed and emissions accounted for, since all permitted incinerators received surveys in 2011, but not 2014. Thus, data from the 2011 periodic emissions inventory (MCAQD, 2014) were grown to 2014 based on industrial employment rates.

Annual and season-day emissions estimates for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the percentage industrial employment within the nonattainment area. See Section 1.5.1 for a discussion of the employment data used. Results are shown in Table 3.6–1.

**Table 3.6–1. Annual and season-day emissions from on-site incineration.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| Geographic area | VOC | $NO_x$ | CO | VOC | $NO_x$ | CO |
| Maricopa County | 0.2 | 3.0 | 0.7 | 1 | 19 | 5 |
| 8-hr ozone nonattainment area | 0.1 | 2.9 | 0.7 | 1 | 19 | 5 |

### *3.6.2 Open burning*

Emissions from controlled open burning are regulated by Maricopa County Rule 314 (Open Outdoor Fires and Indoor Fireplaces at Commercial and Institutional Establishments), which requires a burn permit for open burning in Maricopa County. Burn permits are issued primarily for purposes of agricultural ditch bank and fence row burning, tumbleweed burning, land clearance, and firefighting training. MCAQD's burn permit data base was used to identify all burn permits issued in 2014. A total of 43 open burn permits were issued during the year. The quantity and reported activity for the open burn permits (except for firefighting burn permits) are shown in Table 3.6–2.

**Table 3.6–2. Maricopa County burn permit activity in 2014.**

| Permit subtype | Permits issued | Total reported activity | Activity unit of measure |
|---|---|---|---|
| Ditchbank & fence row | 23 | 617,007 | Linear feet |
| Land clearance | 13 | 240 | Acres |
| Firefighting instruction | 5 | 12 | Structures |

Activity data for all categories were converted to tons of material burned using fuel loading factor for "weeds, unspecified" from AP-42 (US EPA, 1992). Activity data were multiplied by the 3.2 tons/acre fuel loading factor to derive the total mass of material burned. Annual emissions were then calculated by multiplying the amount of material burned by the AP-42 emission factors for "weeds, unspecified".

The reported dates of activity from all open burn permits issued were reviewed in order to estimate the total open burn activity occurring during the June–August ozone season. To estimate season-day emissions, it was assumed that activity in all categories listed above normally occurs, on average, 5 days per week. Thus, season-day emissions were calculated by dividing total ozone-season emissions by 65 (=5 days/week × 13 weeks/ozone season).

MCAQD's records of citizen complaints received during 2014 regarding suspected open or illegal outside burning were reviewed to assess the potential extent of unpermitted open burning activity. Emissions estimates from permitted burn activity were multiplied by a factor of 2.87 to account for unpermitted outdoor burning.

Annual and season-day emissions for the nonattainment area were calculated by multiplying the percentage of vacant land use located in the 8-hour ozone nonattainment area (44.74%) by the Maricopa County emissions estimates. See Section 1.5.2 for a discussion of the land-use data used. Table 3.6–3 summarizes 2014 annual and season-day emissions from open burning, for both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.6–3. Annual and season-day emissions from open burning.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 18.2 | 8.1 | 172.2 | 140 | 62 | 1,325 |
| 8-hr ozone nonattainment area | 90.4 | 4.3 | 9.6 | 695 | 33 | 74 |

### *3.6.3 Landfills*

Emissions from municipal solid waste (MSW) landfills come from uncontrolled landfill gas emissions as well as from combustion from control measures, such as a flare. Total emissions were calculated from annual emissions inventory reports from all landfills located within the county. Butterfield Station Facility, Glendale Municipal Sanitary Landfill and Northwest Regional Landfill were considered as point sources; all other MSW landfills (including the Apache Junction landfill, located in the Pinal County portion of the 8-hour ozone nonattainment area) are reported here as an area-source category.

Geographic data on the location of each landfill was used to identify whether each landfill was located inside or outside of the 8-hour ozone nonattainment area. Annual and season-day emissions for Maricopa County and the nonattainment area are summarized in Table 3.6–4.

**Table 3.6–4. Annual and season-day emissions from landfills.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 36.6 | 9.9 | 14.6 | 158 | 54 | 80 |
| 8-hr ozone nonattainment area | 36.6 | 12.7 | 28.5 | 217 | 70 | 157 |

### *3.6.4 Publicly owned treatment works*

Annual emissions from publicly owned treatment works (POTWs) in Maricopa County were obtained from the US Environmental Protection Agency's 2014 National Emissions Inventory (US EPA, 2012c). EPA estimated 58.9 tons of VOC were emitted from POTWs in Maricopa County in 2014. There were no point sources in this category that needed to be subtracted. Ozone season-day emissions were calculated by multiplying annual emissions by a 35% season adjustment factor and then dividing by 91 days per season (US EPA, 2001a).

Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the percentage of total population in the nonattainment area to the total population in the county (100.85%). See Section 1.5.1 for a discussion of the population data used. Resulting emissions estimates are shown in Table 3.6–5 below.

**Table 3.6–5. Annual and season-day VOC emissions from publicly owned treatment works.**

| **Geographic area** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
|---|---|---|
| Maricopa County | 58.9 | 453 |
| 8-hr ozone nonattainment area | 59.3 | 456 |

### *3.6.5 Leaking underground storage tanks*

Leaking underground storage tanks (LUST) are normally not considered a quantifiable source of air emissions until excavation and remediation efforts begin. The majority of air emissions from LUST site remediation occur during the initial site activity, which is typically removal of the tank. Emissions from soil occur as the tank is being removed and when soil is deposited on the ground before treatment and disposal occur (US EPA, 2001c).

A default emission rate of 28 lbs/day per remediation event was used to estimate VOC emissions from LUST remediation (US EPA, 2001c). Data obtained from the Leaking Underground Storage Tank Section of the Arizona Department of Environmental Quality indicated that 35 leaking underground storage tanks opened in Maricopa County in 2014 (N. Giuntoli, pers. commun., July 7, 2016). As data was not available on the numbers of tanks or date of remediation that occurred in 2014, it was conservatively assumed that all 35 tanks were remediated

during the 2014 ozone season. It was also assumed that an initial site action (tank and soil removal) for an average LUST remediation lasts five days.

Ozone season-day emissions were calculated by dividing annual values by 65 (5 days/week × 13 weeks/ozone season). As precise data was not available on the location of each tank, it was conservatively assumed that assumed that all 35 LUST occurrences were located within the 8-hour ozone nonattainment area. Thus, both annual and season-day emissions within the NAA are equal to the Maricopa County totals. Results are shown in Table 3.6–6 below.

**Table 3.6–6. Annual and season-day VOC emissions from remediation of leaking underground storage tanks.**

| Geographic area | Annual emissions (tons/yr) | Season-day emissions (lbs/day) |
|---|---|---|
| Maricopa County | 2.5 | 75 |
| 8-hr ozone nonattainment area | 2.5 | 75 |

### *3.6.6 Other waste*

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. Ozone season-day emissions were calculated based on operating schedule information provided by the facilities in their annual emissions reports.

Since all surveyed facilities for this area source category are located inside the 8-hour ozone nonattainment area, emissions for Maricopa County and the 8-hour ozone nonattainment area are equal. Table 3.6–7 summarizes annual and season-day emissions estimates.

**Table 3.6–7. Annual and season-day emissions from other waste.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| Geographic area | VOC | $NO_x$ | CO | VOC | $NO_x$ | CO |
| Maricopa County | 7.7 | 20.6 | 38.1 | 54 | 113 | 186 |
| 8-hr ozone nonattainment area | 7.7 | 20.6 | 38.1 | 54 | 105 | 186 |

## 3.7 Miscellaneous area sources

### *3.7.1 Backyard barbeques*

Annual emission estimates from backyard barbeques (i.e., residential charcoal grilling) for Maricopa County in 2014 were taken directly from the county-level estimates prepared for use in US EPA's 2014 National Emissions Inventory (NEI) data and documentation (US EPA, 2016).

ERG downloaded and reviewed the Temporal Allocation Factor File (TAFF) that is available with US EPA's 2011 Air Emissions Modeling Platform (version 6.2). The temporal allocation

data (US EPA, 2015) indicates equal allocation across the year for residential charcoal grilling source category (SCC 2810025000). Based on this information, ERG calculated ozone season-day emissions by dividing the 2014 annual emissions by 365.

Maricopa County emissions were then allocated to the 8-hour ozone nonattainment area by multiplying the county totals to the ratio of total resident population in the 8-hour ozone nonattainment area to the total resident population in Maricopa County (100.79%). See Section 1.5.1 for a discussion of the population data used. Table 3.7–1 presents a summary of annual and season-day emissions for Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.7–1. Annual and season-day emissions from backyard barbeques.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 52.8 | 60.5 | 2,819.9 | 289 | 332 | 15,451 |
| 8-hr ozone nonattainment area | 53.2 | 61.0 | 2,842.1 | 291 | 334 | 15,573 |

### *3.7.2 Structure fires*

Emissions from structure fires in Maricopa County were estimated based on 2011 data, which were projected to 2014, based on county population growth over the 2011–2014 period (4.81%). Annual emissions for the 8-hour ozone nonattainment area were derived by multiplying annual county emissions by the percentage of total population within the nonattainment area (100.85%). See Section 1.5.1 for a discussion of the population data used.

In the absence of sufficient data on the temporal distribution of structure fires in 2014, activity for this source category was assumed to occur evenly throughout the year. Thus, ozone season-day emissions were derived by dividing annual emissions by 365 days/year. The results are shown in Table 3.7−2 below.

**Table 3.7–2. Annual and season-day emissions from structure fires.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 15.5 | 2.0 | 84.5 | 76 | 11 | 414 |
| 8-hr ozone nonattainment area | 15.6 | 2.0 | 85.2 | 77 | 10 | 418 |

### *3.7.3 Aircraft engine testing*

Annual emissions from engine testing facilities were derived from annual emissions 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. Ozone season-day emissions were calculated based on operating schedule information provided in the facilities' annual emissions reports.

Since all facilities considered in this section are located within the 8-hour ozone nonattainment area, total emission values for the county and the nonattainment area are equal. Results are shown in Table 3.7–3.

**Table 3.7–3. Annual and season-day emissions from aircraft engine testing.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |
| 8-hr ozone nonattainment area | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |

### *3.7.4 Vehicle fires*

Emissions from vehicle fires in Maricopa County were estimated based on 2011 data, which were grown to 2014 based on county population growth over the 2011–2014 period (4.81%). Annual emissions for the 8-hour ozone nonattainment area were derived by multiplying annual county emissions by the percentage of total population within the nonattainment area (100.85%). See Section 1.5.1 for a discussion of the population data used.

It was assumed that vehicle fires occur evenly throughout the year. Thus, ozone season-day emissions were derived by dividing the Maricopa County and nonattainment area annual emissions by 365 days/year. The results are shown in Table 3.7−4 below.

**Table 3.7–4. Annual and season-day emissions from vehicle fires.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 10.6 | 1.3 | 41.2 | 58 | 7 | 226 |
| 8-hr ozone nonattainment area | 10.6 | 1.3 | 41.6 | 58 | 7 | 228 |

### *3.7.5 Crematories*

Annual and season-day emissions from human and animal crematories were derived from annual emissions reports submitted by permitted sources. It was assumed that there were no significant unpermitted sources within Maricopa County. There were no point sources in this category.

Ozone season-day emissions were calculated based on reported activity data (days per week) for each individual process, and then summed. Table 3.7–5 summarizes annual emissions from crematories in both Maricopa County and the 8-hour ozone nonattainment area and season day emissions in Table 3.7.6.

**Table 3.7–5. Annual emissions (tons/yr) from crematories.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Human | 0.4 | 10.7 | 0.6 | 0.4 | 10.7 | 0.6 |
| Animal | 0.1 | 5.6 | 0.3 | 0.1 | 5.6 | 0.3 |

**Table 3.7–6. Season-day emissions (lbs/day) from crematories.**

| | Maricopa County | | | 8-hr ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Human | 3 | 77 | 5 | 3 | 73 | 4 |
| Animal | 1 | 49 | 3 | 1 | 49 | 3 |

### *3.7.6 Accidental releases*

As part of its air quality permit compliance program, MCAQD keeps an "upset log" for each calendar year that records excess emissions and accidental releases at permitted facilities. Annual emissions inventory reports also provide for recording of accidental releases. Data from these two sources were reviewed to estimate emissions from all accidental releases in 2014.

Ozone season-day emissions were calculated based on the whether the reported release occurred during the ozone season. Emissions within the 8-hour ozone nonattainment area are calculated based on locations of facilities that reported releases. Results are shown in Table 3.7–7.

**Table 3.7–7. Annual and season-day emissions from accidental releases.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 10.1 | 0.2 | 0.4 | 2 | 0 | 0 |
| 8-hr ozone nonattainment area | 10.1 | 0.2 | 0.4 | 2 | 16 | 0 |

### *3.7.7 Hospitals*

Emissions from hospitals were calculated by the "scaling up" method as described in EPA emissions inventory guidance (US EPA, 2001a). This method combines detailed emissions data from a subset of sources and county-level employment data from the US Census Bureau (2013) to develop a per-employee emission factor that is then used to estimate emissions from all sources in an industry category. The most recent data from the US Census Bureau's County Business Patterns (CBP) for 2013 employment were used. CBP employment data for NAICS code 662110 (general medical and surgical hospitals) indicated 54,653 employees in this industry in Maricopa County.

Ozone season-day emissions were calculated in the same method as annual emissions, only using surveyed season-day emissions instead of annual totals. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated by multiplying the Maricopa County emission totals by the ratio of population in the nonattainment area to population in the county. See Section 1.5.1 for a discussion of the employment data used. Table 3.7–8 summarizes annual and season-day emissions from hospitals in both Maricopa County and the 8-hour ozone nonattainment area.

**Table 3.7–8. Annual and season-day VOC emissions from hospitals.**

| **Geographic area** | **Annual emissions (tons/yr)** | **Season-day emissions (lbs/day)** |
|---|---|---|
| Maricopa County | 33.4 | 201 |
| 8-hr ozone nonattainment area | 33.7 | 202 |

### *3.7.8 Wildfires*

Data on the incidence of wildfires in Maricopa County in 2014 were obtained from the Arizona State Forestry Division (ASFD, 2015). ASFD provides for the prevention and suppression of wildfires on state trust land and private lands located outside of incorporated communities. The wildfire data provided includes wildfires that occur outside of local fire districts and municipalities on State, private, and U.S. Bureau of Land Management (BLM) land. The ASFD supplied data on 1,299 reported wildfire incidents in Maricopa County, encompassing 146 acres. In supplying this data, the Forestry Division noted a significant increase in the number of fires reported compared with prior years, due to a new State Forestry requirement that the local government fire departments and districts now report their fires to State Forestry.

In addition, data from Incident Status Summary reports (ICS-209) on the US Forest Service's website Monitoring Trends in Burn Severity (MTBS) website (USFS, 2016) were reviewed in order to identify any additional wildfires that may have occurred outside of ASFD jurisdiction. No additional wildfires within the area of interest were identified.

Estimates of the material burned were derived by multiplying the acres burned for each category by an assigned fuel loading factor. Since there was insufficient information concerning the land use or vegetation types for each reported fire, a fuel loading factor of 4.5 tons/acre (reflecting e.g., "agriculture" or "sagebrush" categories), was used as a conservative estimate.

Latitude and longitude data were used to determine the number of acres burned inside of the nonattainment area. Table 3.7–9 shows the number of wildfires and acreage burned for Maricopa County and the 8-hour ozone nonattainment area, as well as the estimated total material burned.

**Table 3.7–9. Wildfire incidence, acreage burned, and material burned in 2014.**

| Geographic area | No. of fires | Acreage burned | Fuel loading factor (tons/acre) | Material burned (tons/yr) |
|---|---|---|---|---|
| Maricopa County | 1,299 | 145.8 | 4.5 | 656.1 |
| 8-hr ozone nonattainment area | 1,286 | 139.1 | 4.5 | 626.0 |

Annual emissions from wildfires for each geographic area were calculated by multiplying the material burned for each area by the emission factors obtained from the Western Regional Air Partnership's (WRAP) 2002 Fire Emissions Inventory (WGA/WRAP, 2005). Ozone season-day emissions were estimated by multiplying the material burned during ozone season by the appropriate emission factor and dividing the result by the number of ozone season burn days. In 2014, wildfire activity was reported on a total of 87 separate days during the June–August ozone season. Table 3.7–10 shows annual and season-day emissions from wildfires in Maricopa County and the nonattainment area.

**Table 3.7–10. Annual and season-day emissions from wildfires.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 4.5 | 2.0 | 94.8 | 29 | 13 | 606 |
| 8-hr ozone nonattainment area | 4.3 | 1.9 | 90.4 | 37 | 17 | 792 |

### *3.7.9 Prescribed fires*

Emissions from prescribed fires were estimated using data obtained from the Arizona Department of Environmental Quality (ADEQ, 2015), which reported that a total of six (6) prescribed fires occurred in Maricopa County during 2014, only one of which was located within the 8-hour ozone nonattainment area. Because all 2014 prescribed fires were piled fuels, material burned was derived by multiplying the number of acres burned by tons of piles per acre for each fire. Table 3.7–11 shows the data provided by the ADEQ, the amount of material burned for each fire, whether the fire occurred within the nonattainment area and during the ozone season.

**Table 3.7–11. Prescribed fires in Maricopa County during 2014.**

| **Date** | **Burn location** | **Tons/ acre** | **Acres burned** | **Material burned (tons)** | **Within 8-hr NAA?** | **During ozone season?** |
|---|---|---|---|---|---|---|
| 02/27/2014 | T3N,R8E,S33 | 1 | 5 | 5 | Y | N |
| 03/03/2014 | T3N,R11E,S2 | 2 | 3 | 6 | Y | N |
| 03/14/2014 | T3N,R8E,S33 | 1 | 10 | 10 | Y | N |
| 07/21/2014 | T2N,R9E,S4 | 1 | 10 | 10 | Y | Y |
| 09/02/2014 | T6N,R10E,S10 | 2 | 4 | 8 | Y | N |
| 10/01/2014 | T3N,R11E,S2 | 2 | 5 | 10 | Y | N |
| **Totals:** | | | **37** | **49** | | |

To estimate emissions, emission factors for "piled fuels" the Western Regional Air Partnership's (WRAP) 2002 Fire Emissions Inventory (WGA/WRAP, 2005) were used. Annual emissions from prescribed fires in Maricopa County were derived by multiplying material burned by the emission factor then dividing by 2,000 lbs/ton.

The prescribed fire data provided by ADEQ indicated that all six of the reported prescribed fires were within the 8-hour ozone nonattainment area; thus annual emissions for both areas are equal. Only one of the six prescribed fires occurred during the June–August ozone season. As it was assumed that each prescribed fire lasted one day, all emissions from this fire were assumed to be generated on a single ozone season-day. Table 3.7–12 shows the annual and season-day from prescribed fires.

**Table 3.7–12. Annual and season-day emissions from prescribed fires.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 0.2 | 0.2 | 1.8 | 51 | 51 | 607 |
| 8-hr ozone nonattainment area | 0.2 | 0.2 | 1.8 | 63 | 62 | 743 |

## 3.8 Quality assurance/quality control procedures

Quality assurance and quality control (QA/QC) activities for the area source emissions inventory were designed to create a comprehensive, accurate, representative and comparable inventory of area source emissions for Maricopa County and the nonattainment 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 identified for inclusion in the inventory based on the latest Emissions Inventory Improvement Program (EIIP) guidance available. In addition, recent EPA activities to develop county-level emissions estimates for newly created source categories (such as portable fuel containers) or refined source classification codes were also reviewed, and incorporated where relevant. Prior-year inventories for the region were also examined to identify possible additional categories for inclusion in the present inventory. 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, oil and natural gas production, and snowmobile use).

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 nonattainment area. When local data was not available, state data from state agencies (e.g., Arizona Department of Transportation [ADOT]) and regional bodies (such as the Western Regional Air Partnership, WRAP) were used. National-level data (such as those from 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.

## 3.9 Summary of all area source emissions

Tables 3.9–1 and 3.9–2 summarize the total annual and average season-day emissions from all area sources addressed in this chapter, for both Maricopa County and the 8-hour ozone NAA, respectively.

**Table 3.9–1. Annual and season-day emissions from all area sources in Maricopa County.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source Category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| ***Fuel combustion:*** | | | | | | |
| Industrial distillate oil: boilers | 1.0 | 96.1 | 24.0 | 6 | 616 | 154 |
| Industrial distillate oil: engines | 134.5 | 1,934.4 | 416.3 | 862 | 12,400 | 2,669 |
| Industrial natural gas | 40.7 | 740.1 | 621.7 | 261 | 4,744 | 3,985 |
| Industrial LPG | 1.9 | 52.1 | 29.2 | 12 | 334 | 187 |
| Comm./inst. distillate oil: boilers | 0.0 | 2.8 | 0.7 | 0 | 18 | 4 |
| Comm./inst. distillate oil: engines | 0.3 | 4.4 | 1.0 | 2 | 28 | 6 |
| Comm./inst. natural gas | 62.0 | 1,126.8 | 946.5 | 397 | 7,223 | 6,068 |
| Residential distillate oil | 0.0 | 0.3 | 0.1 | 0 | 3 | 1 |
| Residential natural gas | 45.5 | 777.0 | 330.7 | 118 | 2,023 | 861 |
| Residential LPG | 1.6 | 41.5 | 11.8 | 15 | 391 | 111 |
| Residential wood combustion | 1,392.2 | 156.3 | 8,328.1 | 0.0 | 0.0 | 0.0 |
| **All Fuel Combustion:** | **1,679.8** | **4,931.9** | **10,710.0** | **1,675** | **27,781** | **14,046** |
| | | | | | | |
| ***Industrial processes:*** | | | | | | |
| Chemical manufacturing | 69.1 | | | 535 | | |
| Commercial cooking | 233.5 | | 666.3 | 1,279 | | 3,651 |
| Bakeries | 112.4 | | | 661 | | |
| Secondary metal production | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |
| Rubber/plastic product manufacturing | 928.8 | | | 7,763 | | |
| Fabricated metal product manufacturing | 19.2 | | | 92 | | |
| Electrical equipment manufacturing | 223.6 | 24.3 | 7.5 | 1,280 | 135 | 41 |
| Industrial processes, NEC | 71.4 | 452.2 | 273.7 | 407 | 2,478 | 1,532 |
| **All Industrial Processes:** | **987.3** | **531.6** | **1,619.1** | **12,484** | **3,095** | **11,160** |
| | | | | | | |
| ***Solvent use:*** | | | | | | |
| Architectural coatings | 5,215.8 | | | 31,748 | | |
| Auto refinishing | 958.3 | | | 5,251 | | |
| Traffic markings | 441.0 | | | 4,478 | | |
| Factory finished wood | 193.6 | | | 1,616 | | |
| Wood furniture | 666.4 | | | 5,126 | | |
| Metal furniture: SIC 25 | 59.8 | | | 460 | | |
| Paper: SIC 26 | 51.3 | | | 394 | | |
| Metal cans: SIC 341 | 183.2 | | | 1,410 | | |
| Machinery and equipment: SIC 35 | 58.2 | | | 448 | | |
| Large appliances: SIC 363 | 35.5 | | | 273 | | |
| Electronic/other elec.: SIC 36–363 | 4.2 | | | 32 | | |
| Motor vehicles: SIC 371 | 183.0 | | | 1,407 | | |
| Aircraft surface coating | 65.8 | | | 473 | | |
| Marine: SIC 373 | 3.5 | | | 27 | | |
| Railroad: SIC 374 | 5.1 | | | 39 | | |
| Miscellaneous surface coating | 160.9 | | | 1,309 | | |
| Industrial maintenance coatings | 301.0 | | | 2,315 | | |
| Other special purpose coatings | 12.0 | | | 93 | | |
| Degreasing | 291.9 | | | 1,923 | | |
| Dry cleaning | 10.3 | | | 79 | | |
| Graphics arts | 297.4 | | | 2,308 | | |
| Misc. industrial solvent use | 201.1 | | | 1,443 | | |
| Personal care products | 4,013.2 | | | 21,990 | | |
| Household products | 4,414.5 | | | 24,189 | | |

**Table 3.9–1. Annual and season-day emissions from all area sources in Maricopa County (continued).**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source Category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| ***Solvent use (continued):*** | | | | | | |
| Automotive aftermarket products | 2,729.0 | | | 14,950 | | |
| Coatings and related products | 1,906.3 | | | 10,445 | | |
| Adhesives and sealants | 1,143.8 | | | 6,257 | | |
| FIFRA-regulated products | 3,571.7 | | | 19,571 | | |
| Miscellaneous products, NEC | 140.5 | | | 770 | | |
| Cutback asphalt | 1,004.8 | | | 21,844 | | |
| Emulsified asphalt | 828.2 | | | 18,004 | | |
| Agricultural pesticides | 371.0 | | | 2,033 | | |
| **All Solvent Use:** | **29,522.2** | | | **172,914** | | |
| | | | | | | |
| ***Storage/transport:*** | | | | | | |
| Residential portable gas cans | 443.1 | | | 2,428 | | |
| Commercial portable gas cans | 382.0 | | | 2,093 | | |
| Bulk terminals | 91.0 | | | 493 | | |
| Bulk plants | 36.2 | | | 229 | | |
| Gas stations Stage I: Submerged fill | 369.9 | | | 2,027 | | |
| Gas stations Stage I: Bal. submerged fill | 646.9 | | | 3,545 | | |
| Underground tanks: Breathing/emptying | 764.8 | | | 4,191 | | |
| Airports: aviation gasoline Stage I | 673.6 | | | 3,691 | | |
| Airports: aviation gasoline Stage II | 33.3 | | | 182 | | |
| Truck: gasoline (tank trucks in transit) | 50.0 | | | 274 | | |
| Pipeline gasoline | 66.2 | | | 363 | | |
| Volatile organic liquids storage/transport | 37.8 | | | 218 | | |
| **All Storage/Transport:** | **3,594.9** | | | **19,734** | | |
| | | | | | | |
| ***Waste treatment/disposal:*** | | | | | | |
| On-site incineration | 0.2 | 3.0 | 0.7 | 1 | 19 | 5 |
| Open burning | 18.2 | 8.1 | 172.2 | 140 | 62 | 1,325 |
| Landfills | 36.6 | 9.9 | 14.6 | 158 | 54 | 80 |
| Publicly owned treatment works | 58.9 | | | 453 | | |
| Leaking underground storage tanks | 2.5 | | | 75 | | |
| Other waste | 7.7 | 20.6 | 38.1 | 54 | 113 | 186 |
| **All Waste Treatment/Disposal:** | **124.0** | **41.5** | **225.6** | **881** | **249** | **1,596** |
| | | | | | | |
| Miscellaneous area sources: | | | | | | |
| Backyard barbeques | 52.8 | 60.5 | 2,819.9 | 289 | 332 | 15,451 |
| Structure fires | 15.5 | 2.0 | 84.5 | 76 | 11 | 414 |
| Aircraft engine testing | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |
| Vehicle fires | 10.6 | 1.3 | 41.2 | 58 | 7 | 226 |
| Crematories, human | 0.4 | 10.7 | 0.6 | 3 | 77 | 5 |
| Crematories, animal | 0.1 | 5.6 | 0.3 | 1 | 49 | 3 |
| Accidental releases | 10.1 | 0.2 | 0.4 | 2 | 0 | 0 |
| Hospitals | 33.4 | | | 201 | | |
| Wildfires | 4.5 | 2.0 | 94.8 | 29 | 13 | 606 |
| Prescribed fires | 0.2 | 0.2 | 1.8 | 51 | 51 | 607 |
| **All Miscellaneous Area Sources:** | **132.1** | **128.1** | **3,060.5** | **736** | **800** | **17,410** |
| **Total, All Area Sources:** | **36,040.4** | **5,633.2** | **15,615.2** | **208,424** | **31,925** | **44,212** |

**Table 3.9–2. Annual and season-day emissions from all area sources in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source Category** | **VOC** | **NOx** | **CO** | **VOC** | **NOx** | **CO** |
| ***Fuel combustion:*** | | | | | | |
| Industrial distillate oil: Boilers | 1.0 | 95.3 | 23.8 | 6 | 611 | 153 |
| Industrial distillate oil: Engines | 133.4 | 1,918.9 | 413.0 | 855 | 12,301 | 2,647 |
| Industrial natural gas | 40.4 | 734.2 | 616.7 | 259 | 4,706 | 3,953 |
| Industrial LPG | 1.9 | 51.7 | 29.0 | 12 | 332 | 186 |
| Comm./inst. distillate oil: Boilers | 0.0 | 2.8 | 0.7 | 0 | 18 | 4 |
| Comm./inst. distillate oil: Engines | 0.3 | 4.4 | 1.0 | 2 | 28 | 6 |
| Comm./inst. natural gas | 61.9 | 1,126.0 | 945.9 | 397.0 | 7,218.2 | 6,063.3 |
| Residential distillate oil | 0.0 | 0.3 | 0.1 | 0 | 0 | 0 |
| Residential natural gas | 45.8 | 783.2 | 333.3 | 119 | 2,038 | 867 |
| Residential LPG | 1.6 | 41.8 | 11.8 | 0 | 0 | 0 |
| Residential wood combustion | 1,403.2 | 157.6 | 8,393.8 | 0.0 | 0.0 | 0.0 |
| **All Fuel Combustion:** | **1,689.7** | **4,916.2** | **10,769.1** | **1,651** | **27,252** | **13,881** |
| | | | | | | |
| ***Industrial processes:*** | | | | | | |
| Chemical manufacturing | 1.0 | | | 531 | | |
| Commercial cooking | 235.3 | | 671.5 | 1,289 | | 3,680 |
| Bakeries | 111.5 | | | 656 | | |
| Secondary metal production | 65.9 | 55.1 | 671.6 | 467 | 482 | 5,936 |
| Rubber/plastic product manufacturing | 928.8 | | | 7,701 | | |
| Fabricated metal product manufacturing | 19.0 | | | 91 | | |
| Electrical equipment manufacturing | 223.6 | 24.3 | 7.5 | 1,280 | 140 | 42 |
| Industrial processes, NEC | 70.3 | 452.2 | 273.7 | 397 | 2,478 | 1,470 |
| **All Industrial Processes:** | **917.3** | **531.6** | **1,624.3** | **12,412** | **3,100** | **11,127** |
| | | | | | | |
| ***Solvent use:*** | | | | | | |
| Architectural coatings | 5,260.0 | | | 32,017 | | |
| Auto refinishing | 950.6 | | | 5,209 | | |
| Traffic markings | 437.5 | | | 4,442 | | |
| Factory finished wood | 192.1 | | | 1,603 | | |
| Wood furniture | 661.1 | | | 5,085 | | |
| Metal furniture: SIC 25 | 59.3 | | | 456 | | |
| Paper: SIC 26 | 50.8 | | | 391 | | |
| Metal cans: SIC 341 | 181.8 | | | 1,398 | | |
| Machinery and equipment: SIC 35 | 57.7 | | | 444 | | |
| Large appliances: SIC 363 | 35.2 | | | 271 | | |
| Electronic/other electrical: SIC 36-363 | 4.2 | | | 32 | | |
| Motor vehicles: SIC 371 | 181.5 | | | 1,396 | | |
| Aircraft surface coating | 65.8 | | | 473 | | |
| Marine: SIC 373 | 3.4 | | | 26 | | |
| Railroad: SIC 374 | 5.1 | | | 39 | | |
| Miscellaneous surface coating | 159.6 | | | 1,299 | | |
| Industrial maintenance coatings | 298.6 | | | 2,297 | | |
| Other special purpose coatings | 11.9 | | | 92 | | |
| Degreasing | 289.5 | | | 1,908 | | |
| Dry cleaning | 10.4 | | | 80 | | |
| Graphics arts | 295.1 | | | 1,908 | | |
| Miscellaneous industrial solvent use | 199.5 | | | 1,431 | | |
| Personal care products | 4,047.3 | | | 22,177 | | |
| Household products | 4,452.0 | | | 24,395 | | |
| Automotive aftermarket products | 2,752.1 | | | 15,080 | | |
| Coatings and related products | 1,922.5 | | | 10,534 | | |
| Adhesives and sealants | 1,153.5 | | | 6,320 | | |
| FIFRA-regulated products | 3,602.1 | | | 19,737 | | |

**Table 3.9–2. Annual and season-day emissions from all area sources in the 8-hour ozone nonattainment area (continued).**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Source Category** | **VOC** | **NOx** | **CO** | **VOC** | **NOx** | **CO** |
| ***Solvent use (continued):*** | | | | | | |
| Miscellaneous products, NEC | 141.7 | | | 776 | | |
| Cutback asphalt | 992.3 | | | 21,572 | | |
| Emulsified asphalt | 817.9 | | | 17,780 | | |
| Agricultural pesticides | 218.1 | | | 1,195 | | |
| **All Solvent Use:** | **29,510.2** | | | **172,431** | | |
| | | | | | | |
| ***Storage/transport:*** | | | | | | |
| Residential portable gas cans | 446.6 | | | 2,447 | | |
| Commercial portable gas cans | 385.1 | | | 2,110 | | |
| Bulk terminals | 91.0 | | | 493 | | |
| Bulk plants | 36.2 | | | 229 | | |
| Gas stations Stage I: submerged fill | 369.9 | | | 2,027 | | |
| Gas stations Stage I: bal. submerged fill | 646.9 | | | 3,545 | | |
| Underground tanks: breathing/emptying | 764.8 | | | 4,191 | | |
| Airports: aviation gasoline Stage I | 667.5 | | | 3,658 | | |
| Airports: aviation gasoline Stage II | 33.0 | | | 181 | | |
| Truck: gasoline (tank trucks in transit) | 50.0 | | | 274 | | |
| Pipeline gasoline | 66.2 | | | 363 | | |
| Volatile organic liquids storage/transport | 35.7 | | | 201 | | |
| **All Storage/Transport:** | **3,592.9** | | | **19,718** | | |
| | | | | | | |
| ***Waste treatment/disposal:*** | | | | | | |
| On-site incineration | 0.1 | 2.9 | 0.7 | 1 | 19 | 5 |
| Open burning | 90.4 | 4.3 | 9.6 | 695 | 33 | 74 |
| Landfills | 36.6 | 12.7 | 28.5 | 217 | 70 | 157 |
| Publicly owned treatment works | 59.3 | | | 456 | | |
| Leaking underground storage tanks | 2.5 | | | 75 | | |
| Other waste | 7.7 | 20.6 | 38.1 | 54 | 105 | 186 |
| **All Waste Treatment/Disposal:** | **196.6** | **40.5** | **76.9** | **1,499** | **226** | **421** |
| | | | | | | |
| ***Misc. area sources:*** | | | | | | |
| Backyard barbeques | 53.2 | 61.0 | 2,842.1 | 291 | 334 | 15,573 |
| Structure fires | 15.6 | 2.0 | 85.2 | 77 | 10 | 418 |
| Aircraft engine testing | 4.6 | 45.5 | 16.9 | 27 | 260 | 98 |
| Vehicle fires | 10.6 | 1.3 | 41.6 | 58 | 7 | 228 |
| Crematories, human | 0.4 | 10.7 | 0.6 | 3 | 73 | 4 |
| Crematories, animal | 0.1 | 5.6 | 0.3 | 1 | 49 | 3 |
| Accidental releases | 10.1 | 0.2 | 0.4 | 2 | 16 | 0 |
| Hospitals | 33.7 | | | 202 | | |
| Wildfires | 4.3 | 1.9 | 90.4 | 37 | 17 | 792 |
| Prescribed fires | 0.2 | 0.2 | 1.8 | 63 | 62 | 743 |
| **All Misc. Area Sources** | **132.8** | **128.5** | **3,079.4** | **761** | **828** | **17,859** |
| **ALL AREA SOURCES:** | **36,039.6** | **5,616.9** | **15,549.7** | **208,473** | **31,407** | **43,287** |

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# 4. Nonroad Mobile Sources

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## 4.1 Introduction

Nonroad mobile sources are defined as those 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-engine planes; and
- Locomotives, such as switching and line-haul trains.

EPA released MOVES2014a in November 2015 as a replacement for its prior NONROAD2008 model. EPA announced that it would no longer support NONROAD2008, and instead recommended using MOVES2014a to model nonroad mobile source emissions. The MOVES2014a model allows for the use of consistent fuel and meteorology inputs for both onroad and nonroad mobile sources. While the same NONROAD2008 core code is still utilized, the inputs and outputs are controlled with MySQL databases that are more efficient to maintain. Procedures for updating local activity and population data have also improved and now require less run time. An update to the VOC emission calculation was implemented in the post-processing stage of MOVES2014a, resulting in different (generally lower) emissions calculations for VOC compared to values previously calculated with NONROAD2008.

Emission calculations for most nonroad mobile source categories except aircraft, airport ground support equipment (GSE) and locomotives were derived using the MOVES2014a model. Aircraft and airport GSE emission estimates were made using the Federal Aviation Administration's EDMS (Emissions Dispersion Modeling System) model, ver. 5.1.4. 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 to run the MOVES2014a model. The prior NONROAD2008 model required manual user input of monthly temperatures (minimum, maximum and average); Reid Vapor Pressure (RVP); gasoline and diesel sulfur content; and information on local gasoline ethanol blends (volume percentage, market share percentage and total oxygen weight percentage).

For the MOVES2014a model, hourly observed temperature data for a typical day in each month were obtained from Phoenix Sky Harbor Airport. Fuel data were provided by the Arizona

Department of Weights and Measures, and are identical to the fuel data used in modeling onroad mobile emissions. Stage II Vapor Recovery program effectiveness for 2014 (66.1%) was used to replace the default value in the model.

EPA recommends adjusting default model input files (such as equipment population and activity levels) where local data are available, as the default values in the model are derived from national averages. For commercial lawn and garden equipment, model defaults were adjusted based on 2003 survey results of the commercial lawn and garden industry performed by ENVIRON 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, populations in 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 inputs.

Ozone season-day emissions were estimated based on a 3-month average of the typical weekday, or typical weekend, emissions in each ozone season month (June – August) as generated by the MOVES2014a model. To be conservative, the typical day with the highest emissions (weekday or weekend) was selected to represent ozone season-day emissions for each nonroad emissions category. For example, typical daily emissions from agricultural equipment are highest on weekdays as compared to weekends. As such, weekday emissions are selected to be representative of ozone season-day emissions for agricultural equipment. (Other categories, such as recreational equipment, have higher emissions on weekends as compared to weekdays).

Annual emissions are first calculated by multiplying the month-specific MOVES2014a model typical weekday and weekend emissions by the number of weekdays and weekends in each month. The product of the weekday and weekend emissions in each month is then summed to produce month-specific emissions. Lastly, monthly emissions are summed to produce annual emissions.

Spatial allocation factors were developed to apportion Maricopa County-level annual and ozone season-day nonroad emissions to the 8-hour ozone nonattainment area. The approaches used are described in each section of this chapter.

## 4.2 Agricultural equipment

Annual and season-day emissions from agricultural equipment in Maricopa County were calculated using EPA's MOVES2014a model, as discussed above. Annual and season-day emissions for the 8-hour ozone nonattainment area were calculated based on the Emission Inventory Guidance for Implementation of Ozone [and Particulate Matter] National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations (US EPA, 2014) and Geographical Allocation (GA) guidance (US EPA, 2002) which recommends using the ratio of agricultural land inside the nonattainment area (157,478 acres) to agricultural land within the county (267,894 acres). See Section 1.5.2 for a discussion of the land-use data used. The resulting annual and season-day emissions are presented in Table 4.2–1.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 5.7 | 286.9 | 262.2 | 49 | 2,473 | 2,311 |
| 8-hr ozone NAA | 3.3 | 168.7 | 154.1 | 29 | 1,454 | 1,358 |

## 4.3 Airport ground support equipment

Annual and season-day emissions from airport ground support equipment (GSE) and auxiliary power units (APUs) were calculated using the Emissions Dispersion Modeling System (EDMS, v. 5.1.4) from the U.S. Federal Aviation Administration (FAA). Activity data on 2014 aircraft operations and GSE use for eight major airports were obtained from FAA's Operations and Performance Data System and MAG's 2014 survey data. In addition, 2014 activity data for six small general-aviation airports were obtained from FAA's 2015 Terminal Area Forecast (TAF) dataset and MAG's 2009 and 2014 survey data. (Further details concerning the modeling input data and results are described in Section 4.11, Aircraft).Emissions from GSE and APUs at Luke Air Force Base (AFB) for the year 2014 are grouped together with aircraft emissions at Luke AFB in Section 4.11. The resulting annual and season-day emissions are shown in Tables 4.3–1 and 4.3–2, respectively.

**Table 4.3–1. Annual emissions (tons/year) from airport ground support equipment (GSE) and auxiliary power units (APUs).**

| | Maricopa County | | | 8-hr. ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| GSE | 70.8 | 211.1 | 2,116.7 | 69.7 | 208.1 | 2,081.7 |
| APUs | 6.4 | 82.7 | 94.7 | 6.4 | 82.4 | 93.2 |
| **Totals:** | **77.3** | **293.7** | **2,211.4** | **76.1** | **290.5** | **2,174.9** |

**Table 4.3–2. Season-day emissions (lbs/day) from airport GSE and APUs.**

| | Maricopa County | | | 8-hr. ozone nonattainment area | | |
|---|---|---|---|---|---|---|
| **Equipment type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| GSE | 374 | 1,121 | 11,194 | 369 | 1,106 | 11,018 |
| APUs | 35 | 454 | 516 | 35 | 453 | 508 |
| **Totals:** | **409** | **1,575** | **11,710** | **404** | **1,559** | **11,526** |

## 4.4 Commercial equipment

Annual and season-day emissions from commercial equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of industrial employment in the nonattainment area to Maricopa County-level employment, as data on the number of wholesale establishments recommended by EPA guidance (US EPA, 2002) was not available. See Section 1.5.1 for a discussion of the industrial employment data used. The resulting annual and season-day emissions are shown in Table 4.4–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1,144.0 | 1,175.6 | 29,670.3 | 7,851 | 7,198 | 198,568 |
| 8-hr ozone NAA | 1,134.9 | 1,166.2 | 29,432.3 | 7,788 | 7,140 | 196,975 |

## 4.5 Construction and mining equipment

Annual and season-day emissions from construction and mining equipment in Maricopa County were calculated using EPA's MOVES2014a model as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of construction employment in the nonattainment area to Maricopa County-level employment as a conservative estimate, as the EPA-recommended allocation factor (the total dollar value of all construction) was unavailable (US EPA, 2002). See Section 1.5.1 for a discussion of the employment data used. The resulting annual and season-day emissions are presented in Table 4.5–1.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 454.4 | 10,495.7 | 12,531.9 | 3,203 | 72,485 | 88,728 |
| 8-hr ozone NAA | 450.3 | 10,400.5 | 12,418.3 | 3,174 | 71,827 | 87,923 |

## 4.6 Industrial equipment

Annual and season-day emissions from industrial equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of industrial employment in the nonattainment area to Maricopa County-level employment as a conservative estimate, as the number of employees in manufacturing recommended by EPA guidance (US EPA, 2002) was unavailable. See Section 1.5.1 for a discussion of the industrial employment data used. The resulting annual and season-day emissions estimates are shown in Table 4.6–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 115.1 | 1,263.3 | 3,956.0 | 733 | 7,645 | 25,053 |
| 8-hr ozone NAA | 114.1 | 1,253.1 | 3,924.2 | 727 | 7,584 | 24,852 |

## 4.7 Lawn and garden equipment

Annual and season-day emissions from lawn and garden equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. These results reflect 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 and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of population in the nonattainment area to Maricopa County-level population, since housing units was not available, as recommended by EPA guidance (US EPA, 2002). See Section 1.5.1 for a discussion of the population data used. The resulting annual and season-day emissions estimates are shown in Table 4.7–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 2,937.5 | 589.9 | 44,389.3 | 25,208 | 4,194 | 403,992 |
| 8-hr ozone NAA | 2,962.4 | 594.9 | 44,765.8 | 25,422 | 4,229 | 407,419 |

## 4.8 Pleasure craft

Annual and season-day emissions from pleasure craft equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of water surface area in the nonattainment area to Maricopa County-level water surface area, as recommended by EPA guidance (US EPA, 2002). See Section 1.5.2 for a discussion of the land-use data used. The resulting annual and season-day emissions estimates are shown in Table 4.8–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| 8-hr ozone NAA | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |

## 4.9 Railway maintenance equipment

Annual and season-day emissions from railway maintenance equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area for this category were derived by applying the ratio of population in the nonattainment area to Maricopa County-level population, as recommended by EPA guidance (US EPA, 2002). See Section 1.5.1 for a discussion of the population data used. The resulting annual and season-day emissions are shown in Table 4.9–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 0.3 | 7.7 | 15.2 | 2 | 53 | 108 |
| 8-hr ozone NAA | 0.3 | 7.8 | 15.3 | 2 | 53 | 109 |

## 4.10 Recreational equipment

Annual emissions from recreational equipment in Maricopa County were calculated using EPA's MOVES2014a model, as described in Section 4.1. Annual and season-day emissions for the 8-hour ozone nonattainment area were derived by applying the ratio of passive open space and vacant land use within the nonattainment area to Maricopa County-level land use, as recommended by EPA guidance (US EPA, 2002). See Section 1.5.2 for a discussion of the land use data used. The resulting annual and season-day emissions are shown in Table 4.10–1 below.

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

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 1,271.8 | 62.4 | 6,501.1 | 15,408 | 713 | 84,058 |
| 8-hr ozone NAA | 572.0 | 28.1 | 2,924.0 | 6,930 | 321 | 37,807 |

## 4.11 Aircraft

Emissions from aircraft at the airports in Maricopa County were estimated using the Federal Aviation Administration's Emissions and Dispersion Model (EDMS, v. 5.1.4). The FAA EDMS model combines atmospheric mixing heights and aircraft-specific activity data with default emissions factors in order to estimate annual emissions inventories for a specific airport. The model calculates emissions of sulfur oxides ($SO_x$), oxides of nitrogen ($NO_x$), particulate matter (only for certain categories of airframes and engines), carbon monoxide (CO), and hydrocarbons (HC). The model also estimate emissions from ground support equipment (GSE) and auxiliary power units (APUs), using either default profiles or user-specified information about these components. The emissions from GSE and APUs at all airports other than Luke Air Force Base have been addressed and reported in Section 4.3 above.

One required meteorological input for EDMS is 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 15181) was employed. Both the 2014 hourly surface meteorological data and the 2014 one-minute Automated Surface Observing System (ASOS) wind data from the National Weather Service (NWS) station at Phoenix Sky Harbor were used (NCDC, 2015). Upper-air data for all of 2014 for the Tucson station (#23160) were obtained from the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory Radiosonde Database (ESRL, 2015). Ultimately, a single mixing height dataset in 2014 is used for all airports other than Luke Air Force Base.

Aircraft emissions have been 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.

Within each of these four main categories, many combinations of specific aircraft and engines are modeled and aggregated by EDMS to produce overall emissions for each of the four categories.

Three databases from the Federal Aviation Administration (FAA) provide annual aircraft activity, aircraft type fleet mix, and hourly/weekly/monthly operational profiles for the eight major airports in the 8-hour ozone nonattainment area (Chandler Municipal, Falcon Field, Glendale Municipal, Phoenix Deer Valley, Phoenix Goodyear, Phoenix-Mesa Gateway, Phoenix Sky Harbor, and Scottsdale airports). The three FAA databases are:

- Operational Network (OPSNET) database (FAA, 2015a),
- Enhanced Traffic Management System Counts (ETMSC) database, and
- Aviation System Performance Metrics (ASPM) database (FAA, 2015b).

In addition, the Traffic Flow Management System Counts (TFMSC) database provides taxi-in and taxi-out time for Phoenix Sky Harbor Airport, while MAG's survey of year 2014 data quantifies touch-and-go operations from Phoenix Deer Valley Airport and Phoenix Goodyear Airport.

To supplement the FAA's database for the eight major airports, another three datasets were used for the six small general-aviation airports:

- FAA's Terminal Area Forecast (TAF) database (FAA, 2015c) for year 2014 activity data at Gila Bend Municipal and Wickenburg Municipal airports;
- MAG's survey of 2014 activity at Buckeye Municipal Airport; and
- MAG's survey of 2008 data on aircraft activity (landing and take-off,or LTOs) in Pleasant Valley, Sky Ranch at Carefree, and Stellar Airpark airports.

Data for the year 2008 for the remaining three small general-aviation airports are assumed to be representative of 2014 activity, since updated aircraft activity data for these airports were not available. Table 4.11–1 below summarizes the activity level for each aircraft category for each airport included in the modeling, and indicates the data sources for each airport's activity (reported number of operations) and fleet mix.

The following section describes how activity and emissions were estimated for a representative airport, Chandler Municipal (CHD). The FAA's Operational Network (OPSNET) database provided 2014 activity by aircraft type category, as listed in Table 4.11–1. While OPSNET reported a total of 215,589 general aviation operations at this airport in 2014, further information on the aircraft types for this activity was needed so that 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 Chandler Municipal Airport (CHD) in 2014 comprises 86 different aircraft types, totaling 3,063 operations. The aircraft-specific activity data were ranked in the decreasing order. Activity data for the predominant aircraft was then grown to represent all general aviation activity. This process for the general aviation activity at Chandler Municipal Airport is depicted in Table 4.11–2.

The processes of ranking reported activity and growing this subset of data typically resulted in 10 to 30 aircraft types for each airport/aircraft class combination, representing 85 to 100% of all reported activity.

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

| Airport | Code | Operations data source[1] | Fleet mix data source[2] | Aircraft type[3] | 2014 operations |
|---|---|---|---|---|---|
| Buckeye Municipal | BXK | Survey response | generic GA profile | GA | 37,114 |
| Chandler Municipal | CHD | FAA/OPSNET | FAA/ETMSC | AT | 1,852 |
| | | | | GA | 215,589 |
| | | | | ML | 108 |
| Falcon Field | FFZ | FAA/OPSNET | FAA/ETMSC | AC | 18 |
| | | | | AT | 38,805 |
| | | | | GA | 194,557 |
| | | | | ML | 3,043 |
| Gila Bend Municipal | E63 | FAA/TAF | generic GA profile | GA | 3,550 |
| Glendale Municipal | GEU | FAA/OPSNET | FAA/ETMSC | AT | 882 |
| | | | | GA | 64,033 |
| | | | | ML | 138 |
| Luke Air Force Base | LUF | [Aircraft emissions in 2014 were estimates through scaling based on the numbers of F-16s and F-35s] | | | |
| Phoenix Deer Valley | DVT | FAA/OPSNET, Survey response | Survey response, FAA/ETMSC | AC | 15 |
| | | | | AT | 5,368 |
| | | | | GA | 334,024 * |
| | | | | ML | 86 |
| Phoenix Goodyear | GYR | FAA/OPSNET, Survey response | Survey response, FAA/ETMSC | AC | 234 |
| | | | | AT | 3,930 |
| | | | | GA | 75,354 * |
| | | | | ML | 3,998 |
| Phoenix-Mesa Gateway (formerly Williams Gateway) | IWA | FAA/OPSNET | FAA/ETMSC | AC | 10,134 |
| | | | | AT | 22,867 |
| | | | | GA | 186,488 |
| | | | | ML | 8,879 |
| Phoenix Sky Harbor | PHX | FAA/OPSNET | FAA/ETMSC | AC | 352,732 |
| | | | | AT | 54,599 |
| | | | | GA | 20,579 |
| | | | | ML | 2,551 |
| Pleasant Valley | P48 | Survey Response | generic GA profile | GA | 6,010 |
| Scottsdale | SDL | FAA/OPSNET | FAA/ETMSC | AC | 76 |
| | | | | AT | 15,518 |
| | | | | GA | 133,540 |
| | | | | ML | 1,285 |
| Sky Ranch/Carefree | 18AZ | Survey response | generic GA profile | GA | 3,030 |
| Stellar Airpark | P19 | airnav.com | generic GA profile | GA | 39,056 |
| Wickenburg Mun. | E25 | FAA/TAF | generic GA profile | GA | 36,030 |

1. **FAA/OPSNET:** Federal Aviation Administration's Operations Network (database); aspm.faa.gov.
   **FAA/TAF:.** FAA's Terminal Area Forecast; taf.faa.gov
2. **FAA/ETMSC:** FAA's Enhanced Traffic Management System Counts (database); aspm.faa.gov.
3. **AC:** Air Commercial; **AT:** Air Taxi; **GA:** General Aviation; **ML:** Military

* The number of operations includes touch-and-go operations reported by airport.

**Table 4.11–2. Aircraft-specific activity growth for EDMS modeling input for Chandler Municipal airport.**

| Rank | Aircraft type | ETMSC-reported operations | % total reported operations | Cumulative percent | Operations grown for EDMS modeling |
|---|---|---|---|---|---|
| 1 | P28A: Piper Cherokee | 490 | 16.00% | 16.00% | 40,568 |
| 2 | BE20: Beech 200 Super King | 177 | 5.78% | 21.78% | 14,654 |
| 3 | C172: Cessna Skyhawk 172/Cutlass | 168 | 5.48% | 27.26% | 13,909 |
| 4 | BE58: Beech 58 | 162 | 5.29% | 32.55% | 13,412 |
| 5 | C25C: Cessna Citation CJ4 | 152 | 4.96% | 37.51% | 12,584 |
| 6 | R22: Robinson R-22 Mariner | 135 | 4.41% | 41.92% | 11,177 |
| 7 | C182: Cessna Skylane 182 | 131 | 4.28% | 46.20% | 10,846 |
| 8 | C560: Cessna Citation V/Ultra | 119 | 3.89% | 50.08% | 9,852 |
| 9 | BE36: Beech Bonanza 36 | 104 | 3.40% | 53.48% | 8,610 |
| 10 | P46T: Piper Malibu Meridian | 89 | 2.91% | 56.38% | 7,368 |
| 11 | C510: Cessna Citation Mustang | 84 | 2.74% | 59.13% | 6,955 |
| 12 | AC90: Gulfstream Commander | 79 | 2.58% | 61.70% | 6,541 |
| 13 | SR22: Cirrus SR 22 | 79 | 2.58% | 64.28% | 6,541 |
| 14 | PC12: Pilatus PC-12 | 78 | 2.55% | 66.83% | 6,458 |
| 15 | BE33: Beech Bonanza 33 | 73 | 2.38% | 69.21% | 6,044 |
| 16 | PA46: Piper Malibu | 70 | 2.29% | 71.50% | 5,795 |
| 17 | BE35: Beech Bonanza 35 | 68 | 2.22% | 73.72% | 5,630 |
| 18 | C525: Cessna CitationJet/CJ1 | 58 | 1.89% | 75.61% | 4,802 |
| 19 | PA28: Piper Cherokee | 42 | 1.37% | 76.98% | 3,477 |
| 20 | M20P: Mooney M-20C Ranger | 38 | 1.24% | 78.22% | 3,146 |
| 21 | BE9L: Beech King Air 90 | 37 | 1.21% | 79.43% | 3,063 |
| 22 | M20T: Turbo Mooney M20K | 37 | 1.21% | 80.64% | 3,063 |
| 23 | PA44: Piper Seminole | 36 | 1.18% | 81.82% | 2,981 |
| 24 | C340: Cessna 340 | 34 | 1.11% | 82.93% | 2,815 |
| 25 | C210: Cessna 210 Centurion | 32 | 1.04% | 83.97% | 2,649 |
| 26 | DA40: Diamond Star DA40 | 32 | 1.04% | 85.01% | 2,649 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | |
| 86 | H25B: BAe HS125/7-800/Hawker | 2 | < 0.1% | 100.00% | (n/a) |
| | **Total:** | **3,063** | | | **215,589** |

Aircraft emissions at Luke Air Force Base (AFB) are based upon three types of aircraft: F-16, F-35, and "transient" aircraft, and also includes emissions from associated ground support equipment (GSE). F-16 aircraft emissions and associated GSE emissions were scaled using a ratio of the number of F-16s in 2014 to the number of F-16s in 2008 (Weston, 2010). Emissions from F-35 aircraft and their associated GSE were scaled using a ratio of the number of F-35 aircraft in 2014 to the future total number (144) of F-35 aircraft in the L6 scenario emissions as obtained from the base's 2012 environmental impact statement report (USAF, 2012). "Transient" aircraft emissions in 2014 were assumed to be the same as those in 2008 based on discussions with Luke AFB personnel. Emissions from F-16 aircraft, F-35 aircraft, "transient" aircraft, and GSE were all summed into the single "ML" category for Luke Air Force Base.

Tables 4.11–3 and 4.11–4 present total annual and season-day emissions by airport and aircraft type for airports inside and outside the 8-hour ozone nonattainment area, respectively. Ozone

season-day emissions are calculated by summing monthly emissions in the ozone season (June–August), and then dividing the sum by the number of days in the ozone season (92).

**Table 4.11–3. Annual and season-day emissions for airports in the 8-hour ozone nonattainment area, by airport and aircraft type.**

| | | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|
| **Facility** | **Type*** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Buckeye Municipal | GA | 4.1 | 1.7 | 176.7 | 21 | 8 | 951 |
| Chandler Municipal | AT | 6.6 | 1.2 | 7.3 | 40 | 7 | 45 |
| | GA | 142.3 | 24.1 | 1,351.0 | 726 | 117 | 7,480 |
| | ML | 0.0 | 0.0 | 1.4 | 0 | 0 | 8 |
| | ***Total*** | **149.0** | **25.3** | **1,359.7** | **766** | **124** | **7,533** |
| Falcon Field | AC | 0.0 | 0.0 | 0.4 | 0 | 0 | 1 |
| | AT | 136.7 | 27.9 | 171.89 | 1,019 | 205 | 1,294 |
| | GA | 146.7 | 24.7 | 1,198.0 | 547 | 84 | 5,001 |
| | ML | 3.0 | 0.8 | 15.2 | 16 | 4 | 86 |
| | ***Total*** | **286.4** | **53.4** | **1,385.5** | **1,583** | **292** | **6,382** |
| Gila Bend Municipal | GA | **0.4** | **0.2** | **16.8** | **2** | **1** | **89** |
| Glendale Municipal | AT | 2.9 | 0.9 | 3.9 | 8 | 2 | 11 |
| | GA | 95.5 | 11.5 | 489.3 | 414 | 46 | 2,277 |
| | ML | 0.1 | 0.0 | 0.7 | 1 | 0 | 7 |
| | ***Total*** | **98.5** | **12.4** | **494.0** | **424** | **49** | **2,295** |
| Luke AF Base | ML | **101.0** | **244.8** | **456.6** | **777** | **1,883** | **3,513** |
| Phoenix Deer Valley | AC | 0.0 | 0.0 | 0.1 | 0 | 0 | 1 |
| | AT | 10.8 | 5.6 | 18.1 | 48 | 24 | 81 |
| | GA | 115.9 | 49.0 | 2,021.5 | 608 | 251 | 11,863 |
| | ML | 0.0 | 0.0 | 0.4 | 0 | 0 | 3 |
| | ***Total*** | **126.8** | **54.6** | **2,040.1** | **656** | **275** | **11,948** |
| Phoenix Goodyear | AC | 0.3 | 0.7 | 1.5 | 1 | 2 | 4 |
| | AT | 13.9 | 3.8 | 19.2 | 79 | 20 | 109 |
| | GA | 28.7 | 39.1 | 507.7 | 137 | 184 | 2,704 |
| | ML | 5.6 | 23.5 | 20.3 | 24 | 95 | 87 |
| | ***Total*** | **48.6** | **67.1** | **548.8** | **240** | **301** | **2,905** |
| Phoenix Sky Harbor Intl | AC | 258.5 | 1,567.1 | 1,483.7 | 1,407 | 7,939 | 8,005 |
| | AT | 22.3 | 109.2 | 124.2 | 120 | 554 | 673 |
| | GA | 30.0 | 9.3 | 114.4 | 138 | 40 | 561 |
| | ML | 3.9 | 29.01 | 24.1 | 17 | 113 | 102 |
| | ***Total*** | **314.7** | **1,714.6** | **1,746.4** | **1,682** | **8,645** | **9,341** |
| Phoenix-Mesa Gateway | AC | 5.4 | 39.04 | 42.9 | 29 | 201 | 231 |
| | AT | 104.5 | 13.13 | 119.4 | 600 | 74 | 694 |
| | GA | 186.8 | 47.80 | 1,073.2 | 839 | 193 | 5,224 |
| | ML | 23.5 | 17.30 | 75.8 | 153 | 102 | 495 |
| | ***Total*** | **320.1** | **117.27** | **1,311.3** | **1,621** | **570** | **6,643** |
| Pleasant Valley | GA | **0.1** | **0.38** | **1.1** | **1** | **2** | **56** |
| Scottsdale | AC | 0.1 | 0.07 | 0.3 | 0 | 0 | 0 |
| | AT | 47.3 | 13.10 | 65.4 | 187 | 50 | 261 |
| | GA | 211.3 | 76.64 | 641.5 | 1,066 | 359 | 3,338 |
| | ML | 1.3 | 0.49 | 9.5 | 6 | 2 | 47 |
| | ***Total*** | **260.0** | **90.30** | **716.7** | **1,259** | **410** | **3,646** |
| Skyranch at Carefree | GA | **1.7** | **0.3** | **16.3** | **10** | **2** | **116** |
| Stellar Airpark | GA | **8.0** | **2.3** | **224.5** | **40** | **10** | **1,178** |
| **8–hr ozone NAA totals:** | | **1,719.2** | **2,384.3** | **10,494.4** | **9,080** | **12,571** | **56,545** |

***Type**: 'AC' = Air Commercial; 'AT' = Air Taxi; 'GA" = General Aviation; 'ML' = Military

**Table 4.11–4. Annual and season-day emissions for airports outside the 8-hour ozone nonattainment area, by airport and aircraft type.**

| | | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|
| **Facility** | **Type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Wickenburg Municipal | GA | 42.6 | 6.8 | 193.6 | 204 | 32 | 1,038 |
| **County totals:** | | **1,761.8** | **2,391.1** | **10,688.0** | **9,284** | **12,603** | **57,583** |

## 4.12 Locomotives

Annual emissions from locomotives were calculated based on diesel fuel usage data provided by Burlington Northern/Santa Fe Railway (BNSF), Union Pacific Railway (UP) and Amtrak. Railway operations from these companies fall into three categories: Class I haul lines, passenger trains, and yard/switching operations. Annual emissions were calculated by multiplying diesel fuel usage by emission factors published by US EPA (2009). Ozone season-day emissions were calculated by dividing annual totals by 365 days per year, as locomotive activity is assumed to be uniform throughout the year. The resulting annual and season-day emissions from each of the categories in Maricopa County are presented in Table 4.12–1.

**Table 4.12–1. Annual and season-day emissions from locomotives in Maricopa County.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Locomotive type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Class I haul line | 115.7 | 2,126.8 | 389.5 | 634 | 11,654 | 2,134 |
| Yard/switch ops. | 20.7 | 329.7 | 28.8 | 113 | 1,807 | 158 |
| Passenger trains | 1.1 | 21.8 | 3.5 | 6 | 119 | 19 |
| **Totals:** | **137.5** | **2,478.3** | **421.8** | **754** | **13,580** | **2,311** |

To calculate emissions within the 8-hour ozone nonattainment area, County-level emissions were multiplied by the percentage of track miles inside the nonattainment area, determined by GIS mapping. The resulting annual and season-day emissions are shown in Table 4.12–2.

**Table 4.12–2. Annual and season-day emissions from locomotives in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Locomotive type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Class I haul line | 70.2 | 1,289.9 | 236.2 | 385 | 7,068 | 1,294 |
| Yard/switch ops. | 20.7 | 329.7 | 28.8 | 113 | 1,807 | 158 |
| Passenger trains | 0.1 | 1.5 | 0.2 | 0 | 8 | 1 |
| **Totals:** | **91.0** | **1,621.2** | **265.3** | **498** | **8,883** | **1,454** |

## 4.13 Quality assurance procedures

Established procedures were used to check, and correct when necessary, the nonroad mobile sources emissions estimates. All 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 under review. In addition, the emissions estimates were reviewed for reasonableness by external agency staff.

## 4.14 Summary of all nonroad mobile source emissions

Table 4.14–1 summarizes annual and season-day emissions of VOC, $NO_x$, and CO from nonroad mobile sources in Maricopa County. Table 4.14–2 shows annual and season-day emissions for these pollutants for the 8-hour ozone nonattainment area.

**Table 4.14–1. Annual and season-day emissions from nonroad mobile sources in Maricopa County.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Agricultural | 5.7 | 286.9 | 262.2 | 49 | 2,473 | 2,311 |
| Airport GSE+APUs | 77.3 | 293.7 | 2,211.4 | 409 | 1,575 | 11,710 |
| Commercial | 1,144.0 | 1,175.6 | 29,670.3 | 7,851 | 7,198 | 198,568 |
| Construction & mining | 454.4 | 10,495.7 | 12,531.9 | 3,203 | 72,485 | 88,728 |
| Industrial | 115.1 | 1,263.3 | 3,956.0 | 733 | 7,645 | 25,053 |
| Lawn & garden | 2,937.5 | 589.9 | 44,389.3 | 25,208 | 4,194 | 403,992 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance | 0.3 | 7.7 | 15.2 | 2 | 53 | 108 |
| Recreational | 1,271.8 | 62.4 | 6,501.1 | 15,408 | 713 | 84,058 |
| Aircraft | 1,761.8 | 2,391.1 | 10,688.0 | 9,284 | 12,603 | 57,583 |
| Locomotives | 137.5 | 2,478.3 | 421.8 | 754 | 13,580 | 2,311 |
| **Total:** | **8,287.7** | **19,143.1** | **111,801.8** | **70,378** | **124,946** | **904,107** |

**Table 4.14–2. Annual and season-day emissions from nonroad mobile sources in the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Category** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Agricultural | 3.3 | 168.7 | 154.1 | 29 | 1,454 | 1,358 |
| Airport GSE+APUs | 76.1 | 290.5 | 2,174.9 | 404 | 1,559 | 11,526 |
| Commercial | 1,134.9 | 1,166.2 | 29,432.3 | 7,788 | 7,140 | 196,975 |
| Construction & mining | 450.3 | 10,400.5 | 12,418.3 | 3,174 | 71,827 | 87,923 |
| Industrial | 114.1 | 1,253.1 | 3,924.2 | 727 | 7,584 | 24,852 |
| Lawn & garden | 2,962.4 | 594.9 | 44,765.8 | 25,422 | 4,229 | 407,419 |
| Pleasure craft | 382.3 | 98.3 | 1,154.8 | 7,477 | 2,428 | 29,686 |
| Railway maintenance | 0.3 | 7.8 | 15.3 | 2 | 53 | 109 |
| Recreational | 572.0 | 28.1 | 2,924.0 | 6,930 | 321 | 37,807 |
| Aircraft | 1,719.2 | 2,384.3 | 10,494.4 | 9,080 | 12,571 | 56,545 |
| Locomotives | 91.0 | 1,621.2 | 265.3 | 498 | 8,883 | 1,454 |
| **Totals:** | **7,505.9** | **18,013.6** | **107,723.4** | **61,531** | **118,049** | **855,654** |

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# 5. Onroad Mobile Sources

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## 5.1 Introduction

Onroad mobile source emissions for ozone precursors, such as volatile organic compounds (VOCs), oxides of nitrogen ($NO_x$), and carbon monoxide (CO), have been calculated for the 8-hour ozone nonattainment area (NAA) and Maricopa County for the 2014 Periodic Emissions Inventory (PEI).

Motor Vehicle Emission Simulator (MOVES2014a) 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 MOVES2014a inputs were developed using local data from multiple sources such as the Arizona Department of Transportation (ADOT), the Arizona Department of Weights and Measures (ADWM), the Maricopa Association of Governments (MAG) Transportation Division, and the National Climatic Data Center (NCDC).

The main references for preparing the onroad mobile source portion of the 2014 emissions inventory were:

- Emission Inventory Requirements for Ozone State Implementation Plans (US EPA, 1991);
- Procedures for Emission Inventory Preparation Volume IV: Mobile Sources (US EPA, 1992a);
- Quality Review Guidelines for 1990 Base Year Emission Inventories (US EPA, 1992b);
- Emissions Inventory Guidance for Implementation of Ozone [and Particulate Matter] National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations (US EPA, 2014a);
- Policy Guidance on the Use of MOVES2014 for State Implementation Plan Development, Transportation Conformity, and Other Purposes (US EPA, 2014b);
- MOVES2014a User Guide (US EPA, 2015a);
- MOVES2014a User Interface Reference Manual (US EPA, 2015b);
- MOVES2014a Software Design Reference Manual (US EPA, 2015c); and
- MOVES2014 and MOVES2014a Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity (US EPA, 2015d);

## 5.2 Onroad emissions

Onroad exhaust, evaporative, refueling, and extended idling emissions were estimated by MOVES2014a.

### *5.2.1 MOVES2014a model*

Onroad mobile source emissions were calculated using the EPA state-of-the-art emissions modeling tool, MOVES2014a. MOVES2014a is intended for official use to estimate national, state, and county level inventories of criteria air pollutants from highway vehicles. The user of MOVES2014a 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 2014, MOVES2014a was executed using local input data for each geographical area (Maricopa County and the 8-hour ozone nonattainment area). Each scenario was created using the county scale setting and the inventory calculation type. The specific MOVES2014a model RunSpec and RunSpec summaries are described in Appendix C.

### *5.2.2 Local input data used with the MOVES2014a model*

MOVES2014a requires local data such as the presence of inspection and maintenance (I/M) programs, meteorological data, vehicle populations, source type age distribution, annual vehicle miles traveled (VMT), monthly/daily/hourly fractions, road type distribution, average speed distribution, ramp fraction, fuel data, and alternative vehicle and fuel technologies (AVFT).

#### *5.2.2.1 Fuel data*

Regarding the fuel local input data, MOVES2014a provides three MOVES tables, which are [fuelsupply], [fuelformulation], and [fuelusagefraction]. The fuel data for each month were derived from the 2014 fuel inspection results in Maricopa County provided by ADWM. The fuel data for Maricopa County were also applied to the 8-hour ozone nonattainment area. The specific MOVES tables for fuel data are presented in Appendix C.

#### *5.2.2.2 I/M programs*

MOVES2014a has an [IMCoverage] table for I/M programs, which 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 Area A, with the exception of certain model years and vehicle classes. However, it is assumed that 91.6 percent of the vehicles operating within the 8-hour ozone nonattainment area and Maricopa County participate in the I/M program, while 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 Maricopa County and the 8-hour ozone nonattainment area. The specific MOVES table for I/M programs is presented in Appendix C.

#### *5.2.2.3 Meteorological data*

MOVES2014a requires hourly temperature and relative humidity data by specific month of the year. Meteorological data for the Phoenix Sky Harbor International Airport in 2014 were obtained from the National Climatic Data Center (http://www.ncdc.noaa.gov/IPS/lcd/lcd.html). The same hourly average temperature and relative humidity data for each month were applied for

Maricopa County and the 8-hour ozone nonattainment area. The specific MOVES table [ZoneMonthHour] for meteorological data is presented in Appendix C.

#### *5.2.2.4 Vehicle population*

In MOVES2014a, off-network emissions including start, evaporative, and extended idle emissions are directly determined by population of vehicles in an area. The vehicle population in Maricopa County was obtained from the July 2014 vehicle registration data provided by ADOT. The vehicle population data were allocated to the 13 MOVES source types based on MOVES default vehicle population fractions for Maricopa County in 2014. The vehicle population in the 8-hour ozone nonattainment area was estimated by applying the population ratio of the two geographical areas to the vehicle population in Maricopa County. The population ratio for 2014 was derived from the MAG socioeconomic data, which are 4,022,310 people for the 8-hour ozone nonattainment area and 3,989,980 people for Maricopa County. The specific MOVES table [SourceTypeYear] for vehicle population is presented in Appendix C.

#### *5.2.2.5 Source type age distribution*

MOVES2014a categorizes vehicles according to vehicle classes and model years. The source type age distribution input table was prepared using EPA MOVES data converter and the vehicle registration data from ADOT. The same source type age distribution was applied for Maricopa County and the 8-hour ozone nonattainment area. The specific MOVES table [SourceTypeAgeDistribution] for source type age distribution is presented in Appendix C.

#### *5.2.2.6 Annual VMT*

The 2014 annual VMTs were used to estimate onroad exhaust and evaporative emissions. The 2014 annual average daily VMTs by HPMS vehicle type for Maricopa County and the 8-hour ozone nonattainment area were derived from the 2014 traffic assignment data provided by the MAG Transportation Modeling Group in July 2015. The annual average daily VMTs were multiplied by 365 days to obtain the annual VMTs. The specific MOVES table [HPMSvTypeYear] for annual VMT is presented in Appendix C.

#### *5.2.2.7 Road type distribution*

MOVES2014a requires the distribution of VMTs by road type as a local input. The road type VMT distribution by HPMS vehicle type was derived with the 2014 traffic assignment data and the MOVES default VMT fractions for the HPMS vehicle types. MOVES source types belonging to the same HPMS vehicle class applied the same road type distribution assigned for the HPMS vehicle class. The specific MOVES table [RoadTypeDistribution] for road type distribution is presented in Appendix C.

#### *5.2.2.8 VMT fraction*

Since VMT varies by month, day of week, and hour, MOVES2014a 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) in 2007. The specific MOVES tables [MonthVMTFraction], [DayVMTFraction], and [HourVMTFraction] for VMT fractions are presented in Appendix C.

#### *5.2.2.9 Average speed distribution*

In MOVES2014a, vehicle power, speed, and acceleration have a significant effect on vehicle emissions for all pollutants. MOVES2014a estimates those emission effects by assigning activity to operating mode distributions, which are determined by the distribution of vehicle hours traveled (VHT) in sixteen speed bins. Local estimates of average speed were developed by post-processing the output from the 2014 traffic assignment data. 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 8-hour ozone nonattainment area. The specific MOVES table [AvgSpeedDistribution] for the average speed distribution is presented in Appendix C.

#### *5.2.2.10 Ramp fraction*

MOVES2014a requires the ramp fraction, which 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 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 2014 traffic assignment. The specific MOVES table [RoadType] for ramp fractions is shown in Appendix C.

#### *5.2.2.11 Alternative vehicle and fuel technologies (AVFT) strategy*

MOVES2014a 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 was provided by Valley Metro and used to prepare the AVFT input. Since the fleet data are available only for specific model years, MOVES2014a 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 shown in Appendix C.

#### *5.2.2.12 Stage II refueling control programs*

To account for the impact of Stage II refueling control programs on refueling losses, MOVES2014a requires the control efficiency for the local area. The control efficiency for the refueling displacement vapor losses in 2014 were provided by Arizona Department of Weights and Measures. The same program efficiency of 66.1% was applied to Maricopa County and the 8-hour ozone nonattainment area. The specific MOVES table [CountyYear] for Stage II refueling control programs is presented in Appendix C.

### *5.2.3 MOVES2014a outputs*

MOVES2014a was executed with the RunSpec files described in Appendix C to obtain exhaust and evaporative emissions for VOC, $NO_x$, and CO. These values were obtained for the following categories:

- Source types: motorcycle, passenger car, passenger truck, light commercial truck, intercity bus, transit bus, school bus, refuse truck, single unit short-haul truck, single unit long-haul truck, motor home, combination short-haul truck, and combination long-haul truck.
- Road types: off-network, rural restricted access, rural unrestricted access, urban restricted access, and urban unrestricted access.

### *5.2.4 MOVES2014a emission estimates*

MOVES2014a was used to generate onroad emissions by vehicle class, facility type, weekday/ weekend day, and month. By specifying the output time aggregate level as month, MOVES2014a produces monthly emissions including weekday and weekend emissions for a given month. The annual emissions were calculated by aggregating monthly onroad emissions derived by MOVES2014a. The ozone season-day emissions were calculated by dividing the three-month peak ozone season emissions from June through August by 92 days.

Tables 5.2–1 and 5.2–2 show the calculated annual and ozone season-day VOC, $NO_x$, and CO emissions by road and vehicle type in Maricopa County and the 8-hour ozone nonattainment area, respectively.

**Table 5.2–1. Annual and season-day onroad mobile source emissions in Maricopa County, by road and vehicle type.**

| Road type | Source type | Annual emissions (tons/year) | | | Ozone season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|
| | | VOC | NOx | CO | VOC | NOx | CO |
| Off-Network | Motorcycle | 347.4 | 2.9 | 84.1 | 2,490 | 13 | 375 |
| | Passenger car | 8,583.4 | 3,947.7 | 35,951.9 | 55,043 | 21,035 | 182,111 |
| | Passenger truck | 3,321.3 | 1,785.2 | 21,645.3 | 20,733 | 9,605 | 114,641 |
| | Light commercial truck | 836.9 | 494.5 | 6,136.9 | 5,158 | 2,665 | 32,609 |
| | Intercity bus | 0.0 | 0.1 | 1.5 | 0 | 0 | 8 |
| | Transit bus | 0.1 | 0.0 | 12.1 | 0 | 0 | 66 |
| | School bus | 4.8 | 2.3 | 206.5 | 23 | 13 | 1,126 |
| | Refuse truck | 0.3 | 0.1 | 10.9 | 1 | 1 | 60 |
| | Single unit short-haul truck | 93.1 | 88.0 | 2,416.2 | 530 | 479 | 13,113 |
| | Single unit long-haul truck | 2.7 | 2.3 | 84.6 | 15 | 13 | 459 |
| | Motor home | 12.6 | 4.9 | 256.5 | 90 | 26 | 1,396 |
| | Combination short-haul truck | 1.1 | 0.0 | 56.6 | 0 | 0 | 310 |
| | Combination long-haul truck | 374.7 | 2,030.6 | 891.3 | 1,966 | 10,215 | 4,701 |
| Rural Restricted Access | Motorcycle | 4.9 | 4.8 | 73.1 | 27 | 24 | 382 |
| | Passenger car | 51.8 | 225.5 | 2,150.5 | 300 | 1,255 | 14,357 |
| | Passenger truck | 31.7 | 154.9 | 1,104.4 | 183 | 856 | 7,277 |
| | Light commercial truck | 7.8 | 40.1 | 259.9 | 45 | 222 | 1,714 |
| | Intercity bus | 0.7 | 15.3 | 3.0 | 4 | 77 | 16 |
| | Transit bus | 1.8 | 24.2 | 19.7 | 10 | 125 | 104 |
| | School bus | 3.4 | 37.8 | 18.6 | 18 | 190 | 98 |
| | Refuse truck | 0.7 | 15.4 | 4.2 | 4 | 78 | 22 |
| | Single unit short-haul truck | 16.9 | 153.0 | 196.5 | 92 | 776 | 1,040 |
| | Single unit long-haul truck | 1.0 | 8.2 | 10.6 | 5 | 42 | 56 |
| | Motor home | 0.9 | 5.7 | 16.8 | 5 | 29 | 89 |
| | Combination short-haul truck | 19.1 | 431.8 | 80.5 | 102 | 2,177 | 424 |
| | Combination long-haul truck | 48.4 | 1,172.9 | 214.6 | 257 | 5,913 | 1,129 |
| Rural Unrestricted Access | Motorcycle | 21.6 | 12.8 | 213.8 | 121 | 64 | 1,117 |
| | Passenger car | 165.5 | 502.1 | 4,399.3 | 955 | 2,804 | 29,206 |
| | Passenger truck | 95.8 | 324.1 | 2,208.6 | 551 | 1,796 | 14,436 |
| | Light commercial truck | 25.3 | 90.1 | 561.2 | 146 | 502 | 3,673 |
| | Intercity bus | 0.4 | 6.8 | 1.8 | 2 | 34 | 9 |
| | Transit bus | 1.0 | 9.1 | 7.8 | 5 | 47 | 41 |
| | School bus | 2.0 | 13.9 | 8.1 | 10 | 70 | 43 |
| | Refuse truck | 1.2 | 19.1 | 6.8 | 7 | 96 | 36 |
| | Single unit short-haul truck | 31.1 | 204.3 | 296.7 | 168 | 1,036 | 1,570 |
| | Single unit long-haul truck | 1.7 | 11.1 | 15.6 | 9 | 56 | 82 |
| | Motor home | 1.4 | 6.5 | 20.2 | 8 | 33 | 107 |
| | Combination short-haul truck | 6.6 | 109.2 | 27.1 | 35 | 551 | 142 |
| | Combination long-haul truck | 16.2 | 300.8 | 70.6 | 86 | 1,518 | 371 |

**Table 5.2–1. Annual and ozone season-day onroad mobile source emissions in Maricopa County, by road and source type (continued).**

| Road type | Source type | Annual emissions (tons/year) VOC | NOx | CO | Season-day emissions (lbs/day) VOC | NOx | CO |
|---|---|---|---|---|---|---|---|
| Urban Restricted Access | Motorcycle | 63.0 | 54.0 | 833.5 | 351 | 267 | 4,354 |
| | Passenger car | 812.3 | 3,150.3 | 35,925.7 | 4,693 | 17,530 | 239,761 |
| | Passenger truck | 478.6 | 2,102.2 | 17,539.1 | 2,765 | 11,618 | 115,526 |
| | Light commercial truck | 118.9 | 543.9 | 3,991.9 | 686 | 3,015 | 26,314 |
| | Intercity bus | 2.3 | 43.8 | 9.7 | 12 | 221 | 51 |
| | Transit bus | 6.2 | 71.7 | 61.1 | 33 | 370 | 321 |
| | School bus | 12.0 | 112.9 | 61.9 | 64 | 569 | 328 |
| | Refuse truck | 8.5 | 156.1 | 48.2 | 45 | 787 | 254 |
| | Single unit short-haul truck | 219.9 | 1,776.2 | 2,519.3 | 1,199 | 9,008 | 13,341 |
| | Single unit long-haul truck | 12.5 | 97.7 | 136.9 | 68 | 496 | 725 |
| | Motor home | 11.5 | 62.0 | 203.2 | 65 | 315 | 1,078 |
| | Combination short-haul truck | 41.7 | 811.4 | 173.5 | 222 | 4,091 | 913 |
| | Combination long-haul truck | 103.7 | 2,205.7 | 457.9 | 551 | 11,120 | 2,410 |
| Urban Unrestricted Access | Motorcycle | 173.9 | 72.7 | 1,374.4 | 976 | 360 | 7,181 |
| | Passenger car | 1,580.9 | 4,131.7 | 39,802.3 | 9,115 | 23,151 | 263,742 |
| | Passenger truck | 904.0 | 2,578.9 | 19,594.4 | 5,197 | 14,339 | 127,747 |
| | Light commercial truck | 242.3 | 732.6 | 4,993.0 | 1,392 | 4,111 | 32,588 |
| | Intercity bus | 2.7 | 37.6 | 10.7 | 14 | 190 | 56 |
| | Transit bus | 5.7 | 39.6 | 34.3 | 30 | 204 | 180 |
| | School bus | 11.2 | 68.3 | 38.0 | 60 | 345 | 201 |
| | Refuse truck | 8.7 | 123.1 | 46.1 | 47 | 621 | 243 |
| | Single unit short-haul truck | 232.4 | 1,347.8 | 2,015.6 | 1,261 | 6,830 | 10,666 |
| | Single unit long-haul truck | 12.7 | 73.1 | 102.6 | 69 | 371 | 543 |
| | Motor home | 11.0 | 40.1 | 136.3 | 61 | 203 | 723 |
| | Combination short-haul truck | 27.9 | 412.3 | 106.9 | 148 | 2,081 | 563 |
| | Combination long-haul truck | 67.1 | 1,115.5 | 278.7 | 356 | 5,629 | 1,466 |
| **Summary, all vehicle types:** | | | | | | | |
| | Motorcycle | 610.8 | 147.2 | 2,578.9 | 3,965 | 728 | 13,409 |
| | Passenger car | 11,193.9 | 11,957.3 | 118,229.7 | 70,106 | 65,775 | 729,177 |
| | Passenger truck | 4,831.4 | 6,945.3 | 62,091.8 | 29,429 | 38,214 | 379,627 |
| | Light commercial truck | 1,231.2 | 1,901.2 | 15,942.9 | 7,427 | 10,515 | 96,898 |
| | Intercity bus | 6.1 | 103.6 | 26.7 | 32 | 522 | 140 |
| | Transit bus | 14.8 | 144.6 | 135.0 | 78 | 746 | 712 |
| | School bus | 33.4 | 235.2 | 333.1 | 175 | 1,187 | 1,796 |
| | Refuse truck | 19.4 | 313.8 | 116.2 | 104 | 1,583 | 615 |
| | Single unit short-haul truck | 593.4 | 3,569.3 | 7,444.3 | 3,250 | 18,129 | 39,730 |
| | Single unit long-haul truck | 30.6 | 192.4 | 350.3 | 166 | 978 | 1,865 |
| | Motor home | 37.4 | 119.2 | 633.0 | 229 | 606 | 3,393 |
| | Combination short-haul truck | 96.4 | 1,764.7 | 444.6 | 507 | 8,900 | 2,352 |
| | Combination long-haul truck | 610.1 | 6,825.5 | 1,913.1 | 3,216 | 34,395 | 10,077 |
| | **Totals:** | **19,308.7** | **34,219.1** | **210,239.1** | **118,683** | **182,273** | **1,279,788** |

**Table 5.2–2. Annual and ozone season-day onroad mobile source emissions in the 8-hour ozone nonattainment area, by road and source type.**

| Road type | Source type | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|
| | | VOC | NOx | CO | VOC | NOx | CO |
| Off-Network | Motorcycle | 351.4 | 3.0 | 85.0 | 2,519 | 13 | 380 |
| | Passenger car | 8,638.8 | 3,972.5 | 36,177.6 | 55,399 | 21,167 | 183,254 |
| | Passenger truck | 3,345.1 | 1,797.8 | 21,797.8 | 20,883 | 9,673 | 115,449 |
| | Light commercial truck | 842.9 | 498.0 | 6,180.3 | 5,195 | 2,684 | 32,839 |
| | Intercity bus | 0.0 | 0.1 | 1.5 | 0 | 0 | 8 |
| | Transit bus | 0.1 | 0.0 | 12.2 | 0 | 0 | 67 |
| | School bus | 4.8 | 2.3 | 208.4 | 23 | 13 | 1,136 |
| | Refuse truck | 0.3 | 0.1 | 11.1 | 1 | 1 | 60 |
| | Single unit short-haul truck | 94.1 | 88.9 | 2,442.0 | 536 | 484 | 13,253 |
| | Single unit long-haul truck | 2.8 | 2.3 | 85.5 | 16 | 13 | 464 |
| | Motor home | 12.7 | 4.9 | 258.8 | 90 | 27 | 1,408 |
| | Combination short-haul truck | 1.1 | 0.0 | 57.4 | 0 | 0 | 314 |
| | Combination long-haul truck | 214.0 | 1,157.7 | 533.0 | 1,121 | 5,824 | 2,816 |
| Rural Restricted Access | Motorcycle | 3.6 | 3.5 | 53.0 | 20 | 17 | 277 |
| | Passenger car | 37.6 | 164.2 | 1,590.6 | 217 | 914 | 10,620 |
| | Passenger truck | 23.0 | 112.8 | 814.3 | 133 | 623 | 5,366 |
| | Light commercial truck | 5.6 | 29.1 | 191.2 | 33 | 161 | 1,261 |
| | Intercity bus | 0.4 | 8.8 | 1.7 | 2 | 44 | 9 |
| | Transit bus | 1.0 | 13.9 | 11.3 | 5 | 71 | 60 |
| | School bus | 1.9 | 21.7 | 10.7 | 10 | 109 | 56 |
| | Refuse truck | 0.4 | 9.2 | 2.5 | 2 | 46 | 13 |
| | Single unit short-haul truck | 10.0 | 91.8 | 117.9 | 55 | 466 | 624 |
| | Single unit long-haul truck | 0.6 | 4.9 | 6.3 | 3 | 25 | 34 |
| | Motor home | 0.5 | 3.4 | 10.1 | 3 | 17 | 54 |
| | Combination short-haul truck | 10.9 | 246.5 | 45.8 | 58 | 1,243 | 241 |
| | Combination long-haul truck | 27.6 | 669.7 | 122.1 | 146 | 3,376 | 642 |
| Rural Unrestricted Access | Motorcycle | 19.6 | 11.7 | 194.3 | 110 | 58 | 1,015 |
| | Passenger car | 149.5 | 452.9 | 3,974.1 | 862 | 2,529 | 26,384 |
| | Passenger truck | 86.5 | 292.4 | 1,995.3 | 498 | 1,620 | 13,043 |
| | Light commercial truck | 22.9 | 81.3 | 507.0 | 132 | 453 | 3,318 |
| | Intercity bus | 0.4 | 5.5 | 1.4 | 2 | 28 | 7 |
| | Transit bus | 0.8 | 7.4 | 6.3 | 4 | 38 | 33 |
| | School bus | 1.6 | 11.2 | 6.5 | 8 | 57 | 34 |
| | Refuse truck | 1.1 | 16.4 | 5.8 | 6 | 83 | 31 |
| | Single unit short-haul truck | 26.6 | 175.0 | 254.3 | 144 | 888 | 1,345 |
| | Single unit long-haul truck | 1.5 | 9.5 | 13.3 | 8 | 48 | 71 |
| | Motor home | 1.2 | 5.5 | 17.3 | 7 | 28 | 92 |
| | Combination short-haul truck | 5.3 | 87.8 | 21.7 | 28 | 443 | 114 |
| | Combination long-haul truck | 13.0 | 242.2 | 56.8 | 69 | 1,222 | 299 |

**Table 5.2–2. Annual and ozone season-day onroad mobile source emissions in the 8-hour ozone nonattainment area, by road and source type (continued).**

| Road type | Source type | Annual emissions (tons/year) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|---|
| | | VOC | NOx | CO | VOC | NOx | CO |
| Urban Restricted Access | Motorcycle | 63.3 | 54.2 | 837.6 | 353 | 268 | 4,376 |
| | Passenger car | 816.7 | 3,168.2 | 36,195.1 | 4,719 | 17,629 | 241,560 |
| | Passenger truck | 481.5 | 2,115.5 | 17,677.4 | 2,782 | 11,692 | 116,437 |
| | Light commercial truck | 119.6 | 547.2 | 4,022.1 | 690 | 3,033 | 26,513 |
| | Intercity bus | 2.3 | 43.9 | 9.7 | 12 | 221 | 51 |
| | Transit bus | 6.3 | 71.8 | 61.2 | 33 | 370 | 322 |
| | School bus | 12.0 | 113.2 | 62.0 | 64 | 571 | 328 |
| | Refuse truck | 8.5 | 157.2 | 48.6 | 46 | 793 | 256 |
| | Single unit short-haul truck | 220.8 | 1,784.0 | 2,530.7 | 1,204 | 9,048 | 13,401 |
| | Single unit long-haul truck | 12.5 | 98.1 | 137.6 | 69 | 498 | 728 |
| | Motor home | 11.6 | 62.2 | 203.9 | 65 | 316 | 1,082 |
| | Combination short-haul truck | 41.7 | 812.2 | 173.6 | 222 | 4,095 | 914 |
| | Combination long-haul truck | 103.9 | 2,208.8 | 458.5 | 552 | 11,136 | 2,412 |
| Urban Unrestricted Access | Motorcycle | 175.1 | 73.3 | 1,384.5 | 982 | 363 | 7,234 |
| | Passenger car | 1,590.7 | 4,159.3 | 40,053.3 | 9,172 | 23,305 | 265,408 |
| | Passenger truck | 910.4 | 2,598.5 | 19,735.2 | 5,233 | 14,447 | 128,667 |
| | Light commercial truck | 244.1 | 738.1 | 5,029.0 | 1,402 | 4,142 | 32,824 |
| | Intercity bus | 2.7 | 37.7 | 10.7 | 14 | 190 | 56 |
| | Transit bus | 5.7 | 39.7 | 34.4 | 30 | 205 | 181 |
| | School bus | 11.3 | 68.5 | 38.1 | 60 | 346 | 201 |
| | Refuse truck | 8.8 | 124.0 | 46.4 | 47 | 626 | 245 |
| | Single unit short-haul truck | 233.3 | 1,353.1 | 2,023.5 | 1,266 | 6,857 | 10,708 |
| | Single unit long-haul truck | 12.7 | 73.4 | 103.0 | 69 | 372 | 545 |
| | Motor home | 11.0 | 40.2 | 136.6 | 61 | 204 | 725 |
| | Combination short-haul truck | 27.9 | 413.4 | 107.2 | 148 | 2,086 | 564 |
| | Combination long-haul truck | 67.3 | 1,119.1 | 279.6 | 357 | 5,647 | 1,471 |
| **Summary, all road types:** | | | | | | | |
| | Motorcycle | 613.0 | 145.7 | 2,554.4 | 3,984 | 719 | 13,282 |
| | Passenger car | 11,233.3 | 11,917.1 | 117,990.7 | 70,369 | 65,544 | 727,226 |
| | Passenger truck | 4,846.5 | 6,917.0 | 62,020.0 | 29,529 | 38,055 | 378,962 |
| | Light commercial truck | 1,235.1 | 1,893.7 | 15,929.6 | 7,452 | 10,473 | 96,755 |
| | Intercity bus | 5.8 | 96.0 | 25.0 | 30 | 483 | 131 |
| | Transit bus | 13.9 | 132.8 | 125.4 | 72 | 684 | 663 |
| | School bus | 31.6 | 216.9 | 325.7 | 165 | 1,096 | 1,755 |
| | Refuse truck | 19.1 | 306.9 | 114.4 | 102 | 1,549 | 605 |
| | Single unit short-haul truck | 584.8 | 3,492.8 | 7,368.4 | 3,205 | 17,743 | 39,331 |
| | Single unit long-haul truck | 30.1 | 188.2 | 345.7 | 165 | 956 | 1,842 |
| | Motor home | 37.0 | 116.2 | 626.7 | 226 | 592 | 3,361 |
| | Combination short-haul truck | 86.9 | 1,559.9 | 405.7 | 456 | 7,867 | 2,147 |
| | Combination long-haul truck | 425.8 | 5,397.5 | 1,450.0 | 2,245 | 27,205 | 7,640 |
| | **Totals:** | **19,162.9** | **32,380.6** | **209,281.7** | **117,999** | **172,963** | **1,273,697** |

## 5.3 Quality assurance process

### *5.3.1 VMT estimates*

Normal quality assurance procedures, including automated and manual consistency checks, were conducted by MAG in developing the 2014 TransCAD traffic assignment network used to generate the VMT data. The VMT estimates using the MAG travel demand model have been validated by the MAG transportation modeling group.

### *5.3.2 Emission estimates*

The quality assurance process performed on the MOVES2014a 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.

### *5.3.3 Draft emissions inventory for ozone precursors*

The draft onroad mobile source portion of the 2014 periodic emissions inventory for ozone precursors 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.

## 5.4 Summary of all onroad mobile source emissions

Tables 5.4–1 and 5.4–2 summarize annual and season-day onroad mobile source emissions, by road type, for Maricopa County and the 8-hour ozone nonattainment area, respectively.

**Table 5.4–1. Annual and ozone season-day onroad mobile source emissions in Maricopa County, by road type.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Road type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Off-network | 13,578.2 | 8,358.6 | 67,754.4 | 86,049 | 44,064 | 350,974 |
| Rural restricted access | 189.0 | 2,289.5 | 4,152.3 | 1,051 | 11,762 | 26,707 |
| Rural unrestricted access | 369.8 | 1,609.9 | 7,837.3 | 2,104 | 8,607 | 50,833 |
| Urban restricted access | 1,891.1 | 11,187.9 | 61,961.9 | 10,754 | 59,405 | 405,375 |
| Urban unrestricted access | 3,280.6 | 10,773.3 | 68,533.2 | 18,726 | 58,434 | 445,899 |
| **Totals:** | **19,308.7** | **34,219.1** | **210,239.1** | **118,683** | **182,273** | **1,279,788** |

**Table 5.4–2. Annual and ozone season-day onroad mobile source emissions in the 8-hour ozone nonattainment area, by road type.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Road type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Off-network | 13,508.0 | 7,527.6 | 67,850.7 | 85,782 | 39,898 | 351,449 |
| Rural restricted access | 123.1 | 1,379.5 | 2,977.5 | 688 | 7,113 | 19,256 |
| Rural unrestricted access | 329.9 | 1,398.8 | 7,054.2 | 1,878 | 7,494 | 45,785 |
| Urban restricted access | 1,900.6 | 11,236.5 | 62,417.8 | 10,809 | 59,669 | 408,380 |
| Urban unrestricted access | 3,301.0 | 10,838.3 | 68,981.5 | 18,842 | 58,790 | 448,827 |
| Totals: | **19,162.5** | **32,380.6** | **209,281.7** | **117,999** | **172,963** | **1,273,697** |

Likewise, Tables 5.4–3 and 5.4–4 also summarize annual and season-day emissions from onroad mobile sources, by vehicle type.

**Table 5.4–3. Annual and ozone season-day onroad mobile source emissions in Maricopa County, by vehicle type.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Vehicle type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Motorcycle | 610.7 | 147.3 | 2,578.9 | 3,965 | 726 | 13,410 |
| Passenger car | 11,194.1 | 11,957.3 | 118,229.7 | 70,106 | 65,775 | 729,177 |
| Passenger truck | 4,831.3 | 6,945.3 | 62,091.7 | 29,429 | 38,214 | 379,627 |
| Light commercial truck | 1,231.2 | 1,901.2 | 15,942.8 | 7,427 | 10,514 | 96,897 |
| Intercity bus | 6.1 | 103.6 | 26.6 | 32 | 523 | 140 |
| Transit bus | 14.8 | 144.6 | 134.9 | 78 | 745 | 712 |
| School bus | 33.3 | 235.2 | 333.1 | 175 | 1,187 | 1,795 |
| Refuse truck | 19.4 | 313.7 | 116.2 | 104 | 1,583 | 615 |
| Single unit short-haul truck | 593.3 | 3,569.3 | 7,444.3 | 3,251 | 18,129 | 39,730 |
| Single unit long-haul truck | 30.5 | 192.4 | 350.2 | 167 | 977 | 1,865 |
| Motor home | 37.4 | 119.1 | 633.1 | 228 | 606 | 3,393 |
| Combination short-haul truck | 96.4 | 1,764.7 | 444.6 | 507 | 8,899 | 2,351 |
| Combination long-haul truck | 610.1 | 6,825.6 | 1,913.2 | 3,216 | 34,395 | 10,077 |
| **Totals:** | **19,308.7** | **34,219.1** | **210,239.1** | **118,683** | **182,273** | **1,279,788** |

**Table 5.4–4. Annual and ozone season-day onroad mobile source emissions in the 8-hour ozone nonattainment area, by vehicle type.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Vehicle type** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Motorcycle | 612.9 | 145.6 | 2,554.4 | 3,983 | 718 | 13,281 |
| Passenger car | 11,233.3 | 11,917.0 | 117,990.7 | 70,369 | 65,544 | 727,225 |
| Passenger truck | 4,846.5 | 6,916.9 | 62,020.0 | 29,529 | 38,055 | 378,962 |
| Light commercial truck | 1,235.1 | 1,893.8 | 15,929.7 | 7,452 | 10,473 | 96,755 |
| Intercity bus | 5.8 | 95.9 | 25.0 | 30 | 484 | 132 |
| Transit bus | 13.8 | 132.8 | 125.3 | 73 | 684 | 662 |
| School bus | 31.6 | 217.0 | 325.8 | 165 | 1,095 | 1,756 |
| Refuse truck | 19.1 | 306.9 | 114.3 | 102 | 1,549 | 605 |
| Single unit short-haul truck | 584.8 | 3,492.9 | 7,368.4 | 3,205 | 17,742 | 39,332 |
| Single unit long-haul truck | 30.0 | 188.3 | 345.7 | 165 | 956 | 1,841 |
| Motor home | 37.0 | 116.2 | 626.7 | 226 | 591 | 3,360 |
| Combination short-haul truck | 86.9 | 1,560.0 | 405.7 | 456 | 7,867 | 2,147 |
| Combination long-haul truck | 425.7 | 5,397.5 | 1,450.0 | 2,245 | 27,205 | 7,640 |
| **Totals:** | **19,162.5** | **32,380.6** | **209,281.7** | **117,999** | **172,963** | **1,273,697** |

Table 5.4–5 summarizes the annual and ozone season-day emissions for VOC, $NO_x$, and CO from all onroad mobile sources in Maricopa County and the 8-hour ozone nonattainment area in 2014.

**Table 5.4–5. Annual and ozone season-day emissions from all onroad mobile sources in Maricopa County and the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 19,308.7 | 34,219.1 | 210,239.1 | 118,683 | 182,273 | 1,279,788 |
| 8-hr ozone NAA | 19,162.5 | 32,380.6 | 209,281.7 | 117,999 | 172,963 | 1,273,697 |

## 5.5 References


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# 6. Biogenic Sources

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## 6.1 Introduction

Biogenic emissions have been estimated for the 2014 Periodic Emissions Inventory (PEI) for ozone precursors in Maricopa County and the 8-hour ozone nonattainment area (NAA) 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 important corrections and improvements were made in the latest version of MEGAN2.1 (Jiang et al., 2011; Guenther et al., 2012) compared to its previous versions (Guenther, 2006a, 2006b, and 2007; Guenther et al., 2006). Volatile organic compounds (VOC), carbon monoxide (CO), and nitrogen oxides ($NO_x$) emissions are reported in the ozone precursor emission inventory.

In an effort to improve biogenic emission estimates, the methodology used to calculate biogenic emissions for the 2014 PEI has been updated from the methodology in the 2011 PEI. In the 2014 PEI, Weather Research and Forecasting Model (WRF) meteorology input data were generated using reanalysis data based on observational data from multiple weather stations. WRF data are hour-by-hour for the entire year of 2014 and spatially gridded using a 4km × 4km resolution with 56 × 44 grid cells. The 365 day-specific gridded biogenic emissions at each grid cell were calculated by MEGAN based on WRF meteorology data. These gridded emissions were summed together to calculate monthly and annual total emissions.

In contrast, meteorology data measured at the Southwest Solar Research Park were applied to all grid cells of the modeling domain in the 2011 PEI. The biogenic emissions were estimated for one representative day of each month using the monthly average diurnal cycle of the meteorological data at the site. The daily emissions were then multiplied by the number of days for each month to calculate the monthly total emissions. The monthly total emissions were summed together for annual emissions.

The methodology used in the 2011 PEI limited a realistic representation of the natural meteorological variability, and thereby reduced the overall biogenic emission magnitudes. Since daily biogenic emissions have a large range of temporal and spatial variability depending on the day-to-day weather conditions, the use of more dynamic values provided by the WRF meteorology resulted in a large increase in the monthly and annual biogenic emissions in the 2014 PEI.

For example, daily biogenic VOC emissions in June 2014 ranged from 905 to 1,369 tons per day in Maricopa County using day-to-day gridded WRF meteorology and totaled 36,382 tons for the entire month of June in the 2014 PEI. The biogenic VOC emissions for a representative day in June 2011 in the 2011 PEI were estimated at 498 tons per day in Maricopa County using monthly average meteorology data applied to all grid cells, and were multiplied by 30 days to estimate a total of 14,947 tons for the entire month of June. Since the 2011 PEI depended on the time- and space-averaged meteorological assumptions, the emissions total for a typical day was effectively smoothed to a value lower than the day-to-day range achievable with the more representative gridded data available to the 2014 PEI. As a result, the monthly and annual VOC emissions in the 2014 PEI are approximately two times larger than those in the 2011 PEI.

## 6.2 Modeling domain

MEGAN inputs and outputs are based on the user-defined two-dimensional grid cells. A 4-km grid modeling domain covering the entire area of Maricopa County and portions of neighboring counties are employed to develop biogenic emissions with MEGAN. The target areas for the development of biogenic emissions are the 8-hour ozone nonattainment area and Maricopa County within the 4-km domain. The modeling domain is defined with a Lambert Conformal Conic Projection (LCP) coordinate system presented in Table 6.2–1. Additional input files that mask areas covered by the 8-hour ozone nonattainment area and Maricopa County are developed by using Geographic Information Systems (GIS) software to calculate emissions for those two target areas. 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 (e.g., boundaries of Maricopa County or the 8-hour ozone nonattainment area), and 0.0 for grid cells outside the target area. As shown in Figure 6.2–1, biogenic emissions for the nonattainment area and Maricopa County are extracted from MEGAN simulations using the masked grid cells in the 4-km modeling domain.

**Table 6.2–1. The modeling domain defined in the LCP coordinate system.**

| Grid horizontal resolution | Grid size | LCP range (km) | Target area |
|---|---|---|---|
| 4 km | 56 × 44 | (32.4989, –113.3869) to (34.07317, –111.0435) | 8-hour ozone NAA and Maricopa County |

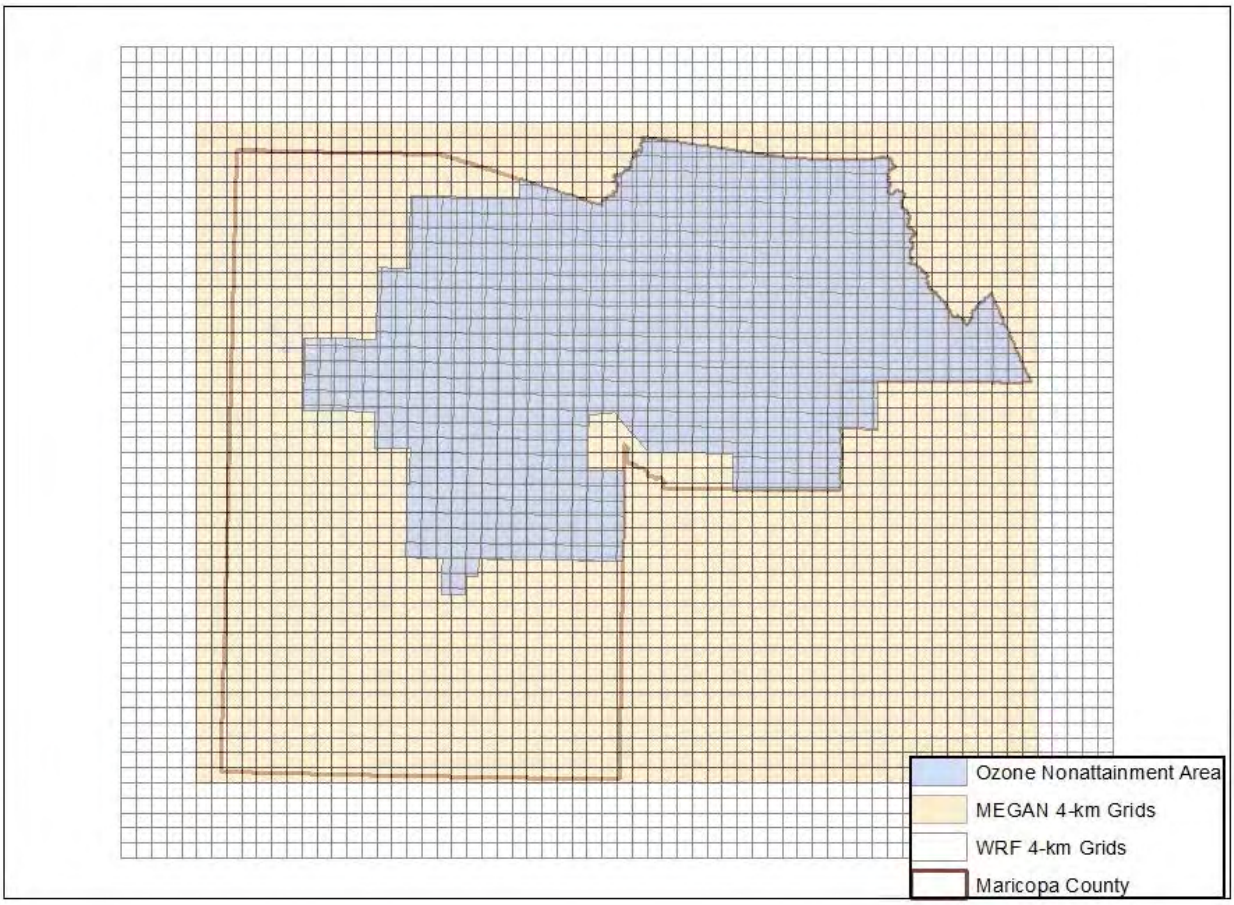


**Figure 6.2–1. The masked grid cells in the 4-km modeling domain.**

## 6.3 Input data

MEGAN requires that both land cover data and meteorological data be prepared as inputs to calculate biogenic emissions.

### *6.3.1 Land cover data*

Land cover datasets released with MEGAN v2.1 include eight-day average leaf area index (LAI), percentages of 16 plant functional types (PFT), and emission factors (EF). The LAI data are based on a resolution of 30 arc-seconds (approximately 1 km) dataset from the North America Leaf Index (version 2011); the PFT data are 30 arc-seconds resolution from the North America Plant Functional Type (version 2011); and the EF data are from a 30 arc-seconds resolution global emission factor dataset.

### *6.3.2 Meteorological data*

Meteorological data are obtained from WRF version 3.7 model runs after processing by the Meteorology-Chemistry Interface Processor (MCIP). The output of MCIP is then used as input to MET2MEG, a component program of MEGAN to generate meteorological input data for the biogenic emission model. The MET2MEG outputs include photosynthetically active radiation (PAR) at the surface, air temperature at 2 meters above surface, air pressure, humidity, wind speed, top-layer soil moisture and temperature, and accumulated precipitation for each hour.

Biogenic emissions of VOC and CO are mainly affected by temperature and solar radiation. Isoprene (a specific VOC) emissions are also dependent upon soil moisture. NOx emissions from soils depend upon soil temperature and water-filled pore space, which are determined by soil types and precipitation. Wind speed and humidity influence leaf temperature. Figure 6.3–1 shows daily mean air temperature, PAR, wind speed, air pressure, water vapor mixing ratio, 24-hour accumulated precipitation, and surface soil moisture and temperature. The highest daily mean temperature was recorded in July, while the maximum daily average PAR was observed in June, indicating the peak daily mean temperature occurred one month after the highest radiation.

In order to examine the reliability of WRF model results, temperature, the water vapor mixing ratio, wind speed, and solar radiation were validated using hourly observational datasets from the National Weather Service (NWS; DS472.0) and the Arizona Meteorological Network (AZMET) stations. There are 12 NWS stations and 13 AZMET stations within the 4-km grid modeling domain. The model validation results are illustrated in Figure 6.3–2. The temperature and water vapor mixing ratio are well replicated with coefficients of determination ($R^2$) of 0.97 and 0.89, respectively. The positive bias of solar radiation indicates the overestimation of PAR and solar radiation by WRF, likely due to inaccurately modeled cloud data.

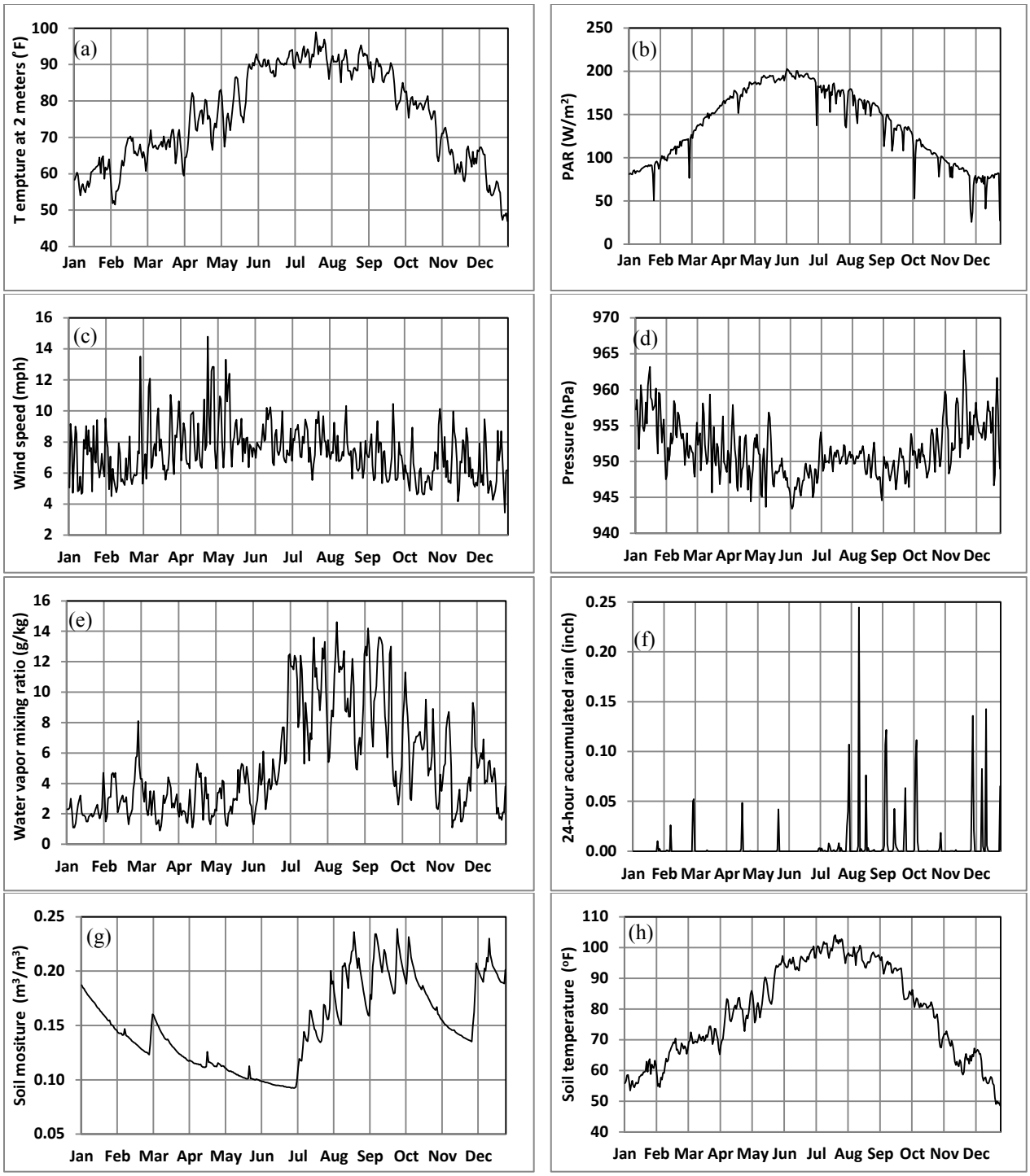


**Figure 6.3–1. Daily averages of meteorological variables derived from WRF simulations for 2014. (a) air temperature at 2-m height, (b) PAR, (c) wind speed, (d) air pressure, (e) water vapor mixing ratio, (f) 24-hour accumulated precipitation, (g) soil moisture, and (h) soil temperature.**

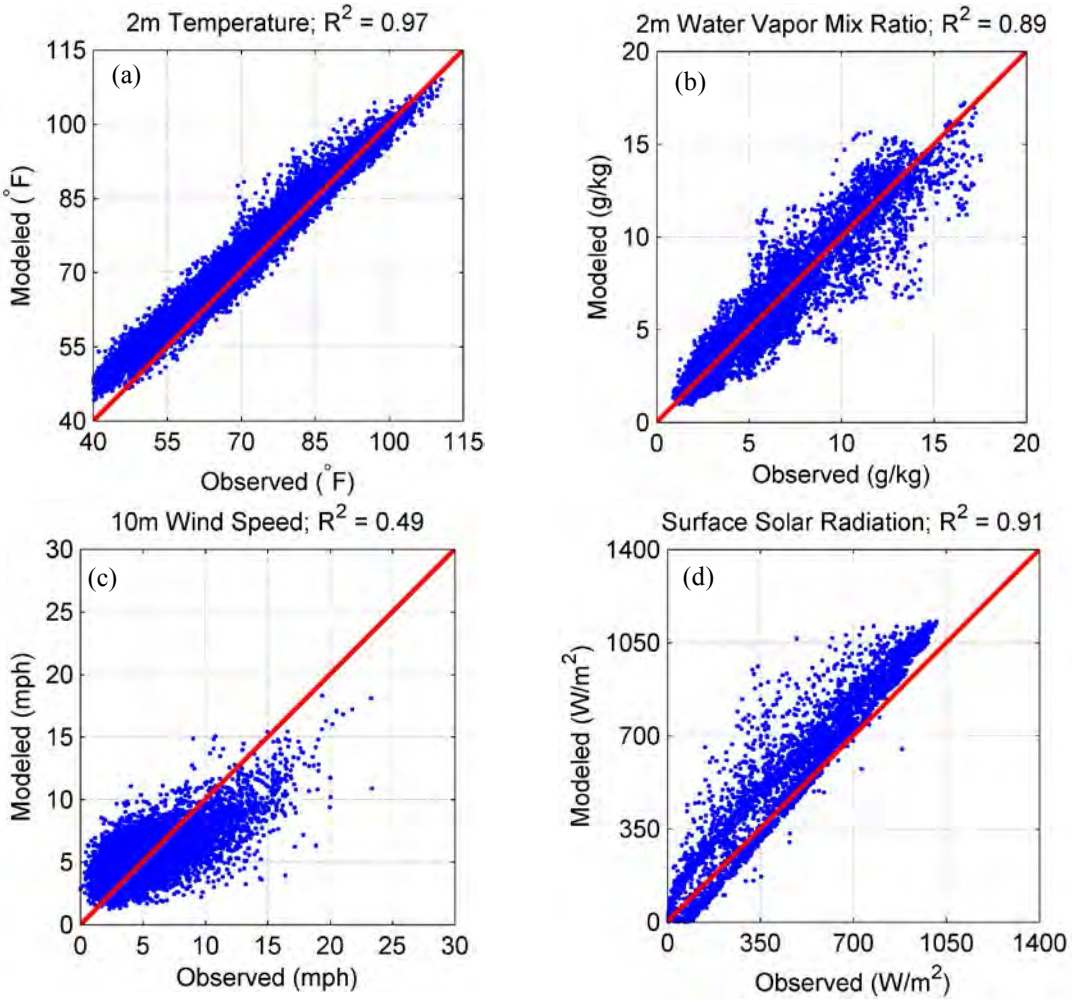


**Figure 6.3–2. Validation results of WRF model simulations using hourly observational data from NWS and AZMET: (a) air temperature at 2-m height, (b) water vapor mixing ratio, (c) wind speed, and (d) surface solar radiation. Results are based on paired hourly modeled and observed data for all of 2014. $R^2$ = coefficient of determination.**

## 6.4 Emission estimation

Daily average emissions for each month in 2014 are provided in Table 6.4–1 for the 8-hour ozone nonattainment area and Maricopa County. Daily average emissions in 2014 (left panel) and diurnal emission cycles (right panel) of ozone precursors (VOC, $NO_x$, and CO) for Maricopa County and the 8-hour ozone nonattainment area are illustrated in Figure 6.4–1. Monthly biogenic emissions for the 8-hour ozone nonattainment area and Maricopa County are presented in Table 6.4–2. The maximum emissions occurred the ozone season (June–August), as temperature and solar radiation reached their highest levels during these summer months.

**Table 6.4–1. Average daily biogenic emissions (lbs/day) for Maricopa County and the 8-hour ozone nonattainment area, by month.**

| | Maricopa County | | | 8-hour ozone NAA | | |
|---|---|---|---|---|---|---|
| **Month** | **VOC** | **$NO_X$** | **CO** | **VOC** | **$NO_X$** | **CO** |
| January | 123,683 | 1,068 | 11,735 | 66,808 | 621 | 6,544 |
| February | 284,837 | 2,147 | 29,906 | 152,442 | 1,248 | 16,531 |
| March | 445,427 | 3,021 | 52,792 | 246,449 | 1,816 | 30,112 |
| April | 664,032 | 3,905 | 84,399 | 358,515 | 2,311 | 47,388 |
| May | 1,327,969 | 6,425 | 169,625 | 741,132 | 3,900 | 97,962 |
| June | 2,425,520 | 10,360 | 309,840 | 1,338,130 | 6,243 | 178,099 |
| July | 2,715,657 | 12,531 | 342,128 | 1,541,904 | 7,637 | 201,635 |
| August | 1,999,716 | 10,813 | 248,697 | 1,083,019 | 6,425 | 140,580 |
| September | 1,388,472 | 8,297 | 168,139 | 716,631 | 4,811 | 91,042 |
| October | 606,096 | 4,021 | 68,960 | 310,059 | 2,230 | 36,916 |
| November | 173,151 | 1,166 | 17,788 | 90,108 | 655 | 9,592 |
| December | 91,809 | 954 | 7,886 | 50,424 | 558 | 4,398 |

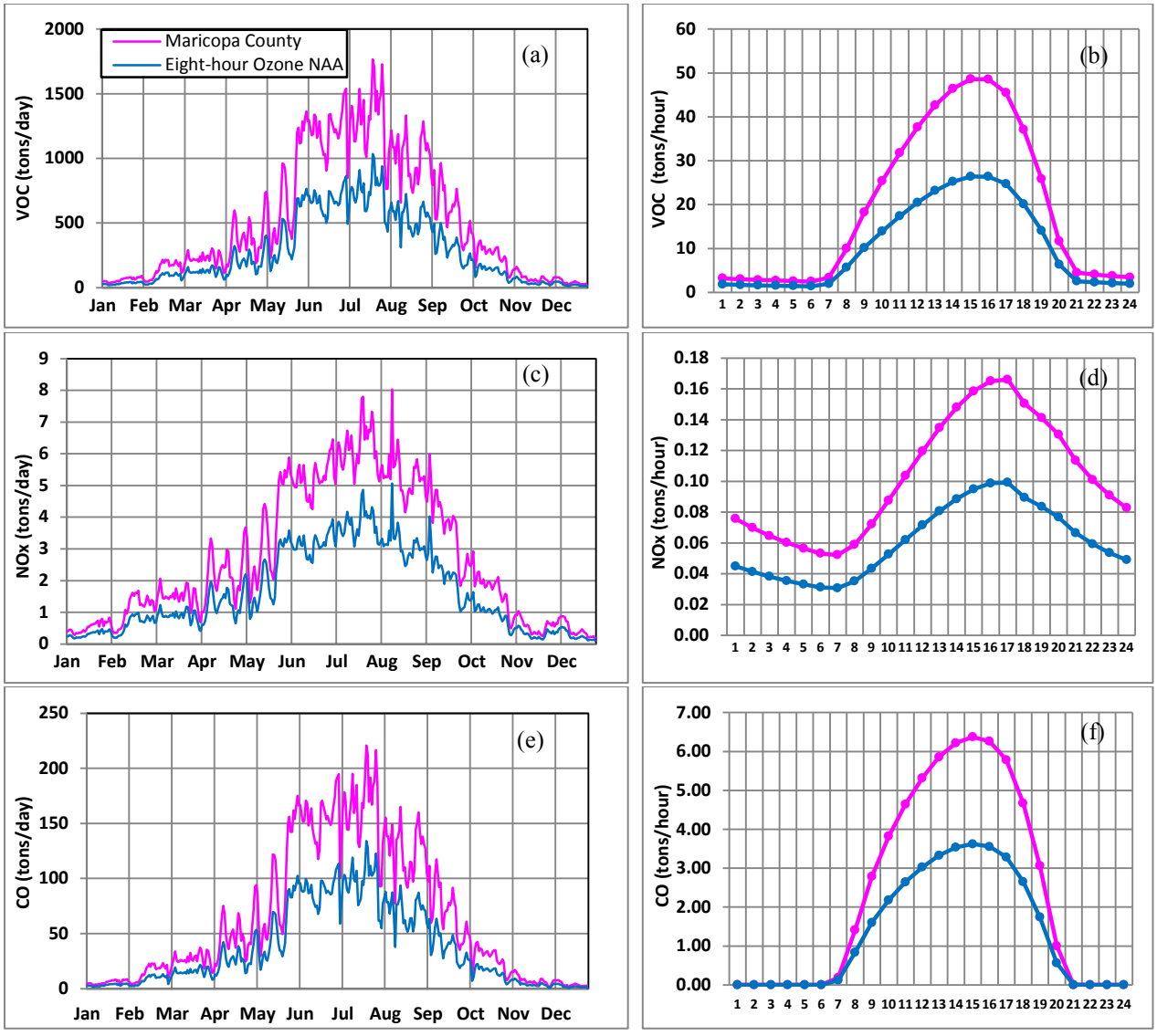


**Figure 6.4–1. Average daily biogenic emissions, by month (left) and annual diurnal emission cycle (right) of VOC (top), $NO_x$ (center), and CO (bottom), for both Maricopa County (pink line) and the 8-hour ozone nonattainment area (blue line).**

**Table 6.4–2. Biogenic emissions (tons/month) for Maricopa County in 2014 for Maricopa County and the 8-hour ozone nonattainment area, by month.**

| | Maricopa County | | | 8-hour ozone NAA | | |
|---|---|---|---|---|---|---|
| **Month** | **VOC** | **$NO_X$** | **CO** | **VOC** | **$NO_X$** | **CO** |
| January | 1,917.1 | 16.6 | 181.9 | 1,035.5 | 9.6 | 101.4 |
| February | 3,987.7 | 30.1 | 418.7 | 2,134.2 | 17.5 | 231.4 |
| March | 6,904.1 | 46.8 | 818.3 | 3,820.0 | 28.1 | 466.7 |
| April | 9,960.5 | 58.6 | 1,266.0 | 5,377.7 | 34.7 | 710.8 |
| May | 20,583.5 | 99.6 | 2,629.2 | 11,487.5 | 60.4 | 1,518.4 |
| June | 36,382.8 | 155.4 | 4,647.6 | 20,072.0 | 93.7 | 2,671.5 |
| July | 42,092.7 | 194.2 | 5,303.0 | 23,899.5 | 118.4 | 3,125.3 |
| August | 30,995.6 | 167.6 | 3,854.8 | 16,786.8 | 99.6 | 2,179.0 |
| September | 20,827.1 | 124.5 | 2,522.1 | 10,749.5 | 72.2 | 1,365.6 |
| October | 9,394.5 | 62.3 | 1,068.9 | 4,805.9 | 34.6 | 572.2 |
| November | 2,597.3 | 17.5 | 266.8 | 1,351.6 | 9.8 | 143.9 |
| December | 1,423.1 | 14.8 | 122.2 | 781.6 | 8.6 | 68.2 |
| **Totals:** | **187,065.9** | **987.9** | **23,099.4** | **102,301.8** | **587.2** | **13,154.5** |

## 6.5 Summary of all biogenic source emissions

Annual and ozone season-day (June–August) emissions from biogenic sources for both Maricopa County and the 8-hour ozone nonattainment area are provided in Table 6.5–1.

**Table 6.5–1. Annual and season-day biogenic emissions for Maricopa County and the 8-hour ozone nonattainment area.**

| | Annual emissions (tons/yr) | | | Season-day emissions (lbs/day) | | |
|---|---|---|---|---|---|---|
| **Geographic area** | **VOC** | **$NO_x$** | **CO** | **VOC** | **$NO_x$** | **CO** |
| Maricopa County | 187,065.9 | 987.9 | 23,099.4 | 2,380,298 | 11,235 | 300,222 |
| 8-hr ozone NAA | 102,301.8 | 587.2 | 13,154.5 | 1,321,018 | 6,768 | 173,438 |

## 6.6 References


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

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. B., Jiang, X., Heald, C. L., Sakulyanontvittaya, T., Duhl, T., Emmons, L. K., and Wang, X., 2012. The Model of Emissions of Gases and Aerosols from Nature version 2.1 (MEGAN2.1): an extended and updated framework for modeling biogenic emissions, *Geosci. Model Dev.*, 5, 1471–1492, doi:10.5194/gmd-5-1471-2012.

Jiang, X., A. Guenther, T. Duhl, and T. Sakulyanontvittaya, 2011. MEGAN version 2.10 User's Guide. NCAR Earth Systems Laboratory, Atmosperhic Chemistry Division. www.acom.ucar.edu/webt/MEGAN/MEGAN2.1_User_Guide_05-07-2012.pdf

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**Appendix A. Instructions for Reporting 2014 Annual Air Pollution Emissions**

Maricopa County
Air Quality Department

# INSTRUCTIONS

## FOR REPORTING 2014

## ANNUAL AIR POLLUTION EMISSIONS

revised
**January 2015**

**Emissions Inventory Unit**
**1001 North Central Avenue, Suite 125**
**Phoenix, Arizona 85004**

**Phone: (602) 506-6790**
**Fax: (602) 506-6179**
**Email: *EmisInv@mail.maricopa.gov***

**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***

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**APPENDIX. List of Valid Control Device Codes for 2014**

# WHAT'S NEW FOR 2014?

**Emission factors, codes, etc.:**

- U.S. EPA has revised (i.e., retired, replaced, and/or combined) many **Control Device Codes**. If you report control devices please verify the current "Control Type Code" (col. 4 on the Control Device Form) to ensure that your control equipment has been properly (re)assigned. For your convenience, we have included a complete 2-page list of all currently valid Control Device Codes as an appendix to this document.

- We have standardized the reporting of several types of **$PM_{10}$-generating processes** that use watering to reduce emissions (e.g., unpaved road travel, stockpiles, and certain activities at sand/gravel operations and concrete batch plants). For those processes that use an emission factor that already incorporates this control measure (i.e., **"Controlled EF?"** is "**Y**" in Col. 18 on the General Process Form), values for capture and control efficiencies are no longer pre-printed, to avoid double-counting the emission reductions achieved by watering.

- The $PM_{10}$ emission factor for **certain crematory processes** has been updated (from 0.8 lb/ton to 5.92 lb/ton) to reflect current EPA guidance, and to be consistent with the values that MCAQD uses to establish emission limits when issuing permits.

**Reporting forms:**

- Some **preprinted information** on your report may be different from last year's version. Please review the enclosed forms carefully, and **VERIFY THOROUGHLY that the information you provide on all reporting forms match the information presented on the preprinted forms from MCAQD.**

- Many of our reporting forms have changed in past years. If you develop 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.

**Miscellaneous:**

- **Non-operational facilities**: Any facility that has been issued an air quality permit, but that did NOT operate at any time during 2014, must still respond in writing to this request for annual emissions information, as a condition of its air quality permit. Please provide ALL information requested on both the "Business Form" and the "Data Certification Form", and submit these forms, along with a letter certifying that there were no operations at the facility during calendar year 2014, by the due date shown on the Business Form.
- **Emissions fees for Title V facilities:** In accordance with Maricopa County Air Pollution Control Rule 280 (Fees), the 2014 annual emission fee for Title V sources is $42.21/ton. **NOTE:** Only emissions from 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 2014 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 those major sources with a **Title V** permit are required to pay annual emissions fees, and thus 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:

Maricopa County Air Quality Department
Emissions Inventory Unit
1001 North Central Avenue, Suite 125
Phoenix, AZ 85004

## 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, not 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 ***or***
(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 VOC.

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 described in Arizona Revised Statutes and Maricopa County Rules. Applicable excerpts concerning confidentiality of data are reproduced below.

**A.R.S. § 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.

***NOTE: No data can be held confidential without proper justification.*** We will reply in writing to all requests for confidentiality, detailing which individual data elements for each process have been deemed confidential.

## 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 Business Assistance Program at (602) 506-5102 or the Engineering & Permitting Division at (602) 506-6094 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 call (602) 506-6790, or visit our web site at:
http://www.maricopa.gov/aq/divisions/planning_analysis/emissions_inventory/Default.aspx

- 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 or email at EmisInv@mail.maricopa.gov.

## 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:*** Making a change on the Business Form will **NOT** transfer the permit ownership or location. You must contact the Department's Business Assistance Program at (602) 506-5102 or the Engineering & Permitting Division at (602) 506-6094 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.

11 Who should receive the Annual Emissions Inventory Form next year?: This should be a person who is directly employed with the business. This person should not be a consultant for the business.

## ***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: N33.5277 Long: W112.2626*** |
| ***2*** | ***V*** | ***14*** ft | ***200*** $^{o}$F | | ***19,186*** | ***40*** | | | ***thermal oxidizer, Bldg. 2 Lat:N33.5259 Long:W112.2613*** |

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

** 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 | ***217*** | ***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 except 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 Process ID: A number (up to three digits) that is preprinted or you assign. (See "Assigning Identification Numbers" on page 6.) This Process ID number is unique and can not be used for any other process at this location.

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

3 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.

4 Process Tier Code and
5 SCC Code:
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 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 total annual activity occurred in January, February and December 2014. The total for all four seasons must equal 100%.

7 Normal Operating Schedule and
8 Typical Hours of Operation:
These reflect the normal daily, weekly, and annual operating parameters of ***this process*** during 2014.

9 Emissions Based on: 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 Used, Produced or Existing: 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 Annual Amount: The annual amount (a number) of material that was used, fuel combusted, product produced, hours of operation, vehicle miles traveled, or acres.

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

13 Unit of Measure: 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 Unit Conversion Factor: 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.

## ***General Process Form*** Instructions (continued)

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* 2014

# 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 20 % Mar-May 25 % Jun-Aug 30 % 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-** [X] 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* **2014**

# 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 | | 90 | 6 | 2400 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 2014. 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 are unique and 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 information on the type 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 Pounds of pollutant sent off-site: 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 Capture % Efficiency: The percent of the pollutant from this process that is captured and sent to the control device.

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

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

Code: Select the Control Efficiency Reference Code from the list at the bottom of the form.

15 Estimated Emissions (lbs/yr): 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:

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

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

*Emissions with off-site recycling/disposal **and** controls:*
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* 2014

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* | *Toro-Red Paint* | *707* | *gl* | *VOC* | *7.0* | *gal* | | % | | % | | *4,949* |
| *803* | *1* | *Toro-Red Paint* | *707* | *gl* | *HAP&NON* | *0.5* | *gal* | | % | | % | | *354* |
| *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* 2014

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* 2014

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.)

2) What was the quantity of this waste stream in 2014? 2,400 *Check one:* ☐ pounds ☒ gallons
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 | 2014 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* 2014

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 2014 Annual Emissions: | (1) Totals from Process Forms | (2) + Accidental Releases | (3) = TOTAL 2014 Emissions |
|---|---|---|---|
| CO | ***2,113*** | ***0*** | ***2,113*** |
| $NH_x$ | ***0*** | ***0*** | ***0*** |
| Lead | ***0*** | ***0*** | ***0*** |
| HAP&NON | ***354*** | ***0*** | ***354*** |
| VOC | ***24,220*** | ***0*** | ***24,220*** |
| $NO_x$ | ***9,815*** | ***0*** | ***9,815*** |
| $SO_x$ | ***645*** | ***0*** | ***645*** |
| $PM_{10}$ | ***3,091*** | ***0*** | ***3,091*** |

***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 Dept., Emissions Inventory Unit,1001 North Central Avenue, Suite 125, Phoenix, AZ 85004.
- 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 |
| 30300834 | Industrial Processes | Primary Metal Production | Iron Production | Paved Road Travel |
| 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 |
| 30502012 | 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 **$42.21**, and enter the result on line 8. This is your 2014 emission fee.

# EXAMPLE (for Title V sources only)

## *Data Certification/Fee Calculation Form* 2014

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 2014 Annual Emissions: | (1) Totals from Process Forms | (2) + Accidental Releases | (3) = TOTAL 2014 Emissions |
|---|---|---|---|
| CO | ***2,113*** | ***0*** | ***2,113*** |
| $NH_x$ | ***0*** | ***0*** | ***0*** |
| Lead | ***0*** | ***0*** | ***0*** |
| $PM_{10}$ (non-billable; see page 22) | ***2,400*** | ***0*** | ***2,400*** |

**Emissions fees are based on your emissions of the following pollutants ONLY:**

| | | | | |
|---|---|---|---|---|
| 1 | HAP&NON | ***354*** | ***0*** | ***354*** |
| 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:** | | | ***35,725*** 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 **$ 42.21**. This is your **2014 ANNUAL EMISSION FEE**. | | | $ ***759.78*** |

***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, Emissions Inventory Unit,1001 North Central Avenue, Suite 125, Phoenix, AZ 85004.
- 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 B. Rule Effectiveness (RE) Studies

## 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 following example illustrates how the application of rule effectiveness can significantly affect the resulting emission estimates. The calculations below reflect a process whose reported emissions are controlled via a control device with a nominal 90% control efficiency (CE). In the second equation, an RE rate of 83% is applied to the controlled process.

**A. Emissions <u>before</u> the application of rule effectiveness:**

*Uncontrolled emissions* × [ 1 – ( *CE* ) ] = *Emissions after control*

100 tons × [ 1 – (0.90) ] = **10.0 tons**

**B. Emissions <u>including</u> the application of an 83% rule effectiveness (RE):**

*Uncontrolled emissions* × [ 1 – (*CE* × ***RE***) ] = *Emissions after control* ***<u>and</u>*** *RE*

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, and unrealistic, 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.

## 2. Calculating Rule Effectiveness Rates for Title V 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 B–2 and B–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 B–2 and B–3.

The data and methods used to develop RE rates for Title V and non-Title V permitted facilities are described below. The resulting rule effectiveness values for 2014 are summarized in Table B–1 below.

**Table B–1. Rates of compliance and rule effectiveness for 2014, by permit category.**

| Source category | Compliance rate * | Rule Effectiveness (RE) rate |
|---|---|---|
| Title V facilities | 88.45% | 90.44% |
| Non-Title V facilities | 85.94% | 89.00% |

** Compliance rates for both Title V and Non-Title V facilities are based upon 2013–14 inspection data, and reflect compliance self-monitoring recordkeeping practices, in addition to violation data.*

For the remaining emission processes that include a control device or technique that limits ozone formation, 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 both Title V and non-Title V facilities are based on two full years of data (2013 and 2014), since compliance information for these sources tends to be more 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 combined scores of the monitoring data and inspection data divided by the 70% of the overall RE rate comprise the "compliance rate" portion of the RE calculation matrix, as shown in Tables B–2 and B–3 below.

## 3. References

US EPA, 1992. Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories. EPA Rep. 452/R-92-010, November 1992.

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 B–2. Rule Effectiveness Matrix for Title V Facilities

### A. Most important factors (2 criteria, each assigned weighting of 35% of total):

| Factor | Range | | Midpoint 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 6–9 months. | 35% | 90% | **31.50%** |
| | 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% | 8 of 16 facilities | **16.98%** |
| | 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 16 facilities | **13.13%** |
| | | < 70% | 35% | High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA. | | | |

**Overall compliance rate for Title V facilities: 88.45%**

### 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% | **2.91%** |
| | 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. | 3% | 97% | **2.91%** |
| | 87% | 93% | 90% | Control equipment operators follow daily O&M instructions. | | | |
| | 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. | | | |

## Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

| Factor | Range | | Midpoint 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. | 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. | | | |

## Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

| Factor | Range | | Midpoint value | Description | Weight | Value assigned to MCAQD | Score (= weight × value) |
|---|---|---|---|---|---|---|---|
| **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. | | | |
| **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. | | | |

## Table B–2. Rule Effectiveness Matrix for Title V Facilities (continued)

| Factor | Range | | Midpoint value | Description | Weight | Value assigned to MCAQD | Score (= weight × value) |
|---|---|---|---|---|---|---|---|
| **Inspector Training** | 94% | 100% | 97% | Inspectors must undergo 2 weeks of comprehensive basic training, and 1–2 weeks of source-specific training, and such training is updated each year. | 2% | 97% | **1.94%** |
| | 87% | 93% | 90% | Inspectors must undergo 1–2 weeks of basic training and 1 week of source-specific training and such training is updated every 1–2 years. | | | |
| | 81% | 86% | 84% | Inspectors must undergo 1–2 weeks of basic training and 3–5 days of source-specific training, and such training is updated every 1–2 years. | | | |
| | 70% | 80% | 75% | Inspectors must undergo 1–2 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. | | | |
| **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:** **90.44%**

## Table B–3. Rule Effectiveness Matrix for Non-Title V Facilities

### A. Most important factors (2 criteria, each assigned weighting of 35% of total):

| Factor | Range | | Midpoint 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 6–9 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% | **26.25%** |
| | | < 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% | 82 of 137 facilities | **20.32%** |
| | 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. | | 2 of 137 facilities | **0.46%** |
| | 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. | | 57 of 137 facilities | **13.13%** |
| | | < 70% | 35% | High Priority Violator (HPV): the facility is in significant violation of one or more applicable requirement of the CAA. | | | |

**Overall compliance rate for Non-Title V facilities: 85.94%**

### 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% | **2.91%** |
| | 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. | 3% | 97% | **2.91%** |
| | 87% | 93% | 90% | Control equipment operators follow daily O&M instructions. | | | |
| | 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. | | | |

## Table B–3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

| Factor | Range | | Midpoint 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. | 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) 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. | | | |

## Table B–3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

| Factor | Range | | Midpt. value | Description | Weight | Value assigned to MCAQD | Score (= weight × value) |
|---|---|---|---|---|---|---|---|
| **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. | | | |
| **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. | 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. The implementing agency mails regulatory information packages infrequently, if ever. | | | |

## Table B–3. Rule Effectiveness Matrix for Non-Title V Facilities (continued)

| Factor | Range | | Midpt. value | Description | Weight | Value assigned to MCAQD | Score(= weight × value) |
|---|---|---|---|---|---|---|---|
| **Inspector Training** | 94% | 100% | 97% | Inspectors must undergo 2 weeks of comprehensive basic training, and 1–2 weeks of source-specific training, and such training is updated each year. | 2% | 97% | **1.94%** |
| | 87% | 93% | 90% | Inspectors must undergo 1–2 weeks of basic training and 1 week of source-specific training and such training is updated every 1–2 years. | | | |
| | 81% | 86% | 84% | Inspectors must undergo 1–2 weeks of basic training and 3–5 days of source-specific training, and such training is updated every 1–2 years. | | | |
| | 70% | 80% | 75% | Inspectors must undergo 1–2 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. | | | |
| **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:** **89.00%**

# Appendix C. MOVES2014a Local Input Data and RunSpecs

To calculate 2014 annual and typical daily emissions from onroad sources, MOVES2014a was executed using local input data for each month of the year and each geographic area analyzed (Maricopa County and the 8-hour ozone nonattainment area).

A portion of the MOVES2014a RunSpec Summary, RunSpec, and local input data for Maricopa County are provided in this appendix as an example.

## MOVES2014a RunSpec Summary (Maricopa County)

* Output Database Server Name: [using default]

* Scale:
  - Domain/Scale: County
  - Calculation Type: Inventory

* Time Spans:
  - Time Aggregation Level: Hour
  - Years: 2014
  - Months: January - 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: c04013y2014_20151118

* Vehicles/Equipment
  - On Road Vehicle Equipment:
    - Compressed natural Gas (CNG) - Transit Bus
    - 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 - 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
    - Electricity - Light Commercial Truck
    - Electricity - Passenger Car
    - Electricity - Passenger Truck
    - Ethanol (E-85) - Light Commercial Truck
    - Ethanol (E-85) - Passenger Car
    - Ethanol (E-85) - Passenger Truck
    - Gasoline - Combination Short-haul Truck
    - 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

* Road Type
  - Off-Network
  - Rural Restricted Access
  - Rural Unrestricted Access
  - Urban Restricted Access
  - Urban Unrestricted Access

* Pollutants and Processes
  - Total Gaseous Hydrocarbons - Running Exhaust
  - Total Gaseous Hydrocarbons - Start Exhaust
  - Total Gaseous Hydrocarbons - Evap Permeation
  - Total Gaseous Hydrocarbons - Evap Fuel Vapor Venting
  - Total Gaseous Hydrocarbons - Evap Fuel Leaks
  - Total Gaseous Hydrocarbons - Crankcase Running Exhaust
  - Total Gaseous Hydrocarbons - Crankcase Start Exhaust
  - Total Gaseous Hydrocarbons - Crankcase Extended Idle Exhaust
  - Total Gaseous Hydrocarbons - Refueling Displacement Vapor Loss
  - Total Gaseous Hydrocarbons - Refueling Spillage Loss
  - Total Gaseous Hydrocarbons - Extended Idle Exhaust
  - Total Gaseous Hydrocarbons - Auxiliary Power Exhaust
  - 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
  - Carbon Monoxide (CO) - Auxiliary Power Exhaust
  - Oxides of Nitrogen (NOx) - Running Exhaust
  - Oxides of Nitrogen (NOx) - Start Exhaust
  - Oxides of Nitrogen (NOx) - Crankcase Running Exhaust
  - Oxides of Nitrogen (NOx) - Crankcase Start Exhaust
  - Oxides of Nitrogen (NOx) - Crankcase Extended Idle Exhaust
  - Oxides of Nitrogen (NOx) - Extended Idle Exhaust
  - Oxides of Nitrogen (NOx) - Auxiliary Power Exhaust
  - Methane (CH4) - Running Exhaust
  - Methane (CH4) - Start Exhaust
  - Methane (CH4) - Crankcase Running Exhaust
  - Methane (CH4) - Crankcase Start Exhaust
  - Methane (CH4) - Crankcase Extended Idle Exhaust
  - Methane (CH4) - Extended Idle Exhaust
  - Methane (CH4) - Auxiliary Power Exhaust
  - Non-Methane Hydrocarbons - Running Exhaust
  - Non-Methane Hydrocarbons - Start Exhaust
  - Non-Methane Hydrocarbons - Evap Permeation
  - Non-Methane Hydrocarbons - Evap Fuel Vapor Venting
  - Non-Methane Hydrocarbons - Evap Fuel Leaks
  - Non-Methane Hydrocarbons - Crankcase Running Exhaust
  - Non-Methane Hydrocarbons - Crankcase Start Exhaust
  - Non-Methane Hydrocarbons - Crankcase Extended Idle Exhaust
  - Non-Methane Hydrocarbons - Refueling Displacement Vapor Loss
  - Non-Methane Hydrocarbons - Refueling Spillage Loss
  - Non-Methane Hydrocarbons - Extended Idle Exhaust
  - Non-Methane Hydrocarbons - Auxiliary Power Exhaust
  - Non-Methane Organic Gases - Running Exhaust
  - Non-Methane Organic Gases - Start Exhaust
  - Non-Methane Organic Gases - Evap Permeation
  - Non-Methane Organic Gases - Evap Fuel Vapor Venting
  - Non-Methane Organic Gases - Evap Fuel Leaks
  - Non-Methane Organic Gases - Crankcase Running Exhaust
  - Non-Methane Organic Gases - Crankcase Start Exhaust
  - Non-Methane Organic Gases - Crankcase Extended Idle Exhaust

Non-Methane Organic Gases - Refueling Displacement Vapor Loss
Non-Methane Organic Gases - Refueling Spillage Loss
Non-Methane Organic Gases - Extended Idle Exhaust
Non-Methane Organic Gases - Auxiliary Power Exhaust
Total Organic Gases - Running Exhaust
Total Organic Gases - Start Exhaust
Total Organic Gases - Evap Permeation
Total Organic Gases - Evap Fuel Vapor Venting
Total Organic Gases - Evap Fuel Leaks
Total Organic Gases - Crankcase Running Exhaust
Total Organic Gases - Crankcase Start Exhaust
Total Organic Gases - Crankcase Extended Idle Exhaust
Total Organic Gases - Refueling Displacement Vapor Loss
Total Organic Gases - Refueling Spillage Loss
Total Organic Gases - Extended Idle Exhaust
Total Organic Gases - Auxiliary Power Exhaust
Volatile Organic Compounds - Running Exhaust
Volatile Organic Compounds - Start Exhaust
Volatile Organic Compounds - Evap Permeation
Volatile Organic Compounds - Evap Fuel Vapor Venting
Volatile Organic Compounds - Evap Fuel Leaks
Volatile Organic Compounds - Crankcase Running Exhaust
Volatile Organic Compounds - Crankcase Start Exhaust
Volatile Organic Compounds - Crankcase Extended Idle Exhaust
Volatile Organic Compounds - Refueling Displacement Vapor Loss
Volatile Organic Compounds - Refueling Spillage Loss
Volatile Organic Compounds - Extended Idle Exhaust
Volatile Organic Compounds - Auxiliary Power Exhaust

* Manage Input Data Sets
  Selections: / StageII_Input / Stage II Refueling Input

* Output
  General Output:
    Output Database: c04013y2014_20151118_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 (COUNTY) | Pollutant
    For All Vehicle/Equipment Categories: Fuel Type | Emission Process
    On Road: SCC

## MOVES2014a RunSpec (Maricopa County)

```
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   <modelscale value="Inv"/>
   <modeldomain value="SINGLE"/>
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   </geographicselections>
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      <month id="2"/>
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      <endhour id="24"/>
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   </timespan>
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Bus"/>
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Truck"/>
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Truck"/>
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      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="54" sourcetypename="Motor Home"/>
      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="21" sourcetypename="Passenger Car"/>
      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="31" sourcetypename="Passenger Truck"/>
      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="51" sourcetypename="Refuse Truck"/>
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      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="53" sourcetypename="Single Unit Long-haul
Truck"/>
      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="52" sourcetypename="Single Unit Short-haul
Truck"/>
      <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="42" sourcetypename="Transit Bus"/>
      <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="32" sourcetypename="Light Commercial Truck"/>
      <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="21" sourcetypename="Passenger Car"/>
      <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="31" sourcetypename="Passenger Truck"/>
      <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="32" sourcetypename="Light Commercial Truck"/>
      <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="21" sourcetypename="Passenger Car"/>
      <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="31" sourcetypename="Passenger Truck"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="61" sourcetypename="Combination Short-haul Truck"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="32" sourcetypename="Light Commercial Truck"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="54" sourcetypename="Motor Home"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="11" sourcetypename="Motorcycle"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="21" sourcetypename="Passenger Car"/>
      <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="31" sourcetypename="Passenger Truck"/>
      <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"/>
    <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="42" sourcetypename="Transit Bus"/>
  </onroadvehicleselections>
  <offroadvehicleselections>
  </offroadvehicleselections>
  <offroadvehiclesccs>
  </offroadvehiclesccs>
  <roadtypes separateramps="false">
    <roadtype roadtypeid="1" roadtypename="Off-Network" modelCombination="M1"/>
    <roadtype roadtypeid="2" roadtypename="Rural Restricted Access" modelCombination="M1"/>
    <roadtype roadtypeid="3" roadtypename="Rural Unrestricted Access" modelCombination="M1"/>
    <roadtype roadtypeid="4" roadtypename="Urban Restricted Access" modelCombination="M1"/>
    <roadtype roadtypeid="5" roadtypename="Urban Unrestricted Access" modelCombination="M1"/>
  </roadtypes>
  <pollutantprocessassociations>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="1" processname="Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="2" processname="Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="15" processname="Crankcase Running
Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="16" processname="Crankcase Start
Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="90" processname="Extended Idle
Exhaust"/>
    <pollutantprocessassociation pollutantkey="2" pollutantname="Carbon Monoxide (CO)" processkey="91" processname="Auxiliary Power
Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="1" processname="Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="2" processname="Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="15" processname="Crankcase Running
Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="16" processname="Crankcase Start
Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="17" processname="Crankcase Extended Idle
Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="90" processname="Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="5" pollutantname="Methane (CH4)" processkey="91" processname="Auxiliary Power
Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="1" processname="Running
Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="2" processname="Start
Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="11" processname="Evap
Permeation"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="12" processname="Evap Fuel
Vapor Venting"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="13" processname="Evap Fuel
Leaks"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="15" processname="Crankcase
Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="16" processname="Crankcase
Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="18" processname="Refueling
Displacement Vapor Loss"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="19" processname="Refueling
Spillage Loss"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="90" processname="Extended
Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="79" pollutantname="Non-Methane Hydrocarbons" processkey="91" processname="Auxiliary
Power Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="1" processname="Running
Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="2" processname="Start
Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="11" processname="Evap
Permeation"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="12" processname="Evap Fuel
Vapor Venting"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="13" processname="Evap Fuel
Leaks"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="15" processname="Crankcase
Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="16" processname="Crankcase
Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="80" pollutantname="Non-Methane Organic Gases" processkey="18" processname="Refueling
Displacement Vapor Loss"/>
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Spillage Loss"/>
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Idle Exhaust"/>
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Power Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1" processname="Running
Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" processname="Start
Exhaust"/>
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Running Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="16" processname="Crankcase
Start Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90" processname="Extended Idle
Exhaust"/>
    <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91" processname="Auxiliary
Power Exhaust"/>
```

```
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="1" processname="Running
Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="2" processname="Start
Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="11" processname="Evap
Permeation"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="12" processname="Evap Fuel
Vapor Venting"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="13" processname="Evap Fuel
Leaks"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="15" processname="Crankcase
Running Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="16" processname="Crankcase
Start Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="18" processname="Refueling
Displacement Vapor Loss"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="19" processname="Refueling
Spillage Loss"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="90" processname="Extended
Idle Exhaust"/>
     <pollutantprocessassociation pollutantkey="1" pollutantname="Total Gaseous Hydrocarbons" processkey="91" processname="Auxiliary
Power Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="1" processname="Running Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="2" processname="Start Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="11" processname="Evap
Permeation"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="12" processname="Evap Fuel Vapor
Venting"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="13" processname="Evap Fuel
Leaks"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="15" processname="Crankcase Running
Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="16" processname="Crankcase Start
Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="18" processname="Refueling
Displacement Vapor Loss"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="19" processname="Refueling
Spillage Loss"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="90" processname="Extended Idle
Exhaust"/>
     <pollutantprocessassociation pollutantkey="86" pollutantname="Total Organic Gases" processkey="91" processname="Auxiliary Power
Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="1" processname="Running
Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="2" processname="Start
Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="11" processname="Evap
Permeation"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="12" processname="Evap Fuel
Vapor Venting"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="13" processname="Evap Fuel
Leaks"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="15" processname="Crankcase
Running Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="16" processname="Crankcase
Start Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="17" processname="Crankcase
Extended Idle Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="18" processname="Refueling
Displacement Vapor Loss"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="19" processname="Refueling
Spillage Loss"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="90" processname="Extended
Idle Exhaust"/>
     <pollutantprocessassociation pollutantkey="87" pollutantname="Volatile Organic Compounds" processkey="91" processname="Auxiliary
Power Exhaust"/>
   </pollutantprocessassociations>
   <databaseselections>
   </databaseselections>
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<internalcontrolstrategy
classname="gov.epa.otaq.moves.master.implementation.ghg.internalcontrolstrategies.rateofprogress.RateOfProgressStrategy"><![CDATA
[
useParameters                No

]]></internalcontrolstrategy>
   </internalcontrolstrategies>
   <inputdatabase servername="" databasename="" description=""/>
   <uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numberofsimulations="0"/>
   <geographicoutputdetail description="COUNTY"/>
   <outputemissionsbreakdownselection>
     <modelyear selected="false"/>
     <fueltype selected="true"/>
     <emissionprocess selected="true"/>
     <onroadoffroad selected="true"/>
     <roadtype selected="true"/>
     <sourceusetype selected="true"/>
     <movesvehicletype selected="true"/>
     <onroadscc selected="true"/>
     <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="false"/>
     <sector selected="false"/>
     <engtechid selected="false"/>
     <hpclass selected="false"/>
     <regclassid selected="false"/>
   </outputemissionsbreakdownselection>
   <outputdatabase servername="" databasename="c04013y2014_20151118_out" description=""/>
   <outputtimestep value="Month"/>
```

```
   <outputvmtdata value="true"/>
   <outputsho value="true"/>
   <outputsh value="true"/>
   <outputshp value="true"/>
   <outputshidling value="true"/>
   <outputstarts value="true"/>
   <outputpopulation value="true"/>
   <scaleinputdatabase servername="localhost" databasename="c04013y2014_20151118" description=""/>
   <pmsize value="0"/>
   <outputfactors>
      <timefactors selected="true" units="Months"/>
      <distancefactors selected="true" units="Miles"/>
      <massfactors selected="true" units="Grams" energyunits="Joules"/>
   </outputfactors>
   <savedata>

   </savedata>

   <donotexecute>

   </donotexecute>

   <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
      <donotperformfinalaggregation selected="false"/>
   <lookuptableflags scenarioid="c04013y2014_20151118" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
</runspec>
```

# MOVES2014a Local Input Data (Maricopa County)

## [HPMSvTypeYear]

| HPMSVtypeID | yearID | HPMSBaseYearVMT |
|---|---|---|
| 10 | 2014 | 183,419,188 |
| 25 | 2014 | 30,173,627,159 |
| 40 | 2014 | 78,456,880 |
| 50 | 2014 | 1,183,539,915 |
| 60 | 2014 | 971,500,384 |

## [SourceTypeYear]

| yearID | sourceTypeID | sourceTypePopulation |
|---|---|---|
| 2014 | 11 | 90,699 |
| 2014 | 21 | 2,221,072 |
| 2014 | 31 | 531,215 |
| 2014 | 32 | 132,419 |
| 2014 | 41 | 238 |
| 2014 | 42 | 888 |
| 2014 | 43 | 7,962 |
| 2014 | 51 | 1,049 |
| 2014 | 52 | 37,271 |
| 2014 | 53 | 1,567 |
| 2014 | 54 | 9,785 |
| 2014 | 61 | 6,503 |
| 2014 | 62 | 7,070 |

## [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 | BioDiesel Ester | Cetane Index | PAH Content | T50 | T90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 10 | 6.9 | 30 | 0 | 0 | 0 | 0 | 26.1 | 5.6 | 1 | 41.09 | 83.09 | 0 | 0 | 0 | 218 | 329 |
| 20 | 20 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 30 | 0 | 7.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 51 | 7.7 | 11 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 49.9 | 89.5 | 0 | 0 | 0 | 200 | 300 |
| 90 | 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 96 | 10 | 8.7 | 338 | 0 | 0 | 0 | 0 | 26.4 | 11.9 | 1.64 | 50 | 83 | 0 | 0 | 0 | 199.816 | 329.40 |
| 97 | 10 | 6.6 | 150 | 0 | 11.758 | 0 | 0 | 24 | 11 | 0.8 | 52 | 84 | 0 | 0 | 0 | 195.735 | 324.86 |
| 98 | 10 | 6.9 | 30 | 0 | 0 | 0 | 0 | 26.1 | 5.6 | 1 | 41.09 | 83.09 | 0 | 0 | 0 | 218 | 329 |
| 99 | 10 | 6.9 | 90 | 0 | 0 | 0 | 0 | 26.1 | 5.6 | 1 | 41.09 | 83.09 | 0 | 0 | 0 | 218 | 329 |
| 3190 | 12 | 6.83 | 18.5 | 10.0 | 0 | 0 | 0 | 21.964 | 4.8161 | 0.53 | 44.256 | 88.711 | 0 | 0 | 0 | 211.53 | 303.44 |
| 3191 | 12 | 8.61708 | 14.8 | 10.3 | 0 | 0 | 0 | 21.894 | 4.6848 | 0.53 | 46.808 | 89.670 | 0 | 0 | 0 | 206.33 | 299.09 |
| 3192 | 12 | 7.885 | 19 | 10.1 | 0 | 0 | 0 | 21.917 | 4.9097 | 0.53 | 45.779 | 89.313 | 0 | 0 | 0 | 208.42 | 300.71 |
| 25005 | 21 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 27001 | 51 | 10.5 | 8 | 74 | 0 | 0 | 0 | 0 | 0 | 0 | 49.9 | 89.5 | 0 | 0 | 0 | 200 | 300 |
| 27002 | 51 | 7.7 | 8 | 74 | 0 | 0 | 0 | 0 | 0 | 0 | 49.9 | 89.5 | 0 | 0 | 0 | 200 | 300 |
| 28001 | 30 | 0 | 7.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## [FuelUsageFraction]

| countyID | fuelYearID | modelYearGroupID | sourceBinFuelTypeID | fuelSupplyFuelTypeID | usageFraction |
|---|---|---|---|---|---|
| 4013 | 2014 | 0 | 1 | 1 | 1 |
| 4013 | 2014 | 0 | 2 | 2 | 1 |
| 4013 | 2014 | 0 | 3 | 3 | 1 |
| 4013 | 2014 | 0 | 5 | 1 | 0.982134 |
| 4013 | 2014 | 0 | 5 | 5 | 0.017866 |
| 4013 | 2014 | 0 | 9 | 9 | 1 |

**[FuelSupply]**

| fuelRegionID | fuelYearID | monthGroupID | fuelFormulationID | marketShare | marketShareCV |
|---|---|---|---|---|---|
| 1570011000 | 2014 | 5 | 3190 | 1 | 0.5 |
| 1570011000 | 2014 | 6 | 3190 | 1 | 0.5 |
| 1570011000 | 2014 | 7 | 3190 | 1 | 0.5 |
| 1570011000 | 2014 | 8 | 3190 | 1 | 0.5 |
| 1570011000 | 2014 | 9 | 3190 | 1 | 0.5 |
| 1570011000 | 2014 | 1 | 3191 | 1 | 0.5 |
| 1570011000 | 2014 | 2 | 3191 | 1 | 0.5 |
| 1570011000 | 2014 | 3 | 3191 | 1 | 0.5 |
| 1570011000 | 2014 | 11 | 3191 | 1 | 0.5 |
| 1570011000 | 2014 | 12 | 3191 | 1 | 0.5 |
| 1570011000 | 2014 | 4 | 3192 | 1 | 0.5 |
| 1570011000 | 2014 | 10 | 3192 | 1 | 0.5 |
| 1570011000 | 2014 | 1 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 2 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 3 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 4 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 5 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 6 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 7 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 8 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 9 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 10 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 11 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 12 | 25005 | 1 | 0.5 |
| 1570011000 | 2014 | 1 | 27001 | 1 | 0.5 |
| 1570011000 | 2014 | 2 | 27001 | 1 | 0.5 |
| 1570011000 | 2014 | 3 | 27001 | 1 | 0.5 |
| 1570011000 | 2014 | 11 | 27001 | 1 | 0.5 |
| 1570011000 | 2014 | 12 | 27001 | 1 | 0.5 |
| 1570011000 | 2014 | 4 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 5 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 6 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 7 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 8 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 9 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 10 | 27002 | 1 | 0.5 |
| 1570011000 | 2014 | 1 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 2 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 3 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 4 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 5 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 6 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 7 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 8 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 9 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 10 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 11 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 12 | 28001 | 1 | 0.5 |
| 1570011000 | 2014 | 1 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 2 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 3 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 4 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 5 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 6 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 7 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 8 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 9 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 10 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 11 | 90 | 1 | 0.5 |
| 1570011000 | 2014 | 12 | 90 | 1 | 0.5 |

**[ZoneMonthHour]**

| monthID | zoneID | HourID | temperature | relHumidity |
|---|---|---|---|---|
| 1 | 40130 | 1 | 53 | 41 |
| 1 | 40130 | 2 | 52 | 43 |
| 1 | 40130 | 3 | 51 | 44 |
| 1 | 40130 | 4 | 51 | 44 |
| 1 | 40130 | 5 | 50 | 46 |
| 1 | 40130 | 6 | 49 | 47 |
| 1 | 40130 | 7 | 49 | 46 |
| 1 | 40130 | 8 | 49 | 46 |
| 1 | 40130 | 9 | 52 | 39 |
| 1 | 40130 | 10 | 57 | 31 |
| 1 | 40130 | 11 | 62 | 25 |
| 1 | 40130 | 12 | 66 | 21 |
| 1 | 40130 | 13 | 68 | 18 |
| 1 | 40130 | 14 | 70 | 16 |
| 1 | 40130 | 15 | 71 | 15 |
| 1 | 40130 | 16 | 72 | 15 |
| 1 | 40130 | 17 | 71 | 16 |
| 1 | 40130 | 18 | 69 | 18 |

| monthID | zoneID | HourID | temperature | relHumidity |
|---|---|---|---|---|
| 1 | 40130 | 19 | 65 | 22 |
| 1 | 40130 | 20 | 63 | 26 |
| 1 | 40130 | 21 | 61 | 28 |
| 1 | 40130 | 22 | 58 | 33 |
| 1 | 40130 | 23 | 56 | 36 |
| 1 | 40130 | 24 | 55 | 39 |
| 2 | 40130 | 1 | 59 | 35 |
| 2 | 40130 | 2 | 58 | 38 |
| 2 | 40130 | 3 | 57 | 39 |
| 2 | 40130 | 4 | 56 | 40 |
| 2 | 40130 | 5 | 55 | 41 |
| 2 | 40130 | 6 | 54 | 42 |
| 2 | 40130 | 7 | 54 | 43 |
| 2 | 40130 | 8 | 54 | 43 |
| 2 | 40130 | 9 | 58 | 37 |
| 2 | 40130 | 10 | 62 | 31 |
| 2 | 40130 | 11 | 67 | 26 |
| 2 | 40130 | 12 | 70 | 23 |

| monthID | zoneID | HourID | temperature | relHumidity |
|---|---|---|---|---|
| 2 | 40130 | 13 | 72 | 21 |
| 2 | 40130 | 14 | 74 | 19 |
| 2 | 40130 | 15 | 75 | 18 |
| 2 | 40130 | 16 | 75 | 18 |
| 2 | 40130 | 17 | 75 | 18 |
| 2 | 40130 | 18 | 74 | 18 |
| 2 | 40130 | 19 | 72 | 20 |
| 2 | 40130 | 20 | 69 | 23 |
| 2 | 40130 | 21 | 67 | 26 |
| 2 | 40130 | 22 | 65 | 29 |
| 2 | 40130 | 23 | 63 | 32 |
| 2 | 40130 | 24 | 61 | 34 |
| 3 | 40130 | 1 | 65 | 34 |
| 3 | 40130 | 2 | 64 | 35 |
| 3 | 40130 | 3 | 62 | 37 |
| 3 | 40130 | 4 | 61 | 40 |
| 3 | 40130 | 5 | 59 | 43 |
| 3 | 40130 | 6 | 59 | 44 |

| monthID | zoneID | HourID | temperature | relHumidity |
|---|---|---|---|---|
| 3 | 40130 | 7 | 58 | 44 |
| 3 | 40130 | 8 | 61 | 41 |
| 3 | 40130 | 9 | 64 | 34 |
| 3 | 40130 | 10 | 68 | 29 |
| 3 | 40130 | 11 | 71 | 25 |
| 3 | 40130 | 12 | 74 | 22 |
| 3 | 40130 | 13 | 77 | 19 |
| 3 | 40130 | 14 | 78 | 17 |
| 3 | 40130 | 15 | 79 | 16 |
| 3 | 40130 | 16 | 80 | 16 |
| 3 | 40130 | 17 | 80 | 16 |
| 3 | 40130 | 18 | 78 | 17 |
| 3 | 40130 | 19 | 76 | 19 |
| 3 | 40130 | 20 | 74 | 21 |
| 3 | 40130 | 21 | 72 | 23 |
| 3 | 40130 | 22 | 70 | 24 |
| 3 | 40130 | 23 | 68 | 27 |
| 3 | 40130 | 24 | 66 | 30 |
| 4 | 40130 | 1 | 72 | 19 |
| 4 | 40130 | 2 | 70 | 20 |
| 4 | 40130 | 3 | 68 | 23 |
| 4 | 40130 | 4 | 66 | 25 |
| 4 | 40130 | 5 | 65 | 26 |
| 4 | 40130 | 6 | 64 | 27 |
| 4 | 40130 | 7 | 64 | 27 |
| 4 | 40130 | 8 | 67 | 24 |
| 4 | 40130 | 9 | 72 | 20 |
| 4 | 40130 | 10 | 75 | 18 |
| 4 | 40130 | 11 | 78 | 15 |
| 4 | 40130 | 12 | 81 | 13 |
| 4 | 40130 | 13 | 83 | 11 |
| 4 | 40130 | 14 | 84 | 10 |
| 4 | 40130 | 15 | 85 | 10 |
| 4 | 40130 | 16 | 86 | 10 |
| 4 | 40130 | 17 | 86 | 10 |
| 4 | 40130 | 18 | 85 | 10 |
| 4 | 40130 | 19 | 83 | 10 |
| 4 | 40130 | 20 | 81 | 12 |
| 4 | 40130 | 21 | 78 | 14 |
| 4 | 40130 | 22 | 77 | 15 |
| 4 | 40130 | 23 | 75 | 16 |
| 4 | 40130 | 24 | 73 | 18 |
| 5 | 40130 | 1 | 80 | 15 |
| 5 | 40130 | 2 | 78 | 17 |
| 5 | 40130 | 3 | 76 | 19 |
| 5 | 40130 | 4 | 74 | 21 |
| 5 | 40130 | 5 | 73 | 21 |
| 5 | 40130 | 6 | 72 | 22 |
| 5 | 40130 | 7 | 74 | 21 |
| 5 | 40130 | 8 | 77 | 19 |
| 5 | 40130 | 9 | 81 | 16 |
| 5 | 40130 | 10 | 84 | 14 |
| 5 | 40130 | 11 | 87 | 12 |
| 5 | 40130 | 12 | 90 | 11 |
| 5 | 40130 | 13 | 91 | 10 |
| 5 | 40130 | 14 | 92 | 9 |
| 5 | 40130 | 15 | 94 | 9 |
| 5 | 40130 | 16 | 94 | 9 |
| 5 | 40130 | 17 | 94 | 9 |
| 5 | 40130 | 18 | 93 | 9 |
| 5 | 40130 | 19 | 92 | 9 |
| 5 | 40130 | 20 | 90 | 10 |
| 5 | 40130 | 21 | 87 | 11 |
| 5 | 40130 | 22 | 85 | 12 |
| 5 | 40130 | 23 | 84 | 13 |
| 5 | 40130 | 24 | 83 | 14 |
| 6 | 40130 | 1 | 90 | 13 |
| 6 | 40130 | 2 | 88 | 15 |
| 6 | 40130 | 3 | 85 | 18 |
| 6 | 40130 | 4 | 84 | 19 |
| 6 | 40130 | 5 | 82 | 20 |
| 6 | 40130 | 6 | 81 | 21 |
| 6 | 40130 | 7 | 83 | 20 |
| 6 | 40130 | 8 | 86 | 18 |
| 6 | 40130 | 9 | 90 | 15 |
| 6 | 40130 | 10 | 94 | 13 |
| 6 | 40130 | 11 | 98 | 10 |
| 6 | 40130 | 12 | 100 | 9 |
| 6 | 40130 | 13 | 102 | 8 |
| 6 | 40130 | 14 | 103 | 8 |
| 6 | 40130 | 15 | 104 | 8 |
| 6 | 40130 | 16 | 105 | 7 |
| 6 | 40130 | 17 | 105 | 7 |
| 6 | 40130 | 18 | 104 | 7 |
| 6 | 40130 | 19 | 103 | 8 |
| 6 | 40130 | 20 | 101 | 8 |
| 6 | 40130 | 21 | 98 | 9 |
| 6 | 40130 | 22 | 95 | 11 |
| 6 | 40130 | 23 | 93 | 11 |
| 6 | 40130 | 24 | 92 | 12 |
| 7 | 40130 | 1 | 92 | 33 |
| 7 | 40130 | 2 | 91 | 34 |
| 7 | 40130 | 3 | 90 | 36 |
| 7 | 40130 | 4 | 89 | 37 |
| 7 | 40130 | 5 | 88 | 37 |
| 7 | 40130 | 6 | 87 | 38 |
| 7 | 40130 | 7 | 88 | 37 |
| 7 | 40130 | 8 | 90 | 35 |
| 7 | 40130 | 9 | 93 | 31 |
| 7 | 40130 | 10 | 95 | 28 |
| 7 | 40130 | 11 | 98 | 25 |
| 7 | 40130 | 12 | 100 | 22 |
| 7 | 40130 | 13 | 102 | 20 |
| 7 | 40130 | 14 | 104 | 19 |
| 7 | 40130 | 15 | 105 | 18 |
| 7 | 40130 | 16 | 105 | 17 |
| 7 | 40130 | 17 | 105 | 17 |
| 7 | 40130 | 18 | 104 | 19 |
| 7 | 40130 | 19 | 102 | 21 |
| 7 | 40130 | 20 | 100 | 22 |
| 7 | 40130 | 21 | 98 | 25 |
| 7 | 40130 | 22 | 96 | 27 |
| 7 | 40130 | 23 | 95 | 29 |
| 7 | 40130 | 24 | 93 | 32 |
| 8 | 40130 | 1 | 88 | 41 |
| 8 | 40130 | 2 | 87 | 44 |
| 8 | 40130 | 3 | 86 | 46 |
| 8 | 40130 | 4 | 84 | 47 |
| 8 | 40130 | 5 | 83 | 49 |
| 8 | 40130 | 6 | 83 | 50 |
| 8 | 40130 | 7 | 83 | 50 |
| 8 | 40130 | 8 | 85 | 47 |
| 8 | 40130 | 9 | 88 | 42 |
| 8 | 40130 | 10 | 91 | 37 |
| 8 | 40130 | 11 | 93 | 34 |
| 8 | 40130 | 12 | 95 | 30 |
| 8 | 40130 | 13 | 97 | 29 |
| 8 | 40130 | 14 | 99 | 26 |
| 8 | 40130 | 15 | 100 | 24 |
| 8 | 40130 | 16 | 100 | 23 |
| 8 | 40130 | 17 | 100 | 23 |
| 8 | 40130 | 18 | 99 | 26 |
| 8 | 40130 | 19 | 97 | 26 |
| 8 | 40130 | 20 | 96 | 27 |
| 8 | 40130 | 21 | 93 | 31 |
| 8 | 40130 | 22 | 91 | 36 |
| 8 | 40130 | 23 | 90 | 37 |
| 8 | 40130 | 24 | 89 | 39 |
| 9 | 40130 | 1 | 85 | 44 |
| 9 | 40130 | 2 | 84 | 47 |
| 9 | 40130 | 3 | 83 | 50 |
| 9 | 40130 | 4 | 82 | 52 |
| 9 | 40130 | 5 | 81 | 54 |
| 9 | 40130 | 6 | 80 | 56 |
| 9 | 40130 | 7 | 80 | 55 |
| 9 | 40130 | 8 | 83 | 50 |
| 9 | 40130 | 9 | 86 | 45 |
| 9 | 40130 | 10 | 89 | 38 |
| 9 | 40130 | 11 | 92 | 34 |
| 9 | 40130 | 12 | 94 | 32 |
| 9 | 40130 | 13 | 95 | 31 |
| 9 | 40130 | 14 | 96 | 29 |
| 9 | 40130 | 15 | 96 | 30 |
| 9 | 40130 | 16 | 96 | 30 |
| 9 | 40130 | 17 | 96 | 29 |
| 9 | 40130 | 18 | 95 | 29 |
| 9 | 40130 | 19 | 94 | 30 |
| 9 | 40130 | 20 | 92 | 34 |
| 9 | 40130 | 21 | 90 | 38 |
| 9 | 40130 | 22 | 88 | 40 |
| 9 | 40130 | 23 | 88 | 40 |
| 9 | 40130 | 24 | 86 | 44 |
| 10 | 40130 | 1 | 74 | 45 |
| 10 | 40130 | 2 | 73 | 46 |
| 10 | 40130 | 3 | 72 | 49 |
| 10 | 40130 | 4 | 71 | 51 |
| 10 | 40130 | 5 | 70 | 50 |
| 10 | 40130 | 6 | 70 | 51 |
| 10 | 40130 | 7 | 70 | 50 |
| 10 | 40130 | 8 | 73 | 46 |
| 10 | 40130 | 9 | 76 | 40 |
| 10 | 40130 | 10 | 80 | 35 |
| 10 | 40130 | 11 | 83 | 31 |
| 10 | 40130 | 12 | 85 | 28 |
| 10 | 40130 | 13 | 87 | 26 |
| 10 | 40130 | 14 | 89 | 24 |
| 10 | 40130 | 15 | 90 | 22 |
| 10 | 40130 | 16 | 90 | 21 |
| 10 | 40130 | 17 | 89 | 22 |
| 10 | 40130 | 18 | 87 | 24 |
| 10 | 40130 | 19 | 85 | 28 |
| 10 | 40130 | 20 | 82 | 34 |
| 10 | 40130 | 21 | 80 | 36 |
| 10 | 40130 | 22 | 79 | 37 |
| 10 | 40130 | 23 | 77 | 41 |
| 10 | 40130 | 24 | 75 | 43 |
| 11 | 40130 | 1 | 61 | 36 |
| 11 | 40130 | 2 | 59 | 39 |
| 11 | 40130 | 3 | 58 | 40 |
| 11 | 40130 | 4 | 57 | 41 |
| 11 | 40130 | 5 | 56 | 42 |
| 11 | 40130 | 6 | 56 | 42 |
| 11 | 40130 | 7 | 56 | 44 |
| 11 | 40130 | 8 | 57 | 41 |
| 11 | 40130 | 9 | 61 | 34 |
| 11 | 40130 | 10 | 66 | 29 |
| 11 | 40130 | 11 | 69 | 26 |
| 11 | 40130 | 12 | 72 | 23 |
| 11 | 40130 | 13 | 75 | 20 |
| 11 | 40130 | 14 | 76 | 19 |
| 11 | 40130 | 15 | 77 | 18 |
| 11 | 40130 | 16 | 77 | 18 |
| 11 | 40130 | 17 | 76 | 18 |
| 11 | 40130 | 18 | 73 | 20 |
| 11 | 40130 | 19 | 71 | 24 |
| 11 | 40130 | 20 | 68 | 27 |
| 11 | 40130 | 21 | 67 | 31 |
| 11 | 40130 | 22 | 65 | 32 |
| 11 | 40130 | 23 | 63 | 34 |
| 11 | 40130 | 24 | 61 | 35 |
| 12 | 40130 | 1 | 54 | 63 |
| 12 | 40130 | 2 | 53 | 65 |
| 12 | 40130 | 3 | 52 | 67 |
| 12 | 40130 | 4 | 51 | 70 |
| 12 | 40130 | 5 | 50 | 72 |
| 12 | 40130 | 6 | 50 | 72 |
| 12 | 40130 | 7 | 50 | 72 |
| 12 | 40130 | 8 | 50 | 72 |
| 12 | 40130 | 9 | 53 | 66 |
| 12 | 40130 | 10 | 56 | 55 |
| 12 | 40130 | 11 | 60 | 49 |
| 12 | 40130 | 12 | 62 | 43 |
| 12 | 40130 | 13 | 64 | 40 |
| 12 | 40130 | 14 | 65 | 38 |
| 12 | 40130 | 15 | 66 | 36 |
| 12 | 40130 | 16 | 66 | 36 |
| 12 | 40130 | 17 | 65 | 37 |
| 12 | 40130 | 18 | 63 | 44 |
| 12 | 40130 | 19 | 61 | 48 |
| 12 | 40130 | 20 | 58 | 55 |
| 12 | 40130 | 21 | 58 | 55 |
| 12 | 40130 | 22 | 57 | 57 |
| 12 | 40130 | 23 | 55 | 61 |
| 12 | 40130 | 24 | 54 | 63 |

**[SourceTypeAgeDistribution]**

| Source TypeID | YearID | AgeID | AgeFraction |
|---|---|---|---|
| 11 | 2014 | 0 | 0.038851 |
| 11 | 2014 | 1 | 0.067568 |
| 11 | 2014 | 2 | 0.058699 |
| 11 | 2014 | 3 | 0.042019 |
| 11 | 2014 | 4 | 0.030300 |
| 11 | 2014 | 5 | 0.065139 |
| 11 | 2014 | 6 | 0.067779 |
| 11 | 2014 | 7 | 0.085198 |
| 11 | 2014 | 8 | 0.082981 |
| 11 | 2014 | 9 | 0.069257 |
| 11 | 2014 | 10 | 0.051098 |
| 11 | 2014 | 11 | 0.058594 |
| 11 | 2014 | 12 | 0.047297 |
| 11 | 2014 | 13 | 0.040646 |
| 11 | 2014 | 14 | 0.033995 |
| 11 | 2014 | 15 | 0.028188 |
| 11 | 2014 | 16 | 0.020165 |
| 11 | 2014 | 17 | 0.015836 |
| 11 | 2014 | 18 | 0.014886 |
| 11 | 2014 | 19 | 0.012352 |
| 11 | 2014 | 20 | 0.009713 |
| 11 | 2014 | 21 | 0.009185 |
| 11 | 2014 | 22 | 0.006651 |
| 11 | 2014 | 23 | 0.004962 |
| 11 | 2014 | 24 | 0.004540 |
| 11 | 2014 | 25 | 0.004540 |
| 11 | 2014 | 26 | 0.004540 |
| 11 | 2014 | 27 | 0.005068 |
| 11 | 2014 | 28 | 0.007285 |
| 11 | 2014 | 29 | 0.006334 |
| 11 | 2014 | 30 | 0.006334 |
| 21 | 2014 | 0 | 0.050100 |
| 21 | 2014 | 1 | 0.076900 |
| 21 | 2014 | 2 | 0.064800 |
| 21 | 2014 | 3 | 0.052400 |
| 21 | 2014 | 4 | 0.047600 |
| 21 | 2014 | 5 | 0.037500 |
| 21 | 2014 | 6 | 0.059700 |
| 21 | 2014 | 7 | 0.068800 |
| 21 | 2014 | 8 | 0.068900 |
| 21 | 2014 | 9 | 0.063700 |
| 21 | 2014 | 10 | 0.058600 |
| 21 | 2014 | 11 | 0.052300 |
| 21 | 2014 | 12 | 0.048500 |
| 21 | 2014 | 13 | 0.042500 |
| 21 | 2014 | 14 | 0.039500 |
| 21 | 2014 | 15 | 0.031400 |
| 21 | 2014 | 16 | 0.024400 |
| 21 | 2014 | 17 | 0.020300 |
| 21 | 2014 | 18 | 0.014700 |
| 21 | 2014 | 19 | 0.013100 |
| 21 | 2014 | 20 | 0.009600 |
| 21 | 2014 | 21 | 0.007300 |
| 21 | 2014 | 22 | 0.005500 |
| 21 | 2014 | 23 | 0.004800 |
| 21 | 2014 | 24 | 0.003900 |
| 21 | 2014 | 25 | 0.003100 |
| 21 | 2014 | 26 | 0.002500 |
| 21 | 2014 | 27 | 0.002200 |
| 21 | 2014 | 28 | 0.001800 |
| 21 | 2014 | 29 | 0.001500 |
| 21 | 2014 | 30 | 0.022100 |
| 31 | 2014 | 0 | 0.081695 |
| 31 | 2014 | 1 | 0.055524 |
| 31 | 2014 | 2 | 0.040539 |
| 31 | 2014 | 3 | 0.038378 |
| 31 | 2014 | 4 | 0.026072 |
| 31 | 2014 | 5 | 0.019801 |
| 31 | 2014 | 6 | 0.051019 |
| 31 | 2014 | 7 | 0.065069 |
| 31 | 2014 | 8 | 0.072258 |
| 31 | 2014 | 9 | 0.059254 |
| 31 | 2014 | 10 | 0.062216 |
| 31 | 2014 | 11 | 0.051430 |
| 31 | 2014 | 12 | 0.047464 |
| 31 | 2014 | 13 | 0.051500 |
| 31 | 2014 | 14 | 0.045435 |
| 31 | 2014 | 15 | 0.034062 |
| 31 | 2014 | 16 | 0.027786 |
| 31 | 2014 | 17 | 0.027765 |
| 31 | 2014 | 18 | 0.019702 |
| 31 | 2014 | 19 | 0.019161 |
| 31 | 2014 | 20 | 0.016728 |
| 31 | 2014 | 21 | 0.011136 |
| 31 | 2014 | 22 | 0.007571 |
| 31 | 2014 | 23 | 0.006589 |
| 31 | 2014 | 24 | 0.005906 |
| 31 | 2014 | 25 | 0.006023 |
| 31 | 2014 | 26 | 0.004523 |
| 31 | 2014 | 27 | 0.003103 |
| 31 | 2014 | 28 | 0.004077 |
| 31 | 2014 | 29 | 0.003106 |
| 31 | 2014 | 30 | 0.035108 |
| 32 | 2014 | 0 | 0.086135 |
| 32 | 2014 | 1 | 0.057941 |
| 32 | 2014 | 2 | 0.043586 |
| 32 | 2014 | 3 | 0.039447 |
| 32 | 2014 | 4 | 0.026124 |
| 32 | 2014 | 5 | 0.020848 |
| 32 | 2014 | 6 | 0.052503 |
| 32 | 2014 | 7 | 0.069230 |
| 32 | 2014 | 8 | 0.076084 |
| 32 | 2014 | 9 | 0.059563 |
| 32 | 2014 | 10 | 0.059391 |
| 32 | 2014 | 11 | 0.048796 |
| 32 | 2014 | 12 | 0.044650 |
| 32 | 2014 | 13 | 0.048787 |
| 32 | 2014 | 14 | 0.045632 |
| 32 | 2014 | 15 | 0.033340 |
| 32 | 2014 | 16 | 0.026629 |
| 32 | 2014 | 17 | 0.026523 |
| 32 | 2014 | 18 | 0.018772 |
| 32 | 2014 | 19 | 0.018280 |
| 32 | 2014 | 20 | 0.015767 |
| 32 | 2014 | 21 | 0.010524 |
| 32 | 2014 | 22 | 0.007161 |
| 32 | 2014 | 23 | 0.006290 |
| 32 | 2014 | 24 | 0.005669 |
| 32 | 2014 | 25 | 0.005703 |
| 32 | 2014 | 26 | 0.004298 |
| 32 | 2014 | 27 | 0.002944 |
| 32 | 2014 | 28 | 0.003834 |
| 32 | 2014 | 29 | 0.002913 |
| 32 | 2014 | 30 | 0.032635 |
| 41 | 2014 | 0 | 0.072300 |
| 41 | 2014 | 1 | 0.059200 |
| 41 | 2014 | 2 | 0.063100 |
| 41 | 2014 | 3 | 0.040900 |
| 41 | 2014 | 4 | 0.017800 |
| 41 | 2014 | 5 | 0.026300 |
| 41 | 2014 | 6 | 0.053200 |
| 41 | 2014 | 7 | 0.112200 |
| 41 | 2014 | 8 | 0.107200 |
| 41 | 2014 | 9 | 0.073800 |
| 41 | 2014 | 10 | 0.050800 |
| 41 | 2014 | 11 | 0.036000 |
| 41 | 2014 | 12 | 0.027200 |
| 41 | 2014 | 13 | 0.038000 |
| 41 | 2014 | 14 | 0.046600 |
| 41 | 2014 | 15 | 0.042000 |
| 41 | 2014 | 16 | 0.022600 |
| 41 | 2014 | 17 | 0.021700 |
| 41 | 2014 | 18 | 0.018500 |
| 41 | 2014 | 19 | 0.018700 |
| 41 | 2014 | 20 | 0.011200 |
| 41 | 2014 | 21 | 0.007400 |
| 41 | 2014 | 22 | 0.005400 |
| 41 | 2014 | 23 | 0.004700 |
| 41 | 2014 | 24 | 0.006300 |
| 41 | 2014 | 25 | 0.004100 |
| 41 | 2014 | 26 | 0.003200 |
| 41 | 2014 | 27 | 0.002500 |
| 41 | 2014 | 28 | 0.002000 |
| 41 | 2014 | 29 | 0.001300 |
| 41 | 2014 | 30 | 0.003800 |
| 42 | 2014 | 0 | 0.072300 |
| 42 | 2014 | 1 | 0.059200 |
| 42 | 2014 | 2 | 0.063100 |
| 42 | 2014 | 3 | 0.040900 |
| 42 | 2014 | 4 | 0.017800 |
| 42 | 2014 | 5 | 0.026300 |
| 42 | 2014 | 6 | 0.053200 |
| 42 | 2014 | 7 | 0.112200 |
| 42 | 2014 | 8 | 0.107200 |
| 42 | 2014 | 9 | 0.073800 |
| 42 | 2014 | 10 | 0.050800 |
| 42 | 2014 | 11 | 0.036000 |
| 42 | 2014 | 12 | 0.027200 |
| 42 | 2014 | 13 | 0.038000 |
| 42 | 2014 | 14 | 0.046600 |
| 42 | 2014 | 15 | 0.042000 |
| 42 | 2014 | 16 | 0.022600 |
| 42 | 2014 | 17 | 0.021700 |
| 42 | 2014 | 18 | 0.018500 |
| 42 | 2014 | 19 | 0.018700 |
| 42 | 2014 | 20 | 0.011200 |
| 42 | 2014 | 21 | 0.007400 |
| 42 | 2014 | 22 | 0.005400 |
| 42 | 2014 | 23 | 0.004700 |
| 42 | 2014 | 24 | 0.006300 |
| 42 | 2014 | 25 | 0.004100 |
| 42 | 2014 | 26 | 0.003200 |
| 42 | 2014 | 27 | 0.002500 |
| 42 | 2014 | 28 | 0.002000 |
| 42 | 2014 | 29 | 0.001300 |
| 42 | 2014 | 30 | 0.003800 |
| 43 | 2014 | 0 | 0.126012 |
| 43 | 2014 | 1 | 0.081608 |
| 43 | 2014 | 2 | 0.075807 |
| 43 | 2014 | 3 | 0.050205 |
| 43 | 2014 | 4 | 0.026602 |
| 43 | 2014 | 5 | 0.032103 |
| 43 | 2014 | 6 | 0.068206 |
| 43 | 2014 | 7 | 0.114311 |
| 43 | 2014 | 8 | 0.118011 |
| 43 | 2014 | 9 | 0.063606 |
| 43 | 2014 | 10 | 0.030203 |
| 43 | 2014 | 11 | 0.021602 |
| 43 | 2014 | 12 | 0.015701 |
| 43 | 2014 | 13 | 0.020802 |
| 43 | 2014 | 14 | 0.048605 |
| 43 | 2014 | 15 | 0.026302 |
| 43 | 2014 | 16 | 0.014801 |
| 43 | 2014 | 17 | 0.013801 |
| 43 | 2014 | 18 | 0.009201 |
| 43 | 2014 | 19 | 0.009201 |
| 43 | 2014 | 20 | 0.005801 |
| 43 | 2014 | 21 | 0.004100 |
| 43 | 2014 | 22 | 0.002900 |
| 43 | 2014 | 23 | 0.003200 |
| 43 | 2014 | 24 | 0.003200 |
| 43 | 2014 | 25 | 0.002300 |
| 43 | 2014 | 26 | 0.001900 |
| 43 | 2014 | 27 | 0.001300 |
| 43 | 2014 | 28 | 0.001300 |
| 43 | 2014 | 29 | 0.000900 |
| 43 | 2014 | 30 | 0.006407 |
| 51 | 2014 | 0 | 0.126000 |
| 51 | 2014 | 1 | 0.081600 |
| 51 | 2014 | 2 | 0.075800 |
| 51 | 2014 | 3 | 0.050200 |
| 51 | 2014 | 4 | 0.026600 |
| 51 | 2014 | 5 | 0.032100 |
| 51 | 2014 | 6 | 0.068200 |
| 51 | 2014 | 7 | 0.114300 |
| 51 | 2014 | 8 | 0.118000 |
| 51 | 2014 | 9 | 0.063600 |
| 51 | 2014 | 10 | 0.030200 |
| 51 | 2014 | 11 | 0.021600 |
| 51 | 2014 | 12 | 0.015700 |
| 51 | 2014 | 13 | 0.020800 |
| 51 | 2014 | 14 | 0.048600 |
| 51 | 2014 | 15 | 0.026300 |
| 51 | 2014 | 16 | 0.014800 |
| 51 | 2014 | 17 | 0.013800 |
| 51 | 2014 | 18 | 0.009200 |
| 51 | 2014 | 19 | 0.009200 |
| 51 | 2014 | 20 | 0.005800 |
| 51 | 2014 | 21 | 0.004100 |
| 51 | 2014 | 22 | 0.002900 |
| 51 | 2014 | 23 | 0.003200 |
| 51 | 2014 | 24 | 0.003200 |
| 51 | 2014 | 25 | 0.002300 |
| 51 | 2014 | 26 | 0.001900 |
| 51 | 2014 | 27 | 0.001300 |
| 51 | 2014 | 28 | 0.001300 |
| 51 | 2014 | 29 | 0.000900 |
| 51 | 2014 | 30 | 0.006500 |
| 52 | 2014 | 0 | 0.116089 |
| 52 | 2014 | 1 | 0.074980 |
| 52 | 2014 | 2 | 0.065956 |
| 52 | 2014 | 3 | 0.047090 |
| 52 | 2014 | 4 | 0.026475 |
| 52 | 2014 | 5 | 0.028604 |
| 52 | 2014 | 6 | 0.063398 |

| Source TypeID | YearID | AgeID | AgeFraction |
|---|---|---|---|
| 52 | 2014 | 7 | 0.100180 |
| 52 | 2014 | 8 | 0.104724 |
| 52 | 2014 | 9 | 0.062119 |
| 52 | 2014 | 10 | 0.038902 |
| 52 | 2014 | 11 | 0.029700 |
| 52 | 2014 | 12 | 0.024288 |
| 52 | 2014 | 13 | 0.029128 |
| 52 | 2014 | 14 | 0.047409 |
| 52 | 2014 | 15 | 0.028261 |
| 52 | 2014 | 16 | 0.018284 |
| 52 | 2014 | 17 | 0.017559 |
| 52 | 2014 | 18 | 0.012040 |
| 52 | 2014 | 19 | 0.011898 |
| 52 | 2014 | 20 | 0.008784 |
| 52 | 2014 | 21 | 0.006045 |
| 52 | 2014 | 22 | 0.004177 |
| 52 | 2014 | 23 | 0.004124 |
| 52 | 2014 | 24 | 0.003943 |
| 52 | 2014 | 25 | 0.003346 |
| 52 | 2014 | 26 | 0.002635 |
| 52 | 2014 | 27 | 0.001793 |
| 52 | 2014 | 28 | 0.002062 |
| 52 | 2014 | 29 | 0.001505 |
| 52 | 2014 | 30 | 0.014500 |
| 53 | 2014 | 0 | 0.127928 |
| 53 | 2014 | 1 | 0.081924 |
| 53 | 2014 | 2 | 0.075332 |
| 53 | 2014 | 3 | 0.050230 |
| 53 | 2014 | 4 | 0.026607 |
| 53 | 2014 | 5 | 0.031870 |
| 53 | 2014 | 6 | 0.067955 |
| 53 | 2014 | 7 | 0.113257 |
| 53 | 2014 | 8 | 0.116866 |
| 53 | 2014 | 9 | 0.063248 |
| 53 | 2014 | 10 | 0.030347 |
| 53 | 2014 | 11 | 0.021731 |
| 53 | 2014 | 12 | 0.015805 |
| 53 | 2014 | 13 | 0.020928 |
| 53 | 2014 | 14 | 0.048227 |
| 53 | 2014 | 15 | 0.026176 |
| 53 | 2014 | 16 | 0.014812 |
| 53 | 2014 | 17 | 0.013827 |
| 53 | 2014 | 18 | 0.009234 |
| 53 | 2014 | 19 | 0.009236 |
| 53 | 2014 | 20 | 0.005866 |
| 53 | 2014 | 21 | 0.004166 |
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| 53 | 2014 | 26 | 0.001935 |

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| 54 | 2014 | 0 | 0.126042 |
| 54 | 2014 | 1 | 0.081627 |
| 54 | 2014 | 2 | 0.075825 |
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| 54 | 2014 | 8 | 0.118039 |
| 54 | 2014 | 9 | 0.063621 |
| 54 | 2014 | 10 | 0.030210 |
| 54 | 2014 | 11 | 0.021607 |
| 54 | 2014 | 12 | 0.015705 |
| 54 | 2014 | 13 | 0.020807 |
| 54 | 2014 | 14 | 0.048616 |
| 54 | 2014 | 15 | 0.026309 |
| 54 | 2014 | 16 | 0.014805 |
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| 54 | 2014 | 26 | 0.001901 |
| 54 | 2014 | 27 | 0.001300 |
| 54 | 2014 | 28 | 0.001300 |
| 54 | 2014 | 29 | 0.000900 |
| 54 | 2014 | 30 | 0.006171 |
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| 61 | 2014 | 5 | 0.032101 |
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| 61 | 2014 | 9 | 0.063602 |
| 61 | 2014 | 10 | 0.030201 |
| 61 | 2014 | 11 | 0.021601 |
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| 61 | 2014 | 14 | 0.048602 |
| 61 | 2014 | 15 | 0.026301 |

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| 61 | 2014 | 20 | 0.005800 |
| 61 | 2014 | 21 | 0.004100 |
| 61 | 2014 | 22 | 0.002900 |
| 61 | 2014 | 23 | 0.003200 |
| 61 | 2014 | 24 | 0.003200 |
| 61 | 2014 | 25 | 0.002300 |
| 61 | 2014 | 26 | 0.001900 |
| 61 | 2014 | 27 | 0.001300 |
| 61 | 2014 | 28 | 0.001300 |
| 61 | 2014 | 29 | 0.000900 |
| 61 | 2014 | 30 | 0.006462 |
| 62 | 2014 | 0 | 0.126002 |
| 62 | 2014 | 1 | 0.081601 |
| 62 | 2014 | 2 | 0.075801 |
| 62 | 2014 | 3 | 0.050201 |
| 62 | 2014 | 4 | 0.026600 |
| 62 | 2014 | 5 | 0.032100 |
| 62 | 2014 | 6 | 0.068201 |
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| 62 | 2014 | 9 | 0.063601 |
| 62 | 2014 | 10 | 0.030200 |
| 62 | 2014 | 11 | 0.021600 |
| 62 | 2014 | 12 | 0.015700 |
| 62 | 2014 | 13 | 0.020800 |
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| 62 | 2014 | 15 | 0.026300 |
| 62 | 2014 | 16 | 0.014800 |
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**[IMCoverage]**

| polProcess ID | State ID | County ID | yearID | sourceTypeID | fuelTypeID | IMProgramID | Beg ModelYearID | End ModelYearID | inspectFreq | Test StandardsID | useIMyn | Compliance Factor |
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| polProcess ID | State ID | County ID | yearID | sourceTypeID | fuelTypeID | IMProgramID | Beg ModelYearID | End ModelYearID | inspectFreq | Test StandardsID | useIMyn | Compliance Factor |
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| 113 | 4 | 4013 | 2014 | 61 | 5 | 511 | 1967 | 1980 | 1 | 41 | Y | 86.7668 |
| 113 | 4 | 4013 | 2014 | 62 | 5 | 507 | 1981 | 2010 | 1 | 41 | Y | 85.6133 |
| 113 | 4 | 4013 | 2014 | 62 | 5 | 511 | 1967 | 1980 | 1 | 41 | Y | 86.7668 |
| 201 | 4 | 4013 | 2014 | 21 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 21 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 201 | 4 | 4013 | 2014 | 21 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 83.1594 |
| 201 | 4 | 4013 | 2014 | 31 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 31 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 201 | 4 | 4013 | 2014 | 31 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 78.1699 |
| 201 | 4 | 4013 | 2014 | 32 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 32 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 201 | 4 | 4013 | 2014 | 32 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 73.1802 |
| 201 | 4 | 4013 | 2014 | 41 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 42 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 43 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 51 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 52 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 53 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 54 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 61 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 201 | 4 | 4013 | 2014 | 62 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 21 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 21 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 202 | 4 | 4013 | 2014 | 21 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 83.1594 |
| 202 | 4 | 4013 | 2014 | 31 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 31 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |

| polProcess ID | State ID | County ID | yearID | sourceTypeID | fuelTypeID | IMProgramID | Beg ModelYearID | End ModelYearID | inspectFreq | Test StandardsID | useIMyn | Compliance Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 202 | 4 | 4013 | 2014 | 31 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 78.1699 |
| 202 | 4 | 4013 | 2014 | 32 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 32 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 202 | 4 | 4013 | 2014 | 32 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 73.1802 |
| 202 | 4 | 4013 | 2014 | 41 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 42 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 43 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 51 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 52 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 53 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 54 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 61 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 202 | 4 | 4013 | 2014 | 62 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 21 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 21 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 301 | 4 | 4013 | 2014 | 21 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 83.1594 |
| 301 | 4 | 4013 | 2014 | 31 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 31 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 301 | 4 | 4013 | 2014 | 31 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 78.1699 |
| 301 | 4 | 4013 | 2014 | 32 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 32 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 301 | 4 | 4013 | 2014 | 32 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 73.1802 |
| 301 | 4 | 4013 | 2014 | 41 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 42 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 43 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 51 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 52 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 53 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 54 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 61 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 301 | 4 | 4013 | 2014 | 62 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 21 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 21 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 302 | 4 | 4013 | 2014 | 21 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 83.1594 |
| 302 | 4 | 4013 | 2014 | 31 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 31 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 302 | 4 | 4013 | 2014 | 31 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 78.1699 |
| 302 | 4 | 4013 | 2014 | 32 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 32 | 5 | 506 | 1981 | 1995 | 2 | 31 | Y | 63.6192 |
| 302 | 4 | 4013 | 2014 | 32 | 5 | 510 | 1996 | 2010 | 2 | 51 | Y | 73.1802 |
| 302 | 4 | 4013 | 2014 | 41 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 42 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 43 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 51 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 52 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 53 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 54 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 61 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 302 | 4 | 4013 | 2014 | 62 | 5 | 503 | 1967 | 1980 | 1 | 13 | Y | 57.2079 |
| 101 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 101 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 102 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 201 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 202 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 301 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |

| polProcess ID | State ID | County ID | yearID | sourceTypeID | fuelTypeID | IMProgramID | Beg ModelYearID | End ModelYearID | inspectFreq | Test StandardsID | useIMyn | Compliance Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 41 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 42 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 43 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 51 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 52 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 53 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 54 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 61 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |
| 302 | 4 | 4013 | 2014 | 62 | 5 | 504 | 1981 | 2010 | 2 | 13 | Y | 86.5221 |

## [RoadType]

| roadTypeID | rampFraction |
|---|---|
| 2 | 0.071069 |
| 4 | 0.132624 |

## [RoadTypeDistribution]

| sourceTypeID | roadTypeID | roadTypeVMTFraction |
|---|---|---|
| 11 | 1 | 0.00000 |
| 11 | 2 | 0.02599 |
| 11 | 3 | 0.08524 |
| 11 | 4 | 0.30636 |
| 11 | 5 | 0.58240 |
| 21 | 1 | 0.00000 |
| 21 | 2 | 0.02645 |
| 21 | 3 | 0.06762 |
| 21 | 4 | 0.37328 |
| 21 | 5 | 0.53265 |
| 31 | 1 | 0.00000 |
| 31 | 2 | 0.02645 |
| 31 | 3 | 0.06762 |
| 31 | 4 | 0.37328 |
| 31 | 5 | 0.53265 |
| 32 | 1 | 0.00000 |
| 32 | 2 | 0.02645 |
| 32 | 3 | 0.06762 |
| 32 | 4 | 0.37328 |
| 32 | 5 | 0.53265 |
| 41 | 1 | 0.00000 |
| 41 | 2 | 0.15058 |
| 41 | 3 | 0.07218 |
| 41 | 4 | 0.44269 |
| 41 | 5 | 0.33456 |
| 42 | 1 | 0.00000 |
| 42 | 2 | 0.15058 |
| 42 | 3 | 0.07218 |
| 42 | 4 | 0.44269 |
| 42 | 5 | 0.33456 |
| 43 | 1 | 0.00000 |
| 43 | 2 | 0.15058 |
| 43 | 3 | 0.07218 |
| 43 | 4 | 0.44269 |
| 43 | 5 | 0.33456 |
| 51 | 1 | 0.00000 |
| 51 | 2 | 0.05298 |
| 51 | 3 | 0.06458 |
| 51 | 4 | 0.53405 |
| 51 | 5 | 0.34840 |
| 52 | 1 | 0.00000 |
| 52 | 2 | 0.05298 |
| 52 | 3 | 0.06458 |
| 52 | 4 | 0.53405 |
| 52 | 5 | 0.34840 |
| 53 | 1 | 0.00000 |
| 53 | 2 | 0.05298 |
| 53 | 3 | 0.06458 |
| 53 | 4 | 0.53405 |
| 53 | 5 | 0.34840 |
| 54 | 1 | 0.00000 |
| 54 | 2 | 0.05298 |
| 54 | 3 | 0.06458 |
| 54 | 4 | 0.53405 |
| 54 | 5 | 0.34840 |
| 61 | 1 | 0.00000 |
| 61 | 2 | 0.25094 |
| 61 | 3 | 0.06567 |
| 61 | 4 | 0.48229 |
| 61 | 5 | 0.20111 |
| 62 | 1 | 0.00000 |
| 62 | 2 | 0.25094 |
| 62 | 3 | 0.06567 |
| 62 | 4 | 0.48229 |
| 62 | 5 | 0.20111 |

**[MonthVMTFraction]**

| sourceTypeID | monthID | monthVMTFraction |
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| 11 | 1 | 0.083175 |
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| 41 | 1 | 0.083175 |
| 42 | 1 | 0.083175 |
| 43 | 1 | 0.083175 |
| 51 | 1 | 0.083175 |
| 52 | 1 | 0.083175 |
| 53 | 1 | 0.083175 |
| 54 | 1 | 0.083175 |
| 61 | 1 | 0.083175 |
| 62 | 1 | 0.083175 |
| 11 | 2 | 0.085878 |
| 21 | 2 | 0.085878 |
| 31 | 2 | 0.085878 |
| 32 | 2 | 0.085878 |
| 41 | 2 | 0.085878 |
| 42 | 2 | 0.085878 |
| 43 | 2 | 0.085878 |
| 51 | 2 | 0.085878 |
| 52 | 2 | 0.085878 |
| 53 | 2 | 0.085878 |
| 54 | 2 | 0.085878 |
| 61 | 2 | 0.085878 |
| 62 | 2 | 0.085878 |
| 11 | 3 | 0.086154 |
| 21 | 3 | 0.086154 |
| 31 | 3 | 0.086154 |
| 32 | 3 | 0.086154 |
| 41 | 3 | 0.086154 |
| 42 | 3 | 0.086154 |
| 43 | 3 | 0.086154 |
| 51 | 3 | 0.086154 |
| 52 | 3 | 0.086154 |
| 53 | 3 | 0.086154 |
| 54 | 3 | 0.086154 |
| 61 | 3 | 0.086154 |
| 62 | 3 | 0.086154 |
| 11 | 4 | 0.085796 |
| 21 | 4 | 0.085796 |
| 31 | 4 | 0.085796 |
| 32 | 4 | 0.085796 |
| 41 | 4 | 0.085796 |
| 42 | 4 | 0.085796 |
| 43 | 4 | 0.085796 |
| 51 | 4 | 0.085796 |
| 52 | 4 | 0.085796 |
| 53 | 4 | 0.085796 |
| 54 | 4 | 0.085796 |
| 61 | 4 | 0.085796 |
| 62 | 4 | 0.085796 |
| 11 | 5 | 0.084240 |
| 21 | 5 | 0.084240 |
| 31 | 5 | 0.084240 |
| 32 | 5 | 0.084240 |
| 41 | 5 | 0.084240 |
| 42 | 5 | 0.084240 |
| 43 | 5 | 0.084240 |
| 51 | 5 | 0.084240 |
| 52 | 5 | 0.084240 |
| 53 | 5 | 0.084240 |
| 54 | 5 | 0.084240 |
| 61 | 5 | 0.084240 |
| 62 | 5 | 0.084240 |
| 11 | 6 | 0.082456 |
| 21 | 6 | 0.082456 |
| 31 | 6 | 0.082456 |
| 32 | 6 | 0.082456 |
| 41 | 6 | 0.082456 |
| 42 | 6 | 0.082456 |
| 43 | 6 | 0.082456 |
| 51 | 6 | 0.082456 |
| 52 | 6 | 0.082456 |
| 53 | 6 | 0.082456 |
| 54 | 6 | 0.082456 |
| 61 | 6 | 0.082456 |
| 62 | 6 | 0.082456 |
| 11 | 7 | 0.078756 |
| 21 | 7 | 0.078756 |
| 31 | 7 | 0.078756 |
| 32 | 7 | 0.078756 |
| 41 | 7 | 0.078756 |
| 42 | 7 | 0.078756 |
| 43 | 7 | 0.078756 |
| 51 | 7 | 0.078756 |
| 52 | 7 | 0.078756 |
| 53 | 7 | 0.078756 |
| 54 | 7 | 0.078756 |
| 61 | 7 | 0.078756 |
| 62 | 7 | 0.078756 |
| 11 | 8 | 0.080695 |
| 21 | 8 | 0.080695 |
| 31 | 8 | 0.080695 |
| 32 | 8 | 0.080695 |
| 41 | 8 | 0.080695 |
| 42 | 8 | 0.080695 |
| 43 | 8 | 0.080695 |
| 51 | 8 | 0.080695 |
| 52 | 8 | 0.080695 |
| 53 | 8 | 0.080695 |
| 54 | 8 | 0.080695 |
| 61 | 8 | 0.080695 |
| 62 | 8 | 0.080695 |
| 11 | 9 | 0.082213 |
| 21 | 9 | 0.082213 |
| 31 | 9 | 0.082213 |
| 32 | 9 | 0.082213 |
| 41 | 9 | 0.082213 |
| 42 | 9 | 0.082213 |
| 43 | 9 | 0.082213 |
| 51 | 9 | 0.082213 |
| 52 | 9 | 0.082213 |
| 53 | 9 | 0.082213 |
| 54 | 9 | 0.082213 |
| 61 | 9 | 0.082213 |
| 62 | 9 | 0.082213 |
| 11 | 10 | 0.083410 |
| 21 | 10 | 0.083410 |
| 31 | 10 | 0.083410 |
| 32 | 10 | 0.083410 |
| 41 | 10 | 0.083410 |
| 42 | 10 | 0.083410 |
| 43 | 10 | 0.083410 |
| 51 | 10 | 0.083410 |
| 52 | 10 | 0.083410 |
| 53 | 10 | 0.083410 |
| 54 | 10 | 0.083410 |
| 61 | 10 | 0.083410 |
| 62 | 10 | 0.083410 |
| 11 | 11 | 0.083996 |
| 21 | 11 | 0.083996 |
| 31 | 11 | 0.083996 |
| 32 | 11 | 0.083996 |
| 41 | 11 | 0.083996 |
| 42 | 11 | 0.083996 |
| 43 | 11 | 0.083996 |
| 51 | 11 | 0.083996 |
| 52 | 11 | 0.083996 |
| 53 | 11 | 0.083996 |
| 54 | 11 | 0.083996 |
| 61 | 11 | 0.083996 |
| 62 | 11 | 0.083996 |
| 11 | 12 | 0.083232 |
| 21 | 12 | 0.083232 |
| 31 | 12 | 0.083232 |
| 32 | 12 | 0.083232 |
| 41 | 12 | 0.083232 |
| 42 | 12 | 0.083232 |
| 43 | 12 | 0.083232 |
| 51 | 12 | 0.083232 |
| 52 | 12 | 0.083232 |
| 53 | 12 | 0.083232 |
| 54 | 12 | 0.083232 |
| 61 | 12 | 0.083232 |
| 62 | 12 | 0.083232 |

**[DayVMTFraction] (July 2014)**

| Source TypeID | Month ID | Road TypeID | dayID | Day VMTFraction |
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| 31 | 7 | 1 | 5 | 0.780932 |
| 32 | 7 | 1 | 5 | 0.780932 |
| 41 | 7 | 1 | 5 | 0.780932 |
| 42 | 7 | 1 | 5 | 0.780932 |
| 43 | 7 | 1 | 5 | 0.780932 |
| 51 | 7 | 1 | 5 | 0.780932 |
| 52 | 7 | 1 | 5 | 0.780932 |
| 53 | 7 | 1 | 5 | 0.780932 |
| 54 | 7 | 1 | 5 | 0.780932 |
| 61 | 7 | 1 | 5 | 0.780932 |
| 62 | 7 | 1 | 5 | 0.780932 |
| 11 | 7 | 2 | 5 | 0.783228 |
| 21 | 7 | 2 | 5 | 0.783228 |
| 31 | 7 | 2 | 5 | 0.783228 |
| 32 | 7 | 2 | 5 | 0.783228 |
| 41 | 7 | 2 | 5 | 0.783228 |
| 42 | 7 | 2 | 5 | 0.783228 |
| 43 | 7 | 2 | 5 | 0.783228 |
| 51 | 7 | 2 | 5 | 0.783228 |
| 52 | 7 | 2 | 5 | 0.783228 |
| 53 | 7 | 2 | 5 | 0.783228 |
| 54 | 7 | 2 | 5 | 0.783228 |
| 61 | 7 | 2 | 5 | 0.783228 |
| 62 | 7 | 2 | 5 | 0.783228 |
| 11 | 7 | 3 | 5 | 0.778523 |
| 21 | 7 | 3 | 5 | 0.778523 |
| 31 | 7 | 3 | 5 | 0.778523 |
| 32 | 7 | 3 | 5 | 0.778523 |
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| 42 | 7 | 3 | 5 | 0.778523 |
| 43 | 7 | 3 | 5 | 0.778523 |
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| 52 | 7 | 3 | 5 | 0.778523 |
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| 61 | 7 | 3 | 5 | 0.778523 |
| 62 | 7 | 3 | 5 | 0.778523 |
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| 32 | 7 | 4 | 5 | 0.783228 |
| 41 | 7 | 4 | 5 | 0.783228 |
| 42 | 7 | 4 | 5 | 0.783228 |
| 43 | 7 | 4 | 5 | 0.783228 |
| 51 | 7 | 4 | 5 | 0.783228 |
| 52 | 7 | 4 | 5 | 0.783228 |
| 53 | 7 | 4 | 5 | 0.783228 |
| 54 | 7 | 4 | 5 | 0.783228 |
| 61 | 7 | 4 | 5 | 0.783228 |
| 62 | 7 | 4 | 5 | 0.783228 |
| 11 | 7 | 5 | 5 | 0.778523 |
| 21 | 7 | 5 | 5 | 0.778523 |
| 31 | 7 | 5 | 5 | 0.778523 |
| 32 | 7 | 5 | 5 | 0.778523 |
| 41 | 7 | 5 | 5 | 0.778523 |
| 42 | 7 | 5 | 5 | 0.778523 |
| 43 | 7 | 5 | 5 | 0.778523 |
| 51 | 7 | 5 | 5 | 0.778523 |
| 52 | 7 | 5 | 5 | 0.778523 |
| 53 | 7 | 5 | 5 | 0.778523 |
| 54 | 7 | 5 | 5 | 0.778523 |
| 61 | 7 | 5 | 5 | 0.778523 |
| 62 | 7 | 5 | 5 | 0.778523 |
| 11 | 7 | 1 | 2 | 0.219068 |
| 21 | 7 | 1 | 2 | 0.219068 |
| 31 | 7 | 1 | 2 | 0.219068 |
| 32 | 7 | 1 | 2 | 0.219068 |
| 41 | 7 | 1 | 2 | 0.219068 |
| 42 | 7 | 1 | 2 | 0.219068 |
| 43 | 7 | 1 | 2 | 0.219068 |
| 51 | 7 | 1 | 2 | 0.219068 |
| 52 | 7 | 1 | 2 | 0.219068 |
| 53 | 7 | 1 | 2 | 0.219068 |
| 54 | 7 | 1 | 2 | 0.219068 |
| 61 | 7 | 1 | 2 | 0.219068 |
| 62 | 7 | 1 | 2 | 0.219068 |
| 11 | 7 | 2 | 2 | 0.216772 |
| 21 | 7 | 2 | 2 | 0.216772 |
| 31 | 7 | 2 | 2 | 0.216772 |
| 32 | 7 | 2 | 2 | 0.216772 |
| 41 | 7 | 2 | 2 | 0.216772 |
| 42 | 7 | 2 | 2 | 0.216772 |
| 43 | 7 | 2 | 2 | 0.216772 |
| 51 | 7 | 2 | 2 | 0.216772 |
| 52 | 7 | 2 | 2 | 0.216772 |
| 53 | 7 | 2 | 2 | 0.216772 |
| 54 | 7 | 2 | 2 | 0.216772 |
| 61 | 7 | 2 | 2 | 0.216772 |
| 62 | 7 | 2 | 2 | 0.216772 |
| 11 | 7 | 3 | 2 | 0.221477 |
| 21 | 7 | 3 | 2 | 0.221477 |
| 31 | 7 | 3 | 2 | 0.221477 |
| 32 | 7 | 3 | 2 | 0.221477 |
| 41 | 7 | 3 | 2 | 0.221477 |
| 42 | 7 | 3 | 2 | 0.221477 |
| 43 | 7 | 3 | 2 | 0.221477 |
| 51 | 7 | 3 | 2 | 0.221477 |
| 52 | 7 | 3 | 2 | 0.221477 |
| 53 | 7 | 3 | 2 | 0.221477 |
| 54 | 7 | 3 | 2 | 0.221477 |
| 61 | 7 | 3 | 2 | 0.221477 |
| 62 | 7 | 3 | 2 | 0.221477 |
| 11 | 7 | 4 | 2 | 0.216772 |
| 21 | 7 | 4 | 2 | 0.216772 |
| 31 | 7 | 4 | 2 | 0.216772 |
| 32 | 7 | 4 | 2 | 0.216772 |
| 41 | 7 | 4 | 2 | 0.216772 |
| 42 | 7 | 4 | 2 | 0.216772 |
| 43 | 7 | 4 | 2 | 0.216772 |
| 51 | 7 | 4 | 2 | 0.216772 |
| 52 | 7 | 4 | 2 | 0.216772 |
| 53 | 7 | 4 | 2 | 0.216772 |
| 54 | 7 | 4 | 2 | 0.216772 |
| 61 | 7 | 4 | 2 | 0.216772 |
| 62 | 7 | 4 | 2 | 0.216772 |
| 11 | 7 | 5 | 2 | 0.221477 |
| 21 | 7 | 5 | 2 | 0.221477 |
| 31 | 7 | 5 | 2 | 0.221477 |
| 32 | 7 | 5 | 2 | 0.221477 |
| 41 | 7 | 5 | 2 | 0.221477 |
| 42 | 7 | 5 | 2 | 0.221477 |
| 43 | 7 | 5 | 2 | 0.221477 |
| 51 | 7 | 5 | 2 | 0.221477 |
| 52 | 7 | 5 | 2 | 0.221477 |
| 53 | 7 | 5 | 2 | 0.221477 |
| 54 | 7 | 5 | 2 | 0.221477 |
| 61 | 7 | 5 | 2 | 0.221477 |
| 62 | 7 | 5 | 2 | 0.221477 |

**[HourVMTFraction] (SourceTypeID 21: Passenger Car)**

| Source TypeID | Road TypeID | dayID | hourID | hourVMT Fraction |
|---|---|---|---|---|
| 21 | 1 | 2 | 1 | 0.0216 |
| 21 | 1 | 2 | 2 | 0.0156 |
| 21 | 1 | 2 | 3 | 0.0139 |
| 21 | 1 | 2 | 4 | 0.0110 |
| 21 | 1 | 2 | 5 | 0.0142 |
| 21 | 1 | 2 | 6 | 0.0215 |
| 21 | 1 | 2 | 7 | 0.0289 |
| 21 | 1 | 2 | 8 | 0.0354 |
| 21 | 1 | 2 | 9 | 0.0413 |
| 21 | 1 | 2 | 10 | 0.0489 |
| 21 | 1 | 2 | 11 | 0.0551 |
| 21 | 1 | 2 | 12 | 0.0592 |
| 21 | 1 | 2 | 13 | 0.0634 |
| 21 | 1 | 2 | 14 | 0.0639 |
| 21 | 1 | 2 | 15 | 0.0627 |
| 21 | 1 | 2 | 16 | 0.0623 |
| 21 | 1 | 2 | 17 | 0.0627 |
| 21 | 1 | 2 | 18 | 0.0613 |
| 21 | 1 | 2 | 19 | 0.0581 |
| 21 | 1 | 2 | 20 | 0.0505 |
| 21 | 1 | 2 | 21 | 0.0453 |
| 21 | 1 | 2 | 22 | 0.0417 |
| 21 | 1 | 2 | 23 | 0.0356 |
| 21 | 1 | 2 | 24 | 0.0257 |
| 21 | 1 | 5 | 1 | 0.0080 |
| 21 | 1 | 5 | 2 | 0.0055 |
| 21 | 1 | 5 | 3 | 0.0052 |
| 21 | 1 | 5 | 4 | 0.0077 |
| 21 | 1 | 5 | 5 | 0.0223 |
| 21 | 1 | 5 | 6 | 0.0376 |
| 21 | 1 | 5 | 7 | 0.0536 |
| 21 | 1 | 5 | 8 | 0.0654 |
| 21 | 1 | 5 | 9 | 0.0602 |
| 21 | 1 | 5 | 10 | 0.0518 |
| 21 | 1 | 5 | 11 | 0.0501 |
| 21 | 1 | 5 | 12 | 0.0534 |
| 21 | 1 | 5 | 13 | 0.0565 |
| 21 | 1 | 5 | 14 | 0.0595 |
| 21 | 1 | 5 | 15 | 0.0637 |
| 21 | 1 | 5 | 16 | 0.0670 |
| 21 | 1 | 5 | 17 | 0.0688 |
| 21 | 1 | 5 | 18 | 0.0691 |
| 21 | 1 | 5 | 19 | 0.0568 |
| 21 | 1 | 5 | 20 | 0.0408 |
| 21 | 1 | 5 | 21 | 0.0334 |
| 21 | 1 | 5 | 22 | 0.0288 |
| 21 | 1 | 5 | 23 | 0.0211 |
| 21 | 1 | 5 | 24 | 0.0137 |
| 21 | 2 | 2 | 1 | 0.0219 |
| 21 | 2 | 2 | 2 | 0.0162 |
| 21 | 2 | 2 | 3 | 0.0144 |
| 21 | 2 | 2 | 4 | 0.0116 |
| 21 | 2 | 2 | 5 | 0.0159 |
| 21 | 2 | 2 | 6 | 0.0231 |
| 21 | 2 | 2 | 7 | 0.0297 |
| 21 | 2 | 2 | 8 | 0.0358 |
| 21 | 2 | 2 | 9 | 0.0413 |
| 21 | 2 | 2 | 10 | 0.0484 |
| 21 | 2 | 2 | 11 | 0.0545 |
| 21 | 2 | 2 | 12 | 0.0587 |
| 21 | 2 | 2 | 13 | 0.0628 |
| 21 | 2 | 2 | 14 | 0.0632 |
| 21 | 2 | 2 | 15 | 0.0618 |
| 21 | 2 | 2 | 16 | 0.0613 |
| 21 | 2 | 2 | 17 | 0.0617 |
| 21 | 2 | 2 | 18 | 0.0600 |
| 21 | 2 | 2 | 19 | 0.0571 |
| 21 | 2 | 2 | 20 | 0.0503 |
| 21 | 2 | 2 | 21 | 0.0461 |
| 21 | 2 | 2 | 22 | 0.0423 |
| 21 | 2 | 2 | 23 | 0.0358 |
| 21 | 2 | 2 | 24 | 0.0260 |
| 21 | 2 | 5 | 1 | 0.0097 |
| 21 | 2 | 5 | 2 | 0.0069 |
| 21 | 2 | 5 | 3 | 0.0069 |
| 21 | 2 | 5 | 4 | 0.0110 |
| 21 | 2 | 5 | 5 | 0.0339 |
| 21 | 2 | 5 | 6 | 0.0484 |
| 21 | 2 | 5 | 7 | 0.0579 |
| 21 | 2 | 5 | 8 | 0.0612 |
| 21 | 2 | 5 | 9 | 0.0573 |
| 21 | 2 | 5 | 10 | 0.0531 |
| 21 | 2 | 5 | 11 | 0.0504 |
| 21 | 2 | 5 | 12 | 0.0520 |
| 21 | 2 | 5 | 13 | 0.0548 |
| 21 | 2 | 5 | 14 | 0.0609 |
| 21 | 2 | 5 | 15 | 0.0635 |
| 21 | 2 | 5 | 16 | 0.0615 |
| 21 | 2 | 5 | 17 | 0.0599 |
| 21 | 2 | 5 | 18 | 0.0581 |
| 21 | 2 | 5 | 19 | 0.0503 |
| 21 | 2 | 5 | 20 | 0.0387 |
| 21 | 2 | 5 | 21 | 0.0331 |
| 21 | 2 | 5 | 22 | 0.0299 |
| 21 | 2 | 5 | 23 | 0.0239 |
| 21 | 2 | 5 | 24 | 0.0165 |
| 21 | 3 | 2 | 1 | 0.0213 |
| 21 | 3 | 2 | 2 | 0.0151 |
| 21 | 3 | 2 | 3 | 0.0135 |
| 21 | 3 | 2 | 4 | 0.0103 |
| 21 | 3 | 2 | 5 | 0.0124 |
| 21 | 3 | 2 | 6 | 0.0199 |
| 21 | 3 | 2 | 7 | 0.0281 |
| 21 | 3 | 2 | 8 | 0.0349 |
| 21 | 3 | 2 | 9 | 0.0414 |
| 21 | 3 | 2 | 10 | 0.0493 |
| 21 | 3 | 2 | 11 | 0.0558 |
| 21 | 3 | 2 | 12 | 0.0598 |
| 21 | 3 | 2 | 13 | 0.0640 |
| 21 | 3 | 2 | 14 | 0.0646 |
| 21 | 3 | 2 | 15 | 0.0637 |
| 21 | 3 | 2 | 16 | 0.0634 |
| 21 | 3 | 2 | 17 | 0.0638 |
| 21 | 3 | 2 | 18 | 0.0627 |
| 21 | 3 | 2 | 19 | 0.0592 |
| 21 | 3 | 2 | 20 | 0.0508 |
| 21 | 3 | 2 | 21 | 0.0445 |
| 21 | 3 | 2 | 22 | 0.0410 |
| 21 | 3 | 2 | 23 | 0.0354 |
| 21 | 3 | 2 | 24 | 0.0254 |
| 21 | 3 | 5 | 1 | 0.0061 |
| 21 | 3 | 5 | 2 | 0.0040 |
| 21 | 3 | 5 | 3 | 0.0034 |
| 21 | 3 | 5 | 4 | 0.0040 |
| 21 | 3 | 5 | 5 | 0.0096 |
| 21 | 3 | 5 | 6 | 0.0257 |
| 21 | 3 | 5 | 7 | 0.0489 |
| 21 | 3 | 5 | 8 | 0.0700 |
| 21 | 3 | 5 | 9 | 0.0633 |
| 21 | 3 | 5 | 10 | 0.0503 |
| 21 | 3 | 5 | 11 | 0.0498 |
| 21 | 3 | 5 | 12 | 0.0550 |
| 21 | 3 | 5 | 13 | 0.0584 |
| 21 | 3 | 5 | 14 | 0.0580 |
| 21 | 3 | 5 | 15 | 0.0640 |
| 21 | 3 | 5 | 16 | 0.0730 |
| 21 | 3 | 5 | 17 | 0.0785 |
| 21 | 3 | 5 | 18 | 0.0812 |
| 21 | 3 | 5 | 19 | 0.0639 |
| 21 | 3 | 5 | 20 | 0.0430 |
| 21 | 3 | 5 | 21 | 0.0338 |
| 21 | 3 | 5 | 22 | 0.0275 |
| 21 | 3 | 5 | 23 | 0.0179 |
| 21 | 3 | 5 | 24 | 0.0107 |
| 21 | 4 | 2 | 1 | 0.0219 |
| 21 | 4 | 2 | 2 | 0.0162 |
| 21 | 4 | 2 | 3 | 0.0144 |
| 21 | 4 | 2 | 4 | 0.0116 |
| 21 | 4 | 2 | 5 | 0.0159 |
| 21 | 4 | 2 | 6 | 0.0231 |
| 21 | 4 | 2 | 7 | 0.0297 |
| 21 | 4 | 2 | 8 | 0.0358 |
| 21 | 4 | 2 | 9 | 0.0413 |
| 21 | 4 | 2 | 10 | 0.0484 |
| 21 | 4 | 2 | 11 | 0.0545 |
| 21 | 4 | 2 | 12 | 0.0587 |
| 21 | 4 | 2 | 13 | 0.0628 |
| 21 | 4 | 2 | 14 | 0.0632 |
| 21 | 4 | 2 | 15 | 0.0618 |
| 21 | 4 | 2 | 16 | 0.0613 |
| 21 | 4 | 2 | 17 | 0.0617 |
| 21 | 4 | 2 | 18 | 0.0600 |
| 21 | 4 | 2 | 19 | 0.0571 |
| 21 | 4 | 2 | 20 | 0.0503 |
| 21 | 4 | 2 | 21 | 0.0461 |
| 21 | 4 | 2 | 22 | 0.0423 |
| 21 | 4 | 2 | 23 | 0.0358 |
| 21 | 4 | 2 | 24 | 0.0260 |
| 21 | 4 | 5 | 1 | 0.0097 |
| 21 | 4 | 5 | 2 | 0.0069 |
| 21 | 4 | 5 | 3 | 0.0069 |
| 21 | 4 | 5 | 4 | 0.0110 |
| 21 | 4 | 5 | 5 | 0.0339 |
| 21 | 4 | 5 | 6 | 0.0484 |
| 21 | 4 | 5 | 7 | 0.0579 |
| 21 | 4 | 5 | 8 | 0.0612 |
| 21 | 4 | 5 | 9 | 0.0573 |
| 21 | 4 | 5 | 10 | 0.0531 |
| 21 | 4 | 5 | 11 | 0.0504 |
| 21 | 4 | 5 | 12 | 0.0520 |
| 21 | 4 | 5 | 13 | 0.0548 |
| 21 | 4 | 5 | 14 | 0.0609 |
| 21 | 4 | 5 | 15 | 0.0635 |
| 21 | 4 | 5 | 16 | 0.0615 |
| 21 | 4 | 5 | 17 | 0.0599 |
| 21 | 4 | 5 | 18 | 0.0581 |
| 21 | 4 | 5 | 19 | 0.0503 |
| 21 | 4 | 5 | 20 | 0.0387 |
| 21 | 4 | 5 | 21 | 0.0331 |
| 21 | 4 | 5 | 22 | 0.0299 |
| 21 | 4 | 5 | 23 | 0.0239 |
| 21 | 4 | 5 | 24 | 0.0165 |
| 21 | 5 | 2 | 1 | 0.0213 |
| 21 | 5 | 2 | 2 | 0.0151 |
| 21 | 5 | 2 | 3 | 0.0135 |
| 21 | 5 | 2 | 4 | 0.0103 |
| 21 | 5 | 2 | 5 | 0.0124 |
| 21 | 5 | 2 | 6 | 0.0199 |
| 21 | 5 | 2 | 7 | 0.0281 |
| 21 | 5 | 2 | 8 | 0.0349 |
| 21 | 5 | 2 | 9 | 0.0414 |
| 21 | 5 | 2 | 10 | 0.0493 |
| 21 | 5 | 2 | 11 | 0.0558 |
| 21 | 5 | 2 | 12 | 0.0598 |
| 21 | 5 | 2 | 13 | 0.0640 |
| 21 | 5 | 2 | 14 | 0.0646 |
| 21 | 5 | 2 | 15 | 0.0637 |
| 21 | 5 | 2 | 16 | 0.0634 |
| 21 | 5 | 2 | 17 | 0.0638 |
| 21 | 5 | 2 | 18 | 0.0627 |
| 21 | 5 | 2 | 19 | 0.0592 |
| 21 | 5 | 2 | 20 | 0.0508 |
| 21 | 5 | 2 | 21 | 0.0445 |
| 21 | 5 | 2 | 22 | 0.0410 |
| 21 | 5 | 2 | 23 | 0.0354 |
| 21 | 5 | 2 | 24 | 0.0254 |
| 21 | 5 | 5 | 1 | 0.0061 |
| 21 | 5 | 5 | 2 | 0.0040 |
| 21 | 5 | 5 | 3 | 0.0034 |
| 21 | 5 | 5 | 4 | 0.0040 |
| 21 | 5 | 5 | 5 | 0.0096 |
| 21 | 5 | 5 | 6 | 0.0257 |
| 21 | 5 | 5 | 7 | 0.0489 |
| 21 | 5 | 5 | 8 | 0.0700 |
| 21 | 5 | 5 | 9 | 0.0633 |
| 21 | 5 | 5 | 10 | 0.0503 |
| 21 | 5 | 5 | 11 | 0.0498 |
| 21 | 5 | 5 | 12 | 0.0550 |
| 21 | 5 | 5 | 13 | 0.0584 |
| 21 | 5 | 5 | 14 | 0.0580 |
| 21 | 5 | 5 | 15 | 0.0640 |
| 21 | 5 | 5 | 16 | 0.0730 |
| 21 | 5 | 5 | 17 | 0.0785 |
| 21 | 5 | 5 | 18 | 0.0812 |
| 21 | 5 | 5 | 19 | 0.0639 |
| 21 | 5 | 5 | 20 | 0.0430 |
| 21 | 5 | 5 | 21 | 0.0338 |
| 21 | 5 | 5 | 22 | 0.0275 |
| 21 | 5 | 5 | 23 | 0.0179 |
| 21 | 5 | 5 | 24 | 0.0107 |

**[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 | 0.00000 |
| 21 | 2 | 15 | 2 | 0.00000 |
| 21 | 2 | 15 | 3 | 0.00000 |
| 21 | 2 | 15 | 4 | 0.00000 |
| 21 | 2 | 15 | 5 | 0.00000 |
| 21 | 2 | 15 | 6 | 0.00000 |
| 21 | 2 | 15 | 7 | 0.00000 |
| 21 | 2 | 15 | 8 | 0.00000 |
| 21 | 2 | 15 | 9 | 0.00000 |
| 21 | 2 | 15 | 10 | 0.00000 |
| 21 | 2 | 15 | 11 | 0.00000 |
| 21 | 2 | 15 | 12 | 0.00000 |
| 21 | 2 | 15 | 13 | 0.00000 |
| 21 | 2 | 15 | 14 | 0.04740 |
| 21 | 2 | 15 | 15 | 0.95259 |
| 21 | 2 | 15 | 16 | 0.00000 |
| 21 | 2 | 25 | 1 | 0.00000 |
| 21 | 2 | 25 | 2 | 0.00000 |
| 21 | 2 | 25 | 3 | 0.00000 |
| 21 | 2 | 25 | 4 | 0.00000 |
| 21 | 2 | 25 | 5 | 0.00000 |
| 21 | 2 | 25 | 6 | 0.00000 |
| 21 | 2 | 25 | 7 | 0.00000 |
| 21 | 2 | 25 | 8 | 0.00000 |
| 21 | 2 | 25 | 9 | 0.00000 |
| 21 | 2 | 25 | 10 | 0.00000 |
| 21 | 2 | 25 | 11 | 0.00000 |
| 21 | 2 | 25 | 12 | 0.00000 |
| 21 | 2 | 25 | 13 | 0.00000 |
| 21 | 2 | 25 | 14 | 0.04740 |
| 21 | 2 | 25 | 15 | 0.95259 |
| 21 | 2 | 25 | 16 | 0.00000 |
| 21 | 2 | 35 | 1 | 0.00000 |
| 21 | 2 | 35 | 2 | 0.00000 |
| 21 | 2 | 35 | 3 | 0.00000 |
| 21 | 2 | 35 | 4 | 0.00000 |
| 21 | 2 | 35 | 5 | 0.00000 |
| 21 | 2 | 35 | 6 | 0.00000 |
| 21 | 2 | 35 | 7 | 0.00000 |
| 21 | 2 | 35 | 8 | 0.00000 |
| 21 | 2 | 35 | 9 | 0.00000 |
| 21 | 2 | 35 | 10 | 0.00000 |
| 21 | 2 | 35 | 11 | 0.00000 |
| 21 | 2 | 35 | 12 | 0.00000 |
| 21 | 2 | 35 | 13 | 0.00000 |
| 21 | 2 | 35 | 14 | 0.04740 |
| 21 | 2 | 35 | 15 | 0.95259 |
| 21 | 2 | 35 | 16 | 0.00000 |
| 21 | 2 | 45 | 1 | 0.00000 |
| 21 | 2 | 45 | 2 | 0.00000 |
| 21 | 2 | 45 | 3 | 0.00000 |
| 21 | 2 | 45 | 4 | 0.00000 |
| 21 | 2 | 45 | 5 | 0.00000 |
| 21 | 2 | 45 | 6 | 0.00000 |
| 21 | 2 | 45 | 7 | 0.00000 |
| 21 | 2 | 45 | 8 | 0.00000 |
| 21 | 2 | 45 | 9 | 0.00000 |
| 21 | 2 | 45 | 10 | 0.00000 |
| 21 | 2 | 45 | 11 | 0.00000 |
| 21 | 2 | 45 | 12 | 0.00000 |
| 21 | 2 | 45 | 13 | 0.00000 |
| 21 | 2 | 45 | 14 | 0.04740 |
| 21 | 2 | 45 | 15 | 0.95259 |
| 21 | 2 | 45 | 16 | 0.00000 |
| 21 | 2 | 55 | 1 | 0.00000 |
| 21 | 2 | 55 | 2 | 0.00000 |
| 21 | 2 | 55 | 3 | 0.00000 |
| 21 | 2 | 55 | 4 | 0.00000 |
| 21 | 2 | 55 | 5 | 0.00000 |
| 21 | 2 | 55 | 6 | 0.00000 |
| 21 | 2 | 55 | 7 | 0.00000 |
| 21 | 2 | 55 | 8 | 0.00000 |
| 21 | 2 | 55 | 9 | 0.00000 |
| 21 | 2 | 55 | 10 | 0.00000 |
| 21 | 2 | 55 | 11 | 0.00000 |
| 21 | 2 | 55 | 12 | 0.00000 |
| 21 | 2 | 55 | 13 | 0.00000 |
| 21 | 2 | 55 | 14 | 0.04740 |
| 21 | 2 | 55 | 15 | 0.95259 |
| 21 | 2 | 55 | 16 | 0.00000 |
| 21 | 2 | 65 | 1 | 0.00000 |
| 21 | 2 | 65 | 2 | 0.00000 |
| 21 | 2 | 65 | 3 | 0.00000 |
| 21 | 2 | 65 | 4 | 0.00000 |
| 21 | 2 | 65 | 5 | 0.00000 |
| 21 | 2 | 65 | 6 | 0.00000 |
| 21 | 2 | 65 | 7 | 0.00000 |
| 21 | 2 | 65 | 8 | 0.00000 |
| 21 | 2 | 65 | 9 | 0.00000 |
| 21 | 2 | 65 | 10 | 0.00000 |
| 21 | 2 | 65 | 11 | 0.00000 |
| 21 | 2 | 65 | 12 | 0.00000 |
| 21 | 2 | 65 | 13 | 0.00000 |
| 21 | 2 | 65 | 14 | 0.04740 |
| 21 | 2 | 65 | 15 | 0.95259 |
| 21 | 2 | 65 | 16 | 0.00000 |
| 21 | 2 | 75 | 1 | 0.00000 |
| 21 | 2 | 75 | 2 | 0.00000 |
| 21 | 2 | 75 | 3 | 0.00000 |
| 21 | 2 | 75 | 4 | 0.00000 |
| 21 | 2 | 75 | 5 | 0.00000 |
| 21 | 2 | 75 | 6 | 0.00000 |
| 21 | 2 | 75 | 7 | 0.00000 |
| 21 | 2 | 75 | 8 | 0.02627 |
| 21 | 2 | 75 | 9 | 0.00000 |
| 21 | 2 | 75 | 10 | 0.00000 |
| 21 | 2 | 75 | 11 | 0.05723 |
| 21 | 2 | 75 | 12 | 0.02975 |
| 21 | 2 | 75 | 13 | 0.10615 |
| 21 | 2 | 75 | 14 | 0.20489 |
| 21 | 2 | 75 | 15 | 0.56656 |
| 21 | 2 | 75 | 16 | 0.00915 |
| 21 | 2 | 85 | 1 | 0.00000 |
| 21 | 2 | 85 | 2 | 0.00000 |
| 21 | 2 | 85 | 3 | 0.00000 |
| 21 | 2 | 85 | 4 | 0.00000 |
| 21 | 2 | 85 | 5 | 0.00000 |
| 21 | 2 | 85 | 6 | 0.00000 |
| 21 | 2 | 85 | 7 | 0.00000 |
| 21 | 2 | 85 | 8 | 0.02627 |
| 21 | 2 | 85 | 9 | 0.00000 |
| 21 | 2 | 85 | 10 | 0.00000 |
| 21 | 2 | 85 | 11 | 0.05723 |
| 21 | 2 | 85 | 12 | 0.02975 |
| 21 | 2 | 85 | 13 | 0.10615 |
| 21 | 2 | 85 | 14 | 0.20489 |
| 21 | 2 | 85 | 15 | 0.56656 |
| 21 | 2 | 85 | 16 | 0.00915 |
| 21 | 2 | 95 | 1 | 0.00000 |
| 21 | 2 | 95 | 2 | 0.00000 |
| 21 | 2 | 95 | 3 | 0.00000 |
| 21 | 2 | 95 | 4 | 0.00000 |
| 21 | 2 | 95 | 5 | 0.00000 |
| 21 | 2 | 95 | 6 | 0.00000 |
| 21 | 2 | 95 | 7 | 0.00000 |
| 21 | 2 | 95 | 8 | 0.02627 |
| 21 | 2 | 95 | 9 | 0.00000 |
| 21 | 2 | 95 | 10 | 0.00000 |
| 21 | 2 | 95 | 11 | 0.05723 |
| 21 | 2 | 95 | 12 | 0.02975 |
| 21 | 2 | 95 | 13 | 0.10615 |
| 21 | 2 | 95 | 14 | 0.20489 |
| 21 | 2 | 95 | 15 | 0.56656 |
| 21 | 2 | 95 | 16 | 0.00915 |
| 21 | 2 | 105 | 1 | 0.00000 |
| 21 | 2 | 105 | 2 | 0.00000 |
| 21 | 2 | 105 | 3 | 0.00000 |
| 21 | 2 | 105 | 4 | 0.00000 |
| 21 | 2 | 105 | 5 | 0.00000 |
| 21 | 2 | 105 | 6 | 0.00000 |
| 21 | 2 | 105 | 7 | 0.00000 |
| 21 | 2 | 105 | 8 | 0.00000 |
| 21 | 2 | 105 | 9 | 0.00000 |
| 21 | 2 | 105 | 10 | 0.00000 |
| 21 | 2 | 105 | 11 | 0.00000 |
| 21 | 2 | 105 | 12 | 0.00000 |
| 21 | 2 | 105 | 13 | 0.00849 |
| 21 | 2 | 105 | 14 | 0.04656 |
| 21 | 2 | 105 | 15 | 0.94495 |
| 21 | 2 | 105 | 16 | 0.00000 |
| 21 | 2 | 115 | 1 | 0.00000 |
| 21 | 2 | 115 | 2 | 0.00000 |
| 21 | 2 | 115 | 3 | 0.00000 |
| 21 | 2 | 115 | 4 | 0.00000 |
| 21 | 2 | 115 | 5 | 0.00000 |
| 21 | 2 | 115 | 6 | 0.00000 |
| 21 | 2 | 115 | 7 | 0.00000 |
| 21 | 2 | 115 | 8 | 0.00000 |
| 21 | 2 | 115 | 9 | 0.00000 |
| 21 | 2 | 115 | 10 | 0.00000 |
| 21 | 2 | 115 | 11 | 0.00000 |
| 21 | 2 | 115 | 12 | 0.00000 |
| 21 | 2 | 115 | 13 | 0.00849 |
| 21 | 2 | 115 | 14 | 0.04656 |
| 21 | 2 | 115 | 15 | 0.94495 |
| 21 | 2 | 115 | 16 | 0.00000 |
| 21 | 2 | 125 | 1 | 0.00000 |
| 21 | 2 | 125 | 2 | 0.00000 |
| 21 | 2 | 125 | 3 | 0.00000 |
| 21 | 2 | 125 | 4 | 0.00000 |
| 21 | 2 | 125 | 5 | 0.00000 |
| 21 | 2 | 125 | 6 | 0.00000 |
| 21 | 2 | 125 | 7 | 0.00000 |
| 21 | 2 | 125 | 8 | 0.00000 |
| 21 | 2 | 125 | 9 | 0.00000 |
| 21 | 2 | 125 | 10 | 0.00000 |
| 21 | 2 | 125 | 11 | 0.00000 |
| 21 | 2 | 125 | 12 | 0.00000 |
| 21 | 2 | 125 | 13 | 0.00849 |
| 21 | 2 | 125 | 14 | 0.04656 |
| 21 | 2 | 125 | 15 | 0.94495 |
| 21 | 2 | 125 | 16 | 0.00000 |
| 21 | 2 | 135 | 1 | 0.00000 |
| 21 | 2 | 135 | 2 | 0.00000 |
| 21 | 2 | 135 | 3 | 0.00000 |
| 21 | 2 | 135 | 4 | 0.00000 |
| 21 | 2 | 135 | 5 | 0.00000 |
| 21 | 2 | 135 | 6 | 0.00000 |
| 21 | 2 | 135 | 7 | 0.00000 |
| 21 | 2 | 135 | 8 | 0.00000 |
| 21 | 2 | 135 | 9 | 0.00000 |
| 21 | 2 | 135 | 10 | 0.00000 |
| 21 | 2 | 135 | 11 | 0.00000 |
| 21 | 2 | 135 | 12 | 0.00000 |
| 21 | 2 | 135 | 13 | 0.00849 |
| 21 | 2 | 135 | 14 | 0.04656 |
| 21 | 2 | 135 | 15 | 0.94495 |
| 21 | 2 | 135 | 16 | 0.00000 |
| 21 | 2 | 145 | 1 | 0.00000 |
| 21 | 2 | 145 | 2 | 0.00000 |
| 21 | 2 | 145 | 3 | 0.00000 |
| 21 | 2 | 145 | 4 | 0.00000 |
| 21 | 2 | 145 | 5 | 0.00000 |
| 21 | 2 | 145 | 6 | 0.00000 |
| 21 | 2 | 145 | 7 | 0.00000 |
| 21 | 2 | 145 | 8 | 0.00000 |
| 21 | 2 | 145 | 9 | 0.00000 |
| 21 | 2 | 145 | 10 | 0.00000 |
| 21 | 2 | 145 | 11 | 0.00000 |
| 21 | 2 | 145 | 12 | 0.00000 |
| 21 | 2 | 145 | 13 | 0.00849 |
| 21 | 2 | 145 | 14 | 0.04656 |
| 21 | 2 | 145 | 15 | 0.94495 |
| 21 | 2 | 145 | 16 | 0.00000 |
| 21 | 2 | 155 | 1 | 0.00000 |
| 21 | 2 | 155 | 2 | 0.00000 |
| 21 | 2 | 155 | 3 | 0.00000 |
| 21 | 2 | 155 | 4 | 0.00000 |
| 21 | 2 | 155 | 5 | 0.00000 |
| 21 | 2 | 155 | 6 | 0.00000 |
| 21 | 2 | 155 | 7 | 0.00000 |
| 21 | 2 | 155 | 8 | 0.00000 |
| 21 | 2 | 155 | 9 | 0.01914 |
| 21 | 2 | 155 | 10 | 0.00000 |
| 21 | 2 | 155 | 11 | 0.00000 |
| 21 | 2 | 155 | 12 | 0.05332 |
| 21 | 2 | 155 | 13 | 0.08409 |
| 21 | 2 | 155 | 14 | 0.22279 |
| 21 | 2 | 155 | 15 | 0.61647 |
| 21 | 2 | 155 | 16 | 0.00419 |
| 21 | 2 | 165 | 1 | 0.00000 |
| 21 | 2 | 165 | 2 | 0.00000 |
| 21 | 2 | 165 | 3 | 0.00000 |
| 21 | 2 | 165 | 4 | 0.00000 |
| 21 | 2 | 165 | 5 | 0.00000 |
| 21 | 2 | 165 | 6 | 0.00000 |
| 21 | 2 | 165 | 7 | 0.00000 |
| 21 | 2 | 165 | 8 | 0.00000 |
| 21 | 2 | 165 | 9 | 0.01914 |
| 21 | 2 | 165 | 10 | 0.00000 |
| 21 | 2 | 165 | 11 | 0.00000 |
| 21 | 2 | 165 | 12 | 0.05332 |
| 21 | 2 | 165 | 13 | 0.08409 |
| 21 | 2 | 165 | 14 | 0.22279 |
| 21 | 2 | 165 | 15 | 0.61647 |

| Source TypeID | Road TypeID | Hour DayID | avgSpeed BinID | avgSpeed Fraction |
|---|---|---|---|---|
| 21 | 2 | 165 | 16 | 0.00419 |
| 21 | 2 | 175 | 1 | 0.00000 |
| 21 | 2 | 175 | 2 | 0.00000 |
| 21 | 2 | 175 | 3 | 0.00000 |
| 21 | 2 | 175 | 4 | 0.00000 |
| 21 | 2 | 175 | 5 | 0.00000 |
| 21 | 2 | 175 | 6 | 0.00000 |
| 21 | 2 | 175 | 7 | 0.00000 |
| 21 | 2 | 175 | 8 | 0.00000 |
| 21 | 2 | 175 | 9 | 0.01914 |
| 21 | 2 | 175 | 10 | 0.00000 |
| 21 | 2 | 175 | 11 | 0.00000 |
| 21 | 2 | 175 | 12 | 0.05332 |
| 21 | 2 | 175 | 13 | 0.08409 |
| 21 | 2 | 175 | 14 | 0.22279 |
| 21 | 2 | 175 | 15 | 0.61647 |
| 21 | 2 | 175 | 16 | 0.00419 |
| 21 | 2 | 185 | 1 | 0.00000 |
| 21 | 2 | 185 | 2 | 0.00000 |
| 21 | 2 | 185 | 3 | 0.00000 |
| 21 | 2 | 185 | 4 | 0.00000 |
| 21 | 2 | 185 | 5 | 0.00000 |
| 21 | 2 | 185 | 6 | 0.00000 |
| 21 | 2 | 185 | 7 | 0.00000 |
| 21 | 2 | 185 | 8 | 0.00000 |
| 21 | 2 | 185 | 9 | 0.01914 |
| 21 | 2 | 185 | 10 | 0.00000 |
| 21 | 2 | 185 | 11 | 0.00000 |
| 21 | 2 | 185 | 12 | 0.05332 |
| 21 | 2 | 185 | 13 | 0.08409 |
| 21 | 2 | 185 | 14 | 0.22279 |
| 21 | 2 | 185 | 15 | 0.61647 |
| 21 | 2 | 185 | 16 | 0.00419 |
| 21 | 2 | 195 | 1 | 0.00000 |
| 21 | 2 | 195 | 2 | 0.00000 |
| 21 | 2 | 195 | 3 | 0.00000 |
| 21 | 2 | 195 | 4 | 0.00000 |
| 21 | 2 | 195 | 5 | 0.00000 |
| 21 | 2 | 195 | 6 | 0.00000 |
| 21 | 2 | 195 | 7 | 0.00000 |
| 21 | 2 | 195 | 8 | 0.00000 |
| 21 | 2 | 195 | 9 | 0.00000 |
| 21 | 2 | 195 | 10 | 0.00000 |
| 21 | 2 | 195 | 11 | 0.00000 |
| 21 | 2 | 195 | 12 | 0.00000 |
| 21 | 2 | 195 | 13 | 0.00000 |
| 21 | 2 | 195 | 14 | 0.04740 |
| 21 | 2 | 195 | 15 | 0.95259 |
| 21 | 2 | 195 | 16 | 0.00000 |
| 21 | 2 | 205 | 1 | 0.00000 |
| 21 | 2 | 205 | 2 | 0.00000 |
| 21 | 2 | 205 | 3 | 0.00000 |
| 21 | 2 | 205 | 4 | 0.00000 |
| 21 | 2 | 205 | 5 | 0.00000 |
| 21 | 2 | 205 | 6 | 0.00000 |
| 21 | 2 | 205 | 7 | 0.00000 |
| 21 | 2 | 205 | 8 | 0.00000 |
| 21 | 2 | 205 | 9 | 0.00000 |
| 21 | 2 | 205 | 10 | 0.00000 |
| 21 | 2 | 205 | 11 | 0.00000 |
| 21 | 2 | 205 | 12 | 0.00000 |
| 21 | 2 | 205 | 13 | 0.00000 |
| 21 | 2 | 205 | 14 | 0.04740 |
| 21 | 2 | 205 | 15 | 0.95259 |
| 21 | 2 | 205 | 16 | 0.00000 |
| 21 | 2 | 215 | 1 | 0.00000 |
| 21 | 2 | 215 | 2 | 0.00000 |
| 21 | 2 | 215 | 3 | 0.00000 |
| 21 | 2 | 215 | 4 | 0.00000 |
| 21 | 2 | 215 | 5 | 0.00000 |
| 21 | 2 | 215 | 6 | 0.00000 |
| 21 | 2 | 215 | 7 | 0.00000 |
| 21 | 2 | 215 | 8 | 0.00000 |
| 21 | 2 | 215 | 9 | 0.00000 |
| 21 | 2 | 215 | 10 | 0.00000 |
| 21 | 2 | 215 | 11 | 0.00000 |
| 21 | 2 | 215 | 12 | 0.00000 |
| 21 | 2 | 215 | 13 | 0.00000 |
| 21 | 2 | 215 | 14 | 0.04740 |
| 21 | 2 | 215 | 15 | 0.95259 |
| 21 | 2 | 215 | 16 | 0.00000 |
| 21 | 2 | 225 | 1 | 0.00000 |
| 21 | 2 | 225 | 2 | 0.00000 |
| 21 | 2 | 225 | 3 | 0.00000 |
| 21 | 2 | 225 | 4 | 0.00000 |
| 21 | 2 | 225 | 5 | 0.00000 |
| 21 | 2 | 225 | 6 | 0.00000 |

| Source TypeID | Road TypeID | Hour DayID | avgSpeed BinID | avgSpeed Fraction |
|---|---|---|---|---|
| 21 | 2 | 225 | 7 | 0.00000 |
| 21 | 2 | 225 | 8 | 0.00000 |
| 21 | 2 | 225 | 9 | 0.00000 |
| 21 | 2 | 225 | 10 | 0.00000 |
| 21 | 2 | 225 | 11 | 0.00000 |
| 21 | 2 | 225 | 12 | 0.00000 |
| 21 | 2 | 225 | 13 | 0.00000 |
| 21 | 2 | 225 | 14 | 0.04740 |
| 21 | 2 | 225 | 15 | 0.95259 |
| 21 | 2 | 225 | 16 | 0.00000 |
| 21 | 2 | 235 | 1 | 0.00000 |
| 21 | 2 | 235 | 2 | 0.00000 |
| 21 | 2 | 235 | 3 | 0.00000 |
| 21 | 2 | 235 | 4 | 0.00000 |
| 21 | 2 | 235 | 5 | 0.00000 |
| 21 | 2 | 235 | 6 | 0.00000 |
| 21 | 2 | 235 | 7 | 0.00000 |
| 21 | 2 | 235 | 8 | 0.00000 |
| 21 | 2 | 235 | 9 | 0.00000 |
| 21 | 2 | 235 | 10 | 0.00000 |
| 21 | 2 | 235 | 11 | 0.00000 |
| 21 | 2 | 235 | 12 | 0.00000 |
| 21 | 2 | 235 | 13 | 0.00000 |
| 21 | 2 | 235 | 14 | 0.04740 |
| 21 | 2 | 235 | 15 | 0.95259 |
| 21 | 2 | 235 | 16 | 0.00000 |
| 21 | 2 | 245 | 1 | 0.00000 |
| 21 | 2 | 245 | 2 | 0.00000 |
| 21 | 2 | 245 | 3 | 0.00000 |
| 21 | 2 | 245 | 4 | 0.00000 |
| 21 | 2 | 245 | 5 | 0.00000 |
| 21 | 2 | 245 | 6 | 0.00000 |
| 21 | 2 | 245 | 7 | 0.00000 |
| 21 | 2 | 245 | 8 | 0.00000 |
| 21 | 2 | 245 | 9 | 0.00000 |
| 21 | 2 | 245 | 10 | 0.00000 |
| 21 | 2 | 245 | 11 | 0.00000 |
| 21 | 2 | 245 | 12 | 0.00000 |
| 21 | 2 | 245 | 13 | 0.00000 |
| 21 | 2 | 245 | 14 | 0.04740 |
| 21 | 2 | 245 | 15 | 0.95259 |
| 21 | 2 | 245 | 16 | 0.00000 |
| 21 | 2 | 12 | 1 | 0.00000 |
| 21 | 2 | 12 | 2 | 0.00000 |
| 21 | 2 | 12 | 3 | 0.00000 |
| 21 | 2 | 12 | 4 | 0.00000 |
| 21 | 2 | 12 | 5 | 0.00000 |
| 21 | 2 | 12 | 6 | 0.00000 |
| 21 | 2 | 12 | 7 | 0.00000 |
| 21 | 2 | 12 | 8 | 0.00000 |
| 21 | 2 | 12 | 9 | 0.00000 |
| 21 | 2 | 12 | 10 | 0.00000 |
| 21 | 2 | 12 | 11 | 0.00000 |
| 21 | 2 | 12 | 12 | 0.00000 |
| 21 | 2 | 12 | 13 | 0.00000 |
| 21 | 2 | 12 | 14 | 0.04740 |
| 21 | 2 | 12 | 15 | 0.95259 |
| 21 | 2 | 12 | 16 | 0.00000 |
| 21 | 2 | 22 | 1 | 0.00000 |
| 21 | 2 | 22 | 2 | 0.00000 |
| 21 | 2 | 22 | 3 | 0.00000 |
| 21 | 2 | 22 | 4 | 0.00000 |
| 21 | 2 | 22 | 5 | 0.00000 |
| 21 | 2 | 22 | 6 | 0.00000 |
| 21 | 2 | 22 | 7 | 0.00000 |
| 21 | 2 | 22 | 8 | 0.00000 |
| 21 | 2 | 22 | 9 | 0.00000 |
| 21 | 2 | 22 | 10 | 0.00000 |
| 21 | 2 | 22 | 11 | 0.00000 |
| 21 | 2 | 22 | 12 | 0.00000 |
| 21 | 2 | 22 | 13 | 0.00000 |
| 21 | 2 | 22 | 14 | 0.04740 |
| 21 | 2 | 22 | 15 | 0.95259 |
| 21 | 2 | 22 | 16 | 0.00000 |
| 21 | 2 | 32 | 1 | 0.00000 |
| 21 | 2 | 32 | 2 | 0.00000 |
| 21 | 2 | 32 | 3 | 0.00000 |
| 21 | 2 | 32 | 4 | 0.00000 |
| 21 | 2 | 32 | 5 | 0.00000 |
| 21 | 2 | 32 | 6 | 0.00000 |
| 21 | 2 | 32 | 7 | 0.00000 |
| 21 | 2 | 32 | 8 | 0.00000 |
| 21 | 2 | 32 | 9 | 0.00000 |
| 21 | 2 | 32 | 10 | 0.00000 |
| 21 | 2 | 32 | 11 | 0.00000 |
| 21 | 2 | 32 | 12 | 0.00000 |
| 21 | 2 | 32 | 13 | 0.00000 |

| Source TypeID | Road TypeID | Hour DayID | avgSpeed BinID | avgSpeed Fraction |
|---|---|---|---|---|
| 21 | 2 | 32 | 14 | 0.04740 |
| 21 | 2 | 32 | 15 | 0.95259 |
| 21 | 2 | 32 | 16 | 0.00000 |
| 21 | 2 | 42 | 1 | 0.00000 |
| 21 | 2 | 42 | 2 | 0.00000 |
| 21 | 2 | 42 | 3 | 0.00000 |
| 21 | 2 | 42 | 4 | 0.00000 |
| 21 | 2 | 42 | 5 | 0.00000 |
| 21 | 2 | 42 | 6 | 0.00000 |
| 21 | 2 | 42 | 7 | 0.00000 |
| 21 | 2 | 42 | 8 | 0.00000 |
| 21 | 2 | 42 | 9 | 0.00000 |
| 21 | 2 | 42 | 10 | 0.00000 |
| 21 | 2 | 42 | 11 | 0.00000 |
| 21 | 2 | 42 | 12 | 0.00000 |
| 21 | 2 | 42 | 13 | 0.00000 |
| 21 | 2 | 42 | 14 | 0.04740 |
| 21 | 2 | 42 | 15 | 0.95259 |
| 21 | 2 | 42 | 16 | 0.00000 |
| 21 | 2 | 52 | 1 | 0.00000 |
| 21 | 2 | 52 | 2 | 0.00000 |
| 21 | 2 | 52 | 3 | 0.00000 |
| 21 | 2 | 52 | 4 | 0.00000 |
| 21 | 2 | 52 | 5 | 0.00000 |
| 21 | 2 | 52 | 6 | 0.00000 |
| 21 | 2 | 52 | 7 | 0.00000 |
| 21 | 2 | 52 | 8 | 0.00000 |
| 21 | 2 | 52 | 9 | 0.00000 |
| 21 | 2 | 52 | 10 | 0.00000 |
| 21 | 2 | 52 | 11 | 0.00000 |
| 21 | 2 | 52 | 12 | 0.00000 |
| 21 | 2 | 52 | 13 | 0.00000 |
| 21 | 2 | 52 | 14 | 0.04740 |
| 21 | 2 | 52 | 15 | 0.95259 |
| 21 | 2 | 52 | 16 | 0.00000 |
| 21 | 2 | 62 | 1 | 0.00000 |
| 21 | 2 | 62 | 2 | 0.00000 |
| 21 | 2 | 62 | 3 | 0.00000 |
| 21 | 2 | 62 | 4 | 0.00000 |
| 21 | 2 | 62 | 5 | 0.00000 |
| 21 | 2 | 62 | 6 | 0.00000 |
| 21 | 2 | 62 | 7 | 0.00000 |
| 21 | 2 | 62 | 8 | 0.00000 |
| 21 | 2 | 62 | 9 | 0.00000 |
| 21 | 2 | 62 | 10 | 0.00000 |
| 21 | 2 | 62 | 11 | 0.00000 |
| 21 | 2 | 62 | 12 | 0.00000 |
| 21 | 2 | 62 | 13 | 0.00000 |
| 21 | 2 | 62 | 14 | 0.04740 |
| 21 | 2 | 62 | 15 | 0.95259 |
| 21 | 2 | 62 | 16 | 0.00000 |
| 21 | 2 | 72 | 1 | 0.00000 |
| 21 | 2 | 72 | 2 | 0.00000 |
| 21 | 2 | 72 | 3 | 0.00000 |
| 21 | 2 | 72 | 4 | 0.00000 |
| 21 | 2 | 72 | 5 | 0.00000 |
| 21 | 2 | 72 | 6 | 0.00000 |
| 21 | 2 | 72 | 7 | 0.00000 |
| 21 | 2 | 72 | 8 | 0.02627 |
| 21 | 2 | 72 | 9 | 0.00000 |
| 21 | 2 | 72 | 10 | 0.00000 |
| 21 | 2 | 72 | 11 | 0.05723 |
| 21 | 2 | 72 | 12 | 0.02975 |
| 21 | 2 | 72 | 13 | 0.10615 |
| 21 | 2 | 72 | 14 | 0.20489 |
| 21 | 2 | 72 | 15 | 0.56656 |
| 21 | 2 | 72 | 16 | 0.00915 |
| 21 | 2 | 82 | 1 | 0.00000 |
| 21 | 2 | 82 | 2 | 0.00000 |
| 21 | 2 | 82 | 3 | 0.00000 |
| 21 | 2 | 82 | 4 | 0.00000 |
| 21 | 2 | 82 | 5 | 0.00000 |
| 21 | 2 | 82 | 6 | 0.00000 |
| 21 | 2 | 82 | 7 | 0.00000 |
| 21 | 2 | 82 | 8 | 0.02627 |
| 21 | 2 | 82 | 9 | 0.00000 |
| 21 | 2 | 82 | 10 | 0.00000 |
| 21 | 2 | 82 | 11 | 0.05723 |
| 21 | 2 | 82 | 12 | 0.02975 |
| 21 | 2 | 82 | 13 | 0.10615 |
| 21 | 2 | 82 | 14 | 0.20489 |
| 21 | 2 | 82 | 15 | 0.56656 |
| 21 | 2 | 82 | 16 | 0.00915 |
| 21 | 2 | 92 | 1 | 0.00000 |
| 21 | 2 | 92 | 2 | 0.00000 |
| 21 | 2 | 92 | 3 | 0.00000 |
| 21 | 2 | 92 | 4 | 0.00000 |

| Source TypeID | Road TypeID | Hour DayID | avgSpeed BinID | avgSpeed Fraction |
|---|---|---|---|---|
| 21 | 2 | 92 | 5 | 0.00000 |
| 21 | 2 | 92 | 6 | 0.00000 |
| 21 | 2 | 92 | 7 | 0.00000 |
| 21 | 2 | 92 | 8 | 0.02627 |
| 21 | 2 | 92 | 9 | 0.00000 |
| 21 | 2 | 92 | 10 | 0.00000 |
| 21 | 2 | 92 | 11 | 0.05723 |
| 21 | 2 | 92 | 12 | 0.02975 |
| 21 | 2 | 92 | 13 | 0.10615 |
| 21 | 2 | 92 | 14 | 0.20489 |
| 21 | 2 | 92 | 15 | 0.56656 |
| 21 | 2 | 92 | 16 | 0.00915 |
| 21 | 2 | 102 | 1 | 0.00000 |
| 21 | 2 | 102 | 2 | 0.00000 |
| 21 | 2 | 102 | 3 | 0.00000 |
| 21 | 2 | 102 | 4 | 0.00000 |
| 21 | 2 | 102 | 5 | 0.00000 |
| 21 | 2 | 102 | 6 | 0.00000 |
| 21 | 2 | 102 | 7 | 0.00000 |
| 21 | 2 | 102 | 8 | 0.00000 |
| 21 | 2 | 102 | 9 | 0.00000 |
| 21 | 2 | 102 | 10 | 0.00000 |
| 21 | 2 | 102 | 11 | 0.00000 |
| 21 | 2 | 102 | 12 | 0.00000 |
| 21 | 2 | 102 | 13 | 0.00849 |
| 21 | 2 | 102 | 14 | 0.04656 |
| 21 | 2 | 102 | 15 | 0.94495 |
| 21 | 2 | 102 | 16 | 0.00000 |
| 21 | 2 | 112 | 1 | 0.00000 |
| 21 | 2 | 112 | 2 | 0.00000 |
| 21 | 2 | 112 | 3 | 0.00000 |
| 21 | 2 | 112 | 4 | 0.00000 |
| 21 | 2 | 112 | 5 | 0.00000 |
| 21 | 2 | 112 | 6 | 0.00000 |
| 21 | 2 | 112 | 7 | 0.00000 |
| 21 | 2 | 112 | 8 | 0.00000 |
| 21 | 2 | 112 | 9 | 0.00000 |
| 21 | 2 | 112 | 10 | 0.00000 |
| 21 | 2 | 112 | 11 | 0.00000 |
| 21 | 2 | 112 | 12 | 0.00000 |
| 21 | 2 | 112 | 13 | 0.00849 |
| 21 | 2 | 112 | 14 | 0.04656 |
| 21 | 2 | 112 | 15 | 0.94495 |
| 21 | 2 | 112 | 16 | 0.00000 |
| 21 | 2 | 122 | 1 | 0.00000 |
| 21 | 2 | 122 | 2 | 0.00000 |
| 21 | 2 | 122 | 3 | 0.00000 |
| 21 | 2 | 122 | 4 | 0.00000 |
| 21 | 2 | 122 | 5 | 0.00000 |
| 21 | 2 | 122 | 6 | 0.00000 |
| 21 | 2 | 122 | 7 | 0.00000 |
| 21 | 2 | 122 | 8 | 0.00000 |
| 21 | 2 | 122 | 9 | 0.00000 |
| 21 | 2 | 122 | 10 | 0.00000 |
| 21 | 2 | 122 | 11 | 0.00000 |
| 21 | 2 | 122 | 12 | 0.00000 |
| 21 | 2 | 122 | 13 | 0.00849 |
| 21 | 2 | 122 | 14 | 0.04656 |
| 21 | 2 | 122 | 15 | 0.94495 |
| 21 | 2 | 122 | 16 | 0.00000 |
| 21 | 2 | 132 | 1 | 0.00000 |
| 21 | 2 | 132 | 2 | 0.00000 |
| 21 | 2 | 132 | 3 | 0.00000 |
| 21 | 2 | 132 | 4 | 0.00000 |
| 21 | 2 | 132 | 5 | 0.00000 |
| 21 | 2 | 132 | 6 | 0.00000 |
| 21 | 2 | 132 | 7 | 0.00000 |
| 21 | 2 | 132 | 8 | 0.00000 |
| 21 | 2 | 132 | 9 | 0.00000 |
| 21 | 2 | 132 | 10 | 0.00000 |
| 21 | 2 | 132 | 11 | 0.00000 |
| 21 | 2 | 132 | 12 | 0.00000 |
| 21 | 2 | 132 | 13 | 0.00849 |
| 21 | 2 | 132 | 14 | 0.04656 |
| 21 | 2 | 132 | 15 | 0.94495 |
| 21 | 2 | 132 | 16 | 0.00000 |
| 21 | 2 | 142 | 1 | 0.00000 |
| 21 | 2 | 142 | 2 | 0.00000 |
| 21 | 2 | 142 | 3 | 0.00000 |
| 21 | 2 | 142 | 4 | 0.00000 |
| 21 | 2 | 142 | 5 | 0.00000 |
| 21 | 2 | 142 | 6 | 0.00000 |
| 21 | 2 | 142 | 7 | 0.00000 |
| 21 | 2 | 142 | 8 | 0.00000 |
| 21 | 2 | 142 | 9 | 0.00000 |
| 21 | 2 | 142 | 10 | 0.00000 |
| 21 | 2 | 142 | 11 | 0.00000 |
| 21 | 2 | 142 | 12 | 0.00000 |
| 21 | 2 | 142 | 13 | 0.00849 |
| 21 | 2 | 142 | 14 | 0.04656 |
| 21 | 2 | 142 | 15 | 0.94495 |
| 21 | 2 | 142 | 16 | 0.00000 |
| 21 | 2 | 152 | 1 | 0.00000 |
| 21 | 2 | 152 | 2 | 0.00000 |
| 21 | 2 | 152 | 3 | 0.00000 |
| 21 | 2 | 152 | 4 | 0.00000 |
| 21 | 2 | 152 | 5 | 0.00000 |
| 21 | 2 | 152 | 6 | 0.00000 |
| 21 | 2 | 152 | 7 | 0.00000 |
| 21 | 2 | 152 | 8 | 0.00000 |
| 21 | 2 | 152 | 9 | 0.01914 |
| 21 | 2 | 152 | 10 | 0.00000 |
| 21 | 2 | 152 | 11 | 0.00000 |
| 21 | 2 | 152 | 12 | 0.05332 |
| 21 | 2 | 152 | 13 | 0.08409 |
| 21 | 2 | 152 | 14 | 0.22279 |
| 21 | 2 | 152 | 15 | 0.61647 |
| 21 | 2 | 152 | 16 | 0.00419 |
| 21 | 2 | 162 | 1 | 0.00000 |
| 21 | 2 | 162 | 2 | 0.00000 |
| 21 | 2 | 162 | 3 | 0.00000 |
| 21 | 2 | 162 | 4 | 0.00000 |
| 21 | 2 | 162 | 5 | 0.00000 |
| 21 | 2 | 162 | 6 | 0.00000 |
| 21 | 2 | 162 | 7 | 0.00000 |
| 21 | 2 | 162 | 8 | 0.00000 |
| 21 | 2 | 162 | 9 | 0.01914 |
| 21 | 2 | 162 | 10 | 0.00000 |
| 21 | 2 | 162 | 11 | 0.00000 |
| 21 | 2 | 162 | 12 | 0.05332 |
| 21 | 2 | 162 | 13 | 0.08409 |
| 21 | 2 | 162 | 14 | 0.22279 |
| 21 | 2 | 162 | 15 | 0.61647 |
| 21 | 2 | 162 | 16 | 0.00419 |
| 21 | 2 | 172 | 1 | 0.00000 |
| 21 | 2 | 172 | 2 | 0.00000 |
| 21 | 2 | 172 | 3 | 0.00000 |
| 21 | 2 | 172 | 4 | 0.00000 |
| 21 | 2 | 172 | 5 | 0.00000 |
| 21 | 2 | 172 | 6 | 0.00000 |
| 21 | 2 | 172 | 7 | 0.00000 |
| 21 | 2 | 172 | 8 | 0.00000 |
| 21 | 2 | 172 | 9 | 0.01914 |
| 21 | 2 | 172 | 10 | 0.00000 |
| 21 | 2 | 172 | 11 | 0.00000 |
| 21 | 2 | 172 | 12 | 0.05332 |
| 21 | 2 | 172 | 13 | 0.08409 |
| 21 | 2 | 172 | 14 | 0.22279 |
| 21 | 2 | 172 | 15 | 0.61647 |
| 21 | 2 | 172 | 16 | 0.00419 |
| 21 | 2 | 182 | 1 | 0.00000 |
| 21 | 2 | 182 | 2 | 0.00000 |
| 21 | 2 | 182 | 3 | 0.00000 |
| 21 | 2 | 182 | 4 | 0.00000 |
| 21 | 2 | 182 | 5 | 0.00000 |
| 21 | 2 | 182 | 6 | 0.00000 |
| 21 | 2 | 182 | 7 | 0.00000 |
| 21 | 2 | 182 | 8 | 0.00000 |
| 21 | 2 | 182 | 9 | 0.01914 |
| 21 | 2 | 182 | 10 | 0.00000 |
| 21 | 2 | 182 | 11 | 0.00000 |
| 21 | 2 | 182 | 12 | 0.05332 |
| 21 | 2 | 182 | 13 | 0.08409 |
| 21 | 2 | 182 | 14 | 0.22279 |
| 21 | 2 | 182 | 15 | 0.61647 |
| 21 | 2 | 182 | 16 | 0.00419 |
| 21 | 2 | 192 | 1 | 0.00000 |
| 21 | 2 | 192 | 2 | 0.00000 |
| 21 | 2 | 192 | 3 | 0.00000 |
| 21 | 2 | 192 | 4 | 0.00000 |
| 21 | 2 | 192 | 5 | 0.00000 |
| 21 | 2 | 192 | 6 | 0.00000 |
| 21 | 2 | 192 | 7 | 0.00000 |
| 21 | 2 | 192 | 8 | 0.00000 |
| 21 | 2 | 192 | 9 | 0.00000 |
| 21 | 2 | 192 | 10 | 0.00000 |
| 21 | 2 | 192 | 11 | 0.00000 |
| 21 | 2 | 192 | 12 | 0.00000 |
| 21 | 2 | 192 | 13 | 0.00000 |
| 21 | 2 | 192 | 14 | 0.04740 |
| 21 | 2 | 192 | 15 | 0.95259 |
| 21 | 2 | 192 | 16 | 0.00000 |
| 21 | 2 | 202 | 1 | 0.00000 |
| 21 | 2 | 202 | 2 | 0.00000 |
| 21 | 2 | 202 | 3 | 0.00000 |
| 21 | 2 | 202 | 4 | 0.00000 |
| 21 | 2 | 202 | 5 | 0.00000 |
| 21 | 2 | 202 | 6 | 0.00000 |
| 21 | 2 | 202 | 7 | 0.00000 |
| 21 | 2 | 202 | 8 | 0.00000 |
| 21 | 2 | 202 | 9 | 0.00000 |
| 21 | 2 | 202 | 10 | 0.00000 |
| 21 | 2 | 202 | 11 | 0.00000 |
| 21 | 2 | 202 | 12 | 0.00000 |
| 21 | 2 | 202 | 13 | 0.00000 |
| 21 | 2 | 202 | 14 | 0.04740 |
| 21 | 2 | 202 | 15 | 0.95259 |
| 21 | 2 | 202 | 16 | 0.00000 |
| 21 | 2 | 212 | 1 | 0.00000 |
| 21 | 2 | 212 | 2 | 0.00000 |
| 21 | 2 | 212 | 3 | 0.00000 |
| 21 | 2 | 212 | 4 | 0.00000 |
| 21 | 2 | 212 | 5 | 0.00000 |
| 21 | 2 | 212 | 6 | 0.00000 |
| 21 | 2 | 212 | 7 | 0.00000 |
| 21 | 2 | 212 | 8 | 0.00000 |
| 21 | 2 | 212 | 9 | 0.00000 |
| 21 | 2 | 212 | 10 | 0.00000 |
| 21 | 2 | 212 | 11 | 0.00000 |
| 21 | 2 | 212 | 12 | 0.00000 |
| 21 | 2 | 212 | 13 | 0.00000 |
| 21 | 2 | 212 | 14 | 0.04740 |
| 21 | 2 | 212 | 15 | 0.95259 |
| 21 | 2 | 212 | 16 | 0.00000 |
| 21 | 2 | 222 | 1 | 0.00000 |
| 21 | 2 | 222 | 2 | 0.00000 |
| 21 | 2 | 222 | 3 | 0.00000 |
| 21 | 2 | 222 | 4 | 0.00000 |
| 21 | 2 | 222 | 5 | 0.00000 |
| 21 | 2 | 222 | 6 | 0.00000 |
| 21 | 2 | 222 | 7 | 0.00000 |
| 21 | 2 | 222 | 8 | 0.00000 |
| 21 | 2 | 222 | 9 | 0.00000 |
| 21 | 2 | 222 | 10 | 0.00000 |
| 21 | 2 | 222 | 11 | 0.00000 |
| 21 | 2 | 222 | 12 | 0.00000 |
| 21 | 2 | 222 | 13 | 0.00000 |
| 21 | 2 | 222 | 14 | 0.04740 |
| 21 | 2 | 222 | 15 | 0.95259 |
| 21 | 2 | 222 | 16 | 0.00000 |
| 21 | 2 | 232 | 1 | 0.00000 |
| 21 | 2 | 232 | 2 | 0.00000 |
| 21 | 2 | 232 | 3 | 0.00000 |
| 21 | 2 | 232 | 4 | 0.00000 |
| 21 | 2 | 232 | 5 | 0.00000 |
| 21 | 2 | 232 | 6 | 0.00000 |
| 21 | 2 | 232 | 7 | 0.00000 |
| 21 | 2 | 232 | 8 | 0.00000 |
| 21 | 2 | 232 | 9 | 0.00000 |
| 21 | 2 | 232 | 10 | 0.00000 |
| 21 | 2 | 232 | 11 | 0.00000 |
| 21 | 2 | 232 | 12 | 0.00000 |
| 21 | 2 | 232 | 13 | 0.00000 |
| 21 | 2 | 232 | 14 | 0.04740 |
| 21 | 2 | 232 | 15 | 0.95259 |
| 21 | 2 | 232 | 16 | 0.00000 |
| 21 | 2 | 242 | 1 | 0.00000 |
| 21 | 2 | 242 | 2 | 0.00000 |
| 21 | 2 | 242 | 3 | 0.00000 |
| 21 | 2 | 242 | 4 | 0.00000 |
| 21 | 2 | 242 | 5 | 0.00000 |
| 21 | 2 | 242 | 6 | 0.00000 |
| 21 | 2 | 242 | 7 | 0.00000 |
| 21 | 2 | 242 | 8 | 0.00000 |
| 21 | 2 | 242 | 9 | 0.00000 |
| 21 | 2 | 242 | 10 | 0.00000 |
| 21 | 2 | 242 | 11 | 0.00000 |
| 21 | 2 | 242 | 12 | 0.00000 |
| 21 | 2 | 242 | 13 | 0.00000 |
| 21 | 2 | 242 | 14 | 0.04740 |
| 21 | 2 | 242 | 15 | 0.95259 |
| 21 | 2 | 242 | 16 | 0.00000 |

**[AVFT] (SourceTypeID 42: Transit Bus)**

| Source TypeID | Model YearID | Fuel TypeID | Eng TechID | fuelEng Fraction |
|---|---|---|---|---|
| 42 | 1960 | 1 | 1 | 0.009615 |
| 42 | 1960 | 2 | 1 | 0.990385 |
| 42 | 1960 | 3 | 1 | 0.000000 |
| 42 | 1961 | 1 | 1 | 0.009615 |
| 42 | 1961 | 2 | 1 | 0.990385 |
| 42 | 1961 | 3 | 1 | 0.000000 |
| 42 | 1962 | 1 | 1 | 0.009615 |
| 42 | 1962 | 2 | 1 | 0.990385 |
| 42 | 1962 | 3 | 1 | 0.000000 |
| 42 | 1963 | 1 | 1 | 0.009615 |
| 42 | 1963 | 2 | 1 | 0.990385 |
| 42 | 1963 | 3 | 1 | 0.000000 |
| 42 | 1964 | 1 | 1 | 0.009615 |
| 42 | 1964 | 2 | 1 | 0.990385 |
| 42 | 1964 | 3 | 1 | 0.000000 |
| 42 | 1965 | 1 | 1 | 0.009615 |
| 42 | 1965 | 2 | 1 | 0.990385 |
| 42 | 1965 | 3 | 1 | 0.000000 |
| 42 | 1966 | 1 | 1 | 0.009615 |
| 42 | 1966 | 2 | 1 | 0.990385 |
| 42 | 1966 | 3 | 1 | 0.000000 |
| 42 | 1967 | 1 | 1 | 0.009615 |
| 42 | 1967 | 2 | 1 | 0.990385 |
| 42 | 1967 | 3 | 1 | 0.000000 |
| 42 | 1968 | 1 | 1 | 0.009615 |
| 42 | 1968 | 2 | 1 | 0.990385 |
| 42 | 1968 | 3 | 1 | 0.000000 |
| 42 | 1969 | 1 | 1 | 0.009615 |
| 42 | 1969 | 2 | 1 | 0.990385 |
| 42 | 1969 | 3 | 1 | 0.000000 |
| 42 | 1970 | 1 | 1 | 0.009615 |
| 42 | 1970 | 2 | 1 | 0.990385 |
| 42 | 1970 | 3 | 1 | 0.000000 |
| 42 | 1971 | 1 | 1 | 0.009615 |
| 42 | 1971 | 2 | 1 | 0.990385 |
| 42 | 1971 | 3 | 1 | 0.000000 |
| 42 | 1972 | 1 | 1 | 0.009615 |
| 42 | 1972 | 2 | 1 | 0.990385 |
| 42 | 1972 | 3 | 1 | 0.000000 |
| 42 | 1973 | 1 | 1 | 0.009615 |
| 42 | 1973 | 2 | 1 | 0.990385 |
| 42 | 1973 | 3 | 1 | 0.000000 |
| 42 | 1974 | 1 | 1 | 0.009615 |
| 42 | 1974 | 2 | 1 | 0.990385 |
| 42 | 1974 | 3 | 1 | 0.000000 |
| 42 | 1975 | 1 | 1 | 0.009615 |
| 42 | 1975 | 2 | 1 | 0.990385 |
| 42 | 1975 | 3 | 1 | 0.000000 |
| 42 | 1976 | 1 | 1 | 0.009615 |
| 42 | 1976 | 2 | 1 | 0.990385 |
| 42 | 1976 | 3 | 1 | 0.000000 |
| 42 | 1977 | 1 | 1 | 0.009615 |
| 42 | 1977 | 2 | 1 | 0.990385 |
| 42 | 1977 | 3 | 1 | 0.000000 |
| 42 | 1978 | 1 | 1 | 0.009615 |
| 42 | 1978 | 2 | 1 | 0.990385 |
| 42 | 1978 | 3 | 1 | 0.000000 |
| 42 | 1979 | 1 | 1 | 0.009615 |
| 42 | 1979 | 2 | 1 | 0.990385 |
| 42 | 1979 | 3 | 1 | 0.000000 |
| 42 | 1980 | 1 | 1 | 0.009615 |
| 42 | 1980 | 2 | 1 | 0.990385 |
| 42 | 1980 | 3 | 1 | 0.000000 |
| 42 | 1981 | 1 | 1 | 0.008696 |
| 42 | 1981 | 2 | 1 | 0.991304 |
| 42 | 1981 | 3 | 1 | 0.000000 |
| 42 | 1982 | 1 | 1 | 0.011321 |
| 42 | 1982 | 2 | 1 | 0.988679 |
| 42 | 1982 | 3 | 1 | 0.000000 |
| 42 | 1983 | 1 | 1 | 0.008081 |
| 42 | 1983 | 2 | 1 | 0.991919 |
| 42 | 1983 | 3 | 1 | 0.000000 |
| 42 | 1984 | 1 | 1 | 0.009671 |
| 42 | 1984 | 2 | 1 | 0.990329 |
| 42 | 1984 | 3 | 1 | 0.000000 |
| 42 | 1985 | 1 | 1 | 0.010448 |
| 42 | 1985 | 2 | 1 | 0.989552 |
| 42 | 1985 | 3 | 1 | 0.000000 |
| 42 | 1986 | 1 | 1 | 0.010243 |
| 42 | 1986 | 2 | 1 | 0.989757 |
| 42 | 1986 | 3 | 1 | 0.000000 |
| 42 | 1987 | 1 | 1 | 0.009825 |
| 42 | 1987 | 2 | 1 | 0.990175 |
| 42 | 1987 | 3 | 1 | 0.000000 |
| 42 | 1988 | 1 | 1 | 0.009990 |
| 42 | 1988 | 2 | 1 | 0.990010 |
| 42 | 1988 | 3 | 1 | 0.000000 |
| 42 | 1989 | 1 | 1 | 0.009441 |
| 42 | 1989 | 2 | 1 | 0.990559 |
| 42 | 1989 | 3 | 1 | 0.000000 |
| 42 | 1990 | 1 | 1 | 0.010174 |
| 42 | 1990 | 2 | 1 | 0.982645 |
| 42 | 1990 | 3 | 1 | 0.007181 |
| 42 | 1991 | 1 | 1 | 0.009632 |
| 42 | 1991 | 2 | 1 | 0.971979 |
| 42 | 1991 | 3 | 1 | 0.018389 |
| 42 | 1992 | 1 | 1 | 0.009752 |
| 42 | 1992 | 2 | 1 | 0.944149 |
| 42 | 1992 | 3 | 1 | 0.046099 |
| 42 | 1993 | 1 | 1 | 0.009238 |
| 42 | 1993 | 2 | 1 | 0.914550 |
| 42 | 1993 | 3 | 1 | 0.076212 |
| 42 | 1994 | 1 | 1 | 0.010211 |
| 42 | 1994 | 2 | 1 | 0.904914 |
| 42 | 1994 | 3 | 1 | 0.084876 |
| 42 | 1995 | 1 | 1 | 0.010022 |
| 42 | 1995 | 2 | 1 | 0.836860 |
| 42 | 1995 | 3 | 1 | 0.153118 |
| 42 | 1996 | 1 | 1 | 0.009941 |
| 42 | 1996 | 2 | 1 | 0.892002 |
| 42 | 1996 | 3 | 1 | 0.098057 |
| 42 | 1997 | 1 | 1 | 0.000000 |
| 42 | 1997 | 2 | 1 | 1.000000 |
| 42 | 1997 | 3 | 1 | 0.000000 |
| 42 | 1998 | 1 | 1 | 0.000000 |
| 42 | 1998 | 2 | 1 | 0.000000 |
| 42 | 1998 | 3 | 1 | 1.000000 |
| 42 | 1999 | 1 | 1 | 0.000000 |
| 42 | 1999 | 2 | 1 | 0.000000 |
| 42 | 1999 | 3 | 1 | 1.000000 |
| 42 | 2000 | 1 | 1 | 0.000000 |
| 42 | 2000 | 2 | 1 | 0.000000 |
| 42 | 2000 | 3 | 1 | 1.000000 |
| 42 | 2001 | 1 | 1 | 0.000000 |
| 42 | 2001 | 2 | 1 | 0.000000 |
| 42 | 2001 | 3 | 1 | 1.000000 |
| 42 | 2002 | 1 | 1 | 0.000000 |
| 42 | 2002 | 2 | 1 | 0.000000 |
| 42 | 2002 | 3 | 1 | 1.000000 |
| 42 | 2003 | 1 | 1 | 0.000000 |
| 42 | 2003 | 2 | 1 | 0.000000 |
| 42 | 2003 | 3 | 1 | 1.000000 |
| 42 | 2004 | 1 | 1 | 0.000000 |
| 42 | 2004 | 2 | 1 | 0.327869 |
| 42 | 2004 | 3 | 1 | 0.672131 |
| 42 | 2005 | 1 | 1 | 0.000000 |
| 42 | 2005 | 2 | 1 | 1.000000 |
| 42 | 2005 | 3 | 1 | 0.000000 |
| 42 | 2006 | 1 | 1 | 0.000000 |
| 42 | 2006 | 2 | 1 | 0.075758 |
| 42 | 2006 | 3 | 1 | 0.924242 |
| 42 | 2007 | 1 | 1 | 0.000000 |
| 42 | 2007 | 2 | 1 | 1.000000 |
| 42 | 2007 | 3 | 1 | 0.000000 |
| 42 | 2008 | 1 | 1 | 0.000000 |
| 42 | 2008 | 2 | 1 | 0.385542 |
| 42 | 2008 | 3 | 1 | 0.614458 |
| 42 | 2009 | 1 | 1 | 0.108108 |
| 42 | 2009 | 2 | 1 | 0.135135 |
| 42 | 2009 | 3 | 1 | 0.756757 |
| 42 | 2010 | 1 | 1 | 0.000000 |
| 42 | 2010 | 2 | 1 | 1.000000 |
| 42 | 2010 | 3 | 1 | 0.000000 |
| 42 | 2011 | 1 | 1 | 0.000000 |
| 42 | 2011 | 2 | 1 | 0.048780 |
| 42 | 2011 | 2 | 11 | 0.414634 |
| 42 | 2011 | 3 | 1 | 0.536585 |
| 42 | 2012 | 1 | 1 | 0.000000 |
| 42 | 2012 | 2 | 1 | 0.000000 |
| 42 | 2012 | 3 | 1 | 1.000000 |
| 42 | 2013 | 1 | 1 | 0.045455 |
| 42 | 2013 | 2 | 1 | 0.054545 |
| 42 | 2013 | 2 | 11 | 0.118182 |
| 42 | 2013 | 3 | 1 | 0.781818 |
| 42 | 2014 | 1 | 1 | 0.010417 |
| 42 | 2014 | 2 | 1 | 0.114583 |
| 42 | 2014 | 3 | 1 | 0.875000 |
| 42 | 2015 | 1 | 1 | 0.024619 |
| 42 | 2015 | 2 | 1 | 0.817351 |
| 42 | 2015 | 3 | 1 | 0.158030 |
| 42 | 2016 | 1 | 1 | 0.024619 |
| 42 | 2016 | 2 | 1 | 0.817351 |
| 42 | 2016 | 3 | 1 | 0.158030 |
| 42 | 2017 | 1 | 1 | 0.024619 |
| 42 | 2017 | 2 | 1 | 0.817351 |
| 42 | 2017 | 3 | 1 | 0.158030 |
| 42 | 2018 | 1 | 1 | 0.024619 |
| 42 | 2018 | 2 | 1 | 0.817351 |
| 42 | 2018 | 3 | 1 | 0.158030 |
| 42 | 2019 | 1 | 1 | 0.024619 |
| 42 | 2019 | 2 | 1 | 0.817351 |
| 42 | 2019 | 3 | 1 | 0.158030 |
| 42 | 2020 | 1 | 1 | 0.024619 |
| 42 | 2020 | 2 | 1 | 0.817351 |
| 42 | 2020 | 3 | 1 | 0.158030 |
| 42 | 2021 | 1 | 1 | 0.024619 |
| 42 | 2021 | 2 | 1 | 0.817351 |
| 42 | 2021 | 3 | 1 | 0.158030 |
| 42 | 2022 | 1 | 1 | 0.024619 |
| 42 | 2022 | 2 | 1 | 0.817351 |
| 42 | 2022 | 3 | 1 | 0.158030 |
| 42 | 2023 | 1 | 1 | 0.024619 |
| 42 | 2023 | 2 | 1 | 0.817351 |
| 42 | 2023 | 3 | 1 | 0.158030 |
| 42 | 2024 | 1 | 1 | 0.024619 |
| 42 | 2024 | 2 | 1 | 0.817351 |
| 42 | 2024 | 3 | 1 | 0.158030 |
| 42 | 2025 | 1 | 1 | 0.024619 |
| 42 | 2025 | 2 | 1 | 0.817351 |
| 42 | 2025 | 3 | 1 | 0.158030 |
| 42 | 2026 | 1 | 1 | 0.024619 |
| 42 | 2026 | 2 | 1 | 0.817351 |
| 42 | 2026 | 3 | 1 | 0.158030 |
| 42 | 2027 | 1 | 1 | 0.024619 |
| 42 | 2027 | 2 | 1 | 0.817351 |
| 42 | 2027 | 3 | 1 | 0.158030 |
| 42 | 2028 | 1 | 1 | 0.024619 |
| 42 | 2028 | 2 | 1 | 0.817351 |
| 42 | 2028 | 3 | 1 | 0.158030 |
| 42 | 2029 | 1 | 1 | 0.024619 |
| 42 | 2029 | 2 | 1 | 0.817351 |
| 42 | 2029 | 3 | 1 | 0.158030 |
| 42 | 2030 | 1 | 1 | 0.024619 |
| 42 | 2030 | 2 | 1 | 0.817351 |
| 42 | 2030 | 3 | 1 | 0.158030 |
| 42 | 2031 | 1 | 1 | 0.024619 |
| 42 | 2031 | 2 | 1 | 0.817351 |
| 42 | 2031 | 3 | 1 | 0.158030 |
| 42 | 2032 | 1 | 1 | 0.024619 |
| 42 | 2032 | 2 | 1 | 0.817351 |
| 42 | 2032 | 3 | 1 | 0.158030 |
| 42 | 2033 | 1 | 1 | 0.024619 |
| 42 | 2033 | 2 | 1 | 0.817351 |
| 42 | 2033 | 3 | 1 | 0.158030 |
| 42 | 2034 | 1 | 1 | 0.024619 |
| 42 | 2034 | 2 | 1 | 0.817351 |
| 42 | 2034 | 3 | 1 | 0.158030 |
| 42 | 2035 | 1 | 1 | 0.024619 |
| 42 | 2035 | 2 | 1 | 0.817351 |
| 42 | 2035 | 3 | 1 | 0.158030 |
| 42 | 2036 | 1 | 1 | 0.024619 |
| 42 | 2036 | 2 | 1 | 0.817351 |
| 42 | 2036 | 3 | 1 | 0.158030 |
| 42 | 2037 | 1 | 1 | 0.024619 |
| 42 | 2037 | 2 | 1 | 0.817351 |
| 42 | 2037 | 3 | 1 | 0.158030 |
| 42 | 2038 | 1 | 1 | 0.024619 |
| 42 | 2038 | 2 | 1 | 0.817351 |
| 42 | 2038 | 3 | 1 | 0.158030 |
| 42 | 2039 | 1 | 1 | 0.024619 |
| 42 | 2039 | 2 | 1 | 0.817351 |
| 42 | 2039 | 3 | 1 | 0.158030 |
| 42 | 2040 | 1 | 1 | 0.024619 |
| 42 | 2040 | 2 | 1 | 0.817351 |
| 42 | 2040 | 3 | 1 | 0.158030 |
| 42 | 2041 | 1 | 1 | 0.024619 |
| 42 | 2041 | 2 | 1 | 0.817351 |
| 42 | 2041 | 3 | 1 | 0.158030 |
| 42 | 2042 | 1 | 1 | 0.024619 |
| 42 | 2042 | 2 | 1 | 0.817351 |
| 42 | 2042 | 3 | 1 | 0.158030 |
| 42 | 2043 | 1 | 1 | 0.024619 |
| 42 | 2043 | 2 | 1 | 0.817351 |
| 42 | 2043 | 3 | 1 | 0.158030 |
| 42 | 2044 | 1 | 1 | 0.024619 |
| 42 | 2044 | 2 | 1 | 0.817351 |
| 42 | 2044 | 3 | 1 | 0.158030 |
| 42 | 2045 | 1 | 1 | 0.024619 |
| 42 | 2045 | 2 | 1 | 0.817351 |
| 42 | 2045 | 3 | 1 | 0.158030 |
| 42 | 2046 | 1 | 1 | 0.024619 |
| 42 | 2046 | 2 | 1 | 0.817351 |
| 42 | 2046 | 3 | 1 | 0.158030 |
| 42 | 2047 | 1 | 1 | 0.024619 |
| 42 | 2047 | 2 | 1 | 0.817351 |
| 42 | 2047 | 3 | 1 | 0.158030 |
| 42 | 2048 | 1 | 1 | 0.024619 |

| Source TypeID | Model YearID | Fuel TypeID | Eng TechID | fuelEng Fraction |
|---|---|---|---|---|
| 42 | 2048 | 2 | 1 | 0.817351 |
| 42 | 2048 | 3 | 1 | 0.158030 |
| 42 | 2049 | 1 | 1 | 0.024619 |
| 42 | 2049 | 2 | 1 | 0.817351 |

| Source TypeID | Model YearID | Fuel TypeID | Eng TechID | fuelEng Fraction |
|---|---|---|---|---|
| 42 | 2049 | 3 | 1 | 0.158030 |
| 42 | 2050 | 1 | 1 | 0.024619 |
| 42 | 2050 | 2 | 1 | 0.817351 |
| 42 | 2050 | 3 | 1 | 0.158030 |

**[CountyYear]**

| countyID | yearID | refuelingVaporProgramAdjust | refuelingSpillProgramAdjust |
|---|---|---|---|
| 4013 | 2014 | 0.661 | 0.000 |

# Appendix D. Emissions from Facilities Treated as Area Sources in the 2014 Periodic Emissions Inventory for Ozone Precursors

The table below lists those facilities whose reported 2014 emissions have been included in the area source categories of this 2014 Periodic Emissions Inventory for Ozone Precursors.

**Table D-1. Emissions (tons/yr) from facilities whose emissions are reflected in area source categories in the 2014 Periodic Emissions Inventory.**

| ID | Business name | Street address and city | VOC | $NO_X$ | CO |
|---|---|---|---|---|---|
| 1074 | 23RD AVE WASTEWATER TREATMENT PLANT | 2470 S 22ND AVE, PHOENIX | 0.3 | 2.8 | 29.8 |
| 133843 | A LEGACY FUNERAL HOME LLC | 1722 N BANNING #101, MESA | 0.0 | 0.2 | 0.0 |
| 132976 | ABEL FUNERAL SERVICES INC | 1544 W GRANT ST, PHOENIX | 0.0 | 1.1 | 0.1 |
| 1387 | ABLE STEEL FABRICATORS | 4150 E QUARTZ CIR, MESA | 3.7 | | |
| 130432 | ADVANCED LINING SOLUTIONS INC | 1903 S 11TH AVE, PHOENIX | 0.2 | | |
| 72104 | AEROTURBINE | 1658 S LITCHFIELD RD, GOODYEAR | 5.3 | | |
| 969 | AF LORTS MANUFACTURING COMPANY INC | 15836 W EDDIE ALBERT WAY, GOODYEAR | 21.4 | | |
| 125823 | AFFORDABLE CREMATION & BURIAL CHAPEL | 1130 S HORNE, MESA | 0.0 | 0.0 | 0.0 |
| 3291 | AIRLINE TRAINING CTR AZ INC | 1658 S LITCHFIELD RD, GOODYEAR | 2.3 | | |
| 133089 | ALL IN ONE TRUCK REPAIR INC | 5703 W DOBBINS RD, PHOENIX | 0.4 | | |
| 107220 | ALL PETS GREAT AND SMALL | 1110 S HORNE ST #103, MESA | 0.0 | 0.6 | 0.0 |
| 90012 | ALL STATE CREMATORY | 1110 S HORNE #108, MESA | 0.0 | 1.5 | 0.1 |
| 34139 | ALL WOOD TREASURES CO | 2063 E CEDAR ST, TEMPE | 9.1 | | |
| 131474 | ALLIED PACKAGING CORPORATION | 5640 S 16TH ST, PHOENIX | 5.2 | 0.2 | 0.1 |
| 35541 | ALLIED TUBE AND CONDUIT | 2525 N 27TH AVE, PHOENIX | 30.8 | 0.1 | 0.1 |
| 4397 | AMBER STEEL FABRICATION, INC | 11331 E GERMANN RD, CHANDLER | 9.8 | | |
| 27925 | AMERICAN CASE & PEDESTAL MFG CO | 2022 N 22ND AVE, PHOENIX | 2.7 | | |
| 132483 | AMERICAN FENCE & SECURITY CO INC | 2737 W VIRGINIA AVE, PHOENIX | 6.1 | | |
| 54414 | AMERICAN SAND & ROCK | PORTABLE | 0.1 | 1.7 | 0.4 |
| 42432 | AMERIPRIDE LINEN & APPAREL SERVICE | 6025 W VAN BUREN ST, PHOENIX | 0.8 | 1.3 | 1.1 |
| 199 | AMERON WATER TRANSMISSION GROUP, LLC | 2325 S 7TH ST, PHOENIX | 1.7 | 0.1 | 0.1 |
| 129545 | AMES DIVERSIFIED SERVICES | 3015 W CLARENDON AVE, PHOENIX | 0.0 | 1.8 | 0.1 |
| 133188 | ANIMAL CREMATION SERVICES | 5348 W BETHANY HOME RD, GLENDALE | 0.0 | 0.6 | 0.0 |
| 129550 | ARIZONA AIRCRAFT PAINTING LLC | 4911 E FALCON DR, MESA | 1.0 | | |
| 84 | ARIZONA BRAKE & CLUTCH SUPPLY INC | 2211 N BLACK CANYON HWY, PHOENIX | 0.1 | 0.0 | 0.0 |
| 3938 | ARIZONA GALVANIZING INC | 15775 W ELWOOD ST, GOODYEAR | 0.2 | 4.4 | 3.7 |
| 130470 | ARIZONA LANDFILL LLC | 2750 S 11TH AVE, PHOENIX | 0.5 | 10.8 | 1.7 |
| 131021 | ARIZONA NUTRITIONAL SUPPLEMENTS LLC | 210 S BECK AVE, CHANDLER | 7.8 | | |
| 69409 | ARIZONA POLYMER FLOORING INC | 7731 N 68TH AVE, GLENDALE | 5.2 | | |
| 4364 | ARIZONA STATE UNIVERSITY | 1551 S RURAL RD, TEMPE | 2.4 | 13.5 | 7.2 |
| 134108 | ARMORWORKS ENTERPRISES LLC | 901 E MADISON ST, PHOENIX | 0.1 | | |
| 341 | ARTISAN NATURAL STONE PRODUCTS LLP | 813 E UNIVERSITY DR, PHOENIX | 2.9 | | |
| 30112 | ASM AMERICA INC | 3440 E UNIVERSITY DR, PHOENIX | 0.1 | | |
| 36898 | ASPC-LEWIS | 26700 S HWY 85, BUCKEYE | 6.5 | 9.6 | 4.9 |
| 4328 | ASU MACROTECHNOLOGY WORKS | 7700 S RIVER PKWY, TEMPE | 1.3 | 3.0 | 1.1 |
| 1502 | ATLAS ROOFING CORPORATION | 40 S 45TH AVE, PHOENIX | 5.7 | 0.5 | 2.0 |
| 2656 | AVIATION DEPT - PHOENIX SKY HARBOR | 3400 E SKY HARBOR BLVD, PHOENIX | 0.5 | 3.2 | 1.0 |
| 50422 | BAE SYSTEMS AEROSPACE & DEFENSE GROUP | 7822 S 46TH ST, PHOENIX | 5.4 | 0.0 | 0.0 |

| ID | Business name | Street address and city | VOC | $NO_X$ | CO |
|---|---|---|---|---|---|
| 1449 | BAKER COMMODITIES | 3602 W ELWOOD ST, PHOENIX | 3.8 | 2.1 | |
| 31585 | BANK OF AMERICA | 2500 W FRYE RD, CHANDLER | 0.1 | 3.4 | 0.5 |
| 781 | BANNER GOOD SAMARITAN MEDICAL CENTER | 1111 E MCDOWELL RD, PHOENIX | 0.5 | 7.6 | 5.1 |
| 29946 | BANNER THUNDERBIRD MEDICAL CENTER | 5555 W THUNDERBIRD RD, GLENDALE | 1.5 | 3.3 | 1.0 |
| 129595 | BARREL O' FUN SNACK FOOD SOUTHWEST | 7330 W SHERMAN ST, PHOENIX | 0.3 | 6.1 | 5.1 |
| 110901 | BAY FOAM PRODUCTS INC | 2240 W PEORIA AVE, PHOENIX | 0.0 | 0.3 | 0.1 |
| 42102 | BENCHMARK ELECTRONICS PHOENIX, INC | 2401 W GRANDVIEW RD, PHOENIX | 2.4 | | |
| 607 | BEST FUNERAL SERVICES INC | 9380 W PEORIA AVE, PEORIA | 0.0 | 0.6 | 0.0 |
| 961 | BIG SURF WATERPARK | 1500 N MCCLINTOCK DR, TEMPE | 0.1 | 2.6 | 0.4 |
| 74058 | BILTMORE SHUTTERS INC | 1138 W WATKINS ST, PHOENIX | 3.9 | | |
| 3305 | BIMBO BAKERIES USA, INC | 738 W VAN BUREN ST, PHOENIX | 13.0 | 1.8 | 1.5 |
| 226 | BORAL ROOFING LLC | 1832 S 51ST AVE, PHOENIX | 2.9 | 0.3 | 0.2 |
| 80207 | BROKEN ARROW CONSTRUCTION | PORTABLE #1, MESA | 0.1 | | |
| 56105 | BURDETTE CABINET CO INC | 3941 N HIGLEY RD, MESA | 10.0 | | |
| 131634 | CAFE VALLEY INC | 7000 W BUCKEYE RD, PHOENIX | 16.5 | 3.2 | 2.7 |
| 131208 | CALGON CARBON CORPORATION | 521 S BUTTERFIELD TR, GILA BEND | 0.2 | 2.5 | 7.0 |
| 3442 | CALJET | 125 N 53RD AVE, PHOENIX | 38.3 | 0.1 | 0.3 |
| 108199 | CALJET OF AMERICA LLC | 57 N 57TH AVE, PHOENIX | 6.8 | | |
| 131966 | CALPORTLAND | 4830 S 43RD AVE, PHOENIX | 0.0 | 0.4 | 0.3 |
| 133365 | CALPORTLAND | 3410 E VIRGINIA ST, MESA | 0.0 | 0.0 | 0.0 |
| 3296 | CALVERT OIL CO | 214 E ARIZONA EASTERN AVE, BUCKEYE | 8.5 | | |
| 898 | CAMINO DEL SOL FUNERAL CHAPEL | 13738 W CAMINO DEL SOL, SUN CITY WEST | 0.0 | 0.2 | 0.0 |
| 44182 | CANAM STEEL CORPORATION | 22253 W SOUTHERN AVE, BUCKEYE | 2.1 | | |
| 130156 | CASE FURNITURE & DESIGN, LLC | 1502 E HADLEY ST #100, PHOENIX | 3.4 | | |
| 776 | CASE SANDBLASTING INC | 1018 S 27TH AVE, PHOENIX | 1.9 | | |
| 1318 | CAVCO INDUSTRIES INC | 1366 S LITCHFIELD RD #6, GOODYEAR | 12.2 | | |
| 1316 | CAVCO INDUSTRIES LLC/DURANGO PLANT | 2502 W DURANGO ST, PHOENIX | 11.1 | | |
| 260 | CEMEX - 19TH AVE PLANT | 3640 S 19TH AVE, PHOENIX | 0.7 | 3.4 | 15.7 |
| 98591 | CEMEX - 7TH STREET PLANT | PORTABLE #4, PHOENIX | 0.0 | 0.1 | 0.0 |
| 98492 | CEMEX - BUCKEYE PLANT | 22625 W BELOAT RD, BUCKEYE | 0.0 | 0.0 | 0.0 |
| 63 | CEMEX - EL MIRAGE PLANT | 8635 N EL MIRAGE RD, EL MIRAGE | 0.0 | 0.1 | 0.0 |
| 213 | CEMEX - GLENDALE PLANT | 11920 W GLENDALE AVE, GLENDALE | 2.1 | 1.8 | 10.7 |
| 1266 | CEMEX - WEST PLANT | 11701 W INDIAN SCHOOL RD, PHOENIX | 0.7 | 8.7 | 1.9 |
| 579 | CEMEX - WEST VALLEY PLANT | 11550 W NORTHERN AVE, GLENDALE | 0.5 | 6.4 | 1.4 |
| 1310 | CENTURY GRAPHICS LLC | 2960 GRAND AVE, PHOENIX | 6.3 | 0.3 | 0.2 |
| 823 | CHEMRESEARCH CO INC | 1130 W HILTON AVE, PHOENIX | 3.1 | 0.4 | 0.3 |
| 127623 | CINTAS CORPORATION | 2425 W NEVADA ST, CHANDLER | 0.8 | 0.8 | 0.7 |
| 61573 | CIRCLE H SAND & ROCK | 6400 S EL MIRAGE RD, TOLLESON | 0.3 | 4.1 | 0.9 |
| 3441 | CIRCLE K TERMINAL LLC | 5333 W VAN BUREN ST, PHOENIX | 40.2 | | |
| 3403 | CITY OF PHOENIX 19TH AVE LANDFILL | 1701 W LOWER BUCKEYE RD, PHOENIX | 0.6 | 0.4 | 0.8 |
| 29919 | CITY OF PHOENIX 27TH AVE LANDFILL | 2800 S 27TH AVE, PHOENIX | 1.4 | 1.2 | 2.1 |
| 1075 | CO PHX 91ST AVE WWTP | 5615 S 91ST AVE #1, TOLLESON | 2.9 | 19.8 | 9.0 |
| 105317 | COMMON MARKET EQUIPMENT EAST | 26700 S HWY 85, BUCKEYE | 2.3 | | |
| 113723 | CONTRACTORS LANDFILL & RECYCLING | 2425 N CENTER ST, MESA | 0.7 | 8.8 | 1.9 |
| 31570 | COPPER STATE RUBBER OF ARIZONA | 750 S 59TH AVE, PHOENIX | 8.6 | 0.5 | 0.4 |
| 1054 | COPPERSTATE CABINET CO INC | 1932 W NORTH LN, PHOENIX | 5.8 | | |
| 399 | CORESLAB STRUCTURES (ARIZ) INC | 5026 S 43RD AVE, PHOENIX | 9.6 | | |
| 227 | CORROSION ENGINEERING INC | 145 S NINA CIR, MESA | 21.5 | 0.4 | 0.4 |

| ID | Business name | Street address and city | VOC | $NO_X$ | CO |
|---|---|---|---|---|---|
| 128232 | COSTCO GASOLINE #1028 | 7525 E HAMPTON RD, MESA | 10.6 | | |
| 43917 | COSTCO GASOLINE #490 | 19001 N 27TH AVE, PHOENIX | 14.9 | | |
| 43916 | COSTCO GASOLINE #665 | 1646 W MONTEBELLO AVE, PHOENIX | 10.4 | | |
| 106288 | COSTCO GASOLINE #738 | 2454 E BEARDSLEY RD, PHOENIX | 12.9 | | |
| 129936 | COSTCO GASOLINE FACILITY NO 1058 | 4550 E CACTUS RD PV MALL, PHOENIX | 14.6 | | |
| 127537 | COSTCO GASOLINE LOC 827 (AIR) | 3801 N 33RD AVE, PHOENIX | 4.7 | | |
| 104505 | COSTCO WHOLESALE | 2887 S MARKET ST, GILBERT | 13.7 | | |
| 4339 | COSTCO WHOLESALE #427 | 15255 N HAYDEN RD, SCOTTSDALE | 15.1 | | |
| 16027 | COSTCO WHOLESALE #436 | 1445 W ELLIOT RD, TEMPE | 12.6 | | |
| 18490 | COSTCO WHOLESALE #465 | 4502 E OAK ST, PHOENIX | 12.4 | | |
| 41080 | COSTCO WHOLESALE #481 | 1415 N ARIZONA AVE, GILBERT | 12.7 | | |
| 51068 | COSTCO WHOLESALE #674 | 17550 N 79TH AVE, GLENDALE | 15.6 | | |
| 60765 | COSTCO WHOLESALE #691 | 10000 W MCDOWELL RD, AVONDALE | 11.6 | | |
| 99731 | COSTCO WHOLESALE #736 | 595 S GALLERIA WAY, CHANDLER | 14.1 | | |
| 1198 | COURIER GRAPHICS CORP | 2621 S 37TH ST, PHOENIX | 8.6 | 0.4 | 0.4 |
| 289 | COURTHOUSE AG HOLDINGS LLC | 51040 W VALLEY RD, AGUILA | 2.1 | 0.0 | 0.0 |
| 132333 | COYOTE TIRE RETREADING, INC | 1802 N 23RD AVE, PHOENIX | 0.1 | 0.1 | 0.1 |
| 4368 | CRAFTSMEN IN WOOD MFG | 5441 W HADLEY ST, PHOENIX | 6.3 | 0.0 | 0.0 |
| 1407 | CRANE ELECTRONICS, INC | 340 N ROOSEVELT AVE, CHANDLER | 0.3 | 0.1 | 0.1 |
| 100059 | CRM OF AMERICA (NEW AIR) | 11400 E PECOS RD, MESA | 0.2 | 0.3 | 0.1 |
| 129 | CROTHALL LAUNDRY SERVICES | 4445 S 36TH ST, PHOENIX | 0.2 | 4.2 | 3.5 |
| 134012 | CROWN CUSTOM MILLWORK, LLC | 2740 W DEER VALLEY RD, PHOENIX | 9.6 | | |
| 131179 | CSE OPERATING I, LLC | 29115 W BROADWAY RD, BUCKEYE | | 0.1 | 0.0 |
| 134236 | CURTISS WRIGHT CONTROLS | 1150 N FIESTA BLVD, GILBERT | 0.4 | | |
| 130790 | CUSTOM FAB INC | 3065 S 43RD AVE, PHOENIX | 6.0 | 0.6 | 0.5 |
| 87 | DECA CREMATION SERVICES INC | 2237 S 15TH ST, PHOENIX | 0.0 | 0.7 | 0.0 |
| 45027 | DEER VALLEY TRANSFER STATION | 2120 W ADOBE DR, PHOENIX | 0.0 | 0.1 | 0.0 |
| 1342 | DEL RIO LANDFILL | 1150 E ELWOOD ST, PHOENIX | 0.1 | 0.0 | 0.0 |
| 50725 | DESERT POWDER COATING | 4409 S 35TH AVE, PHOENIX | 0.8 | 0.3 | 0.3 |
| 51073 | DIGITAL REALTY TRUST CHANDLER, LLC | 2121 S PRICE RD, CHANDLER | 0.8 | 12.5 | 5.5 |
| 36 | DON SANDERSON FORD INC | 6400 N 51ST AVE, GLENDALE | 3.8 | | |
| 127094 | DOUBLETREE PAPER MILL LLC | 31201 W THAYER RD, GILA BEND | 6.0 | 4.0 | 10.4 |
| 299 | DPC ENTERPRISES INC GP | 4909 W PASADENA AVE, GLENDALE | 1.6 | | |
| 51062 | DURANGO CORRECTIONAL FACILITY | 3225 W DURANGO ST, PHOENIX | 0.1 | 0.9 | 0.6 |
| 48771 | EAGLE ROOFING PRODUCTS | 4602 W ELWOOD ST, PHOENIX | 1.4 | 2.3 | 1.9 |
| 35018 | EARL'S FIBERGLASS INC | 128 W MARICOPA FWY, PHOENIX | 4.6 | | |
| 1383 | EAST VALLEY CREMATORY | 9642 E APACHE TR, MESA | 0.0 | 0.2 | 0.0 |
| 109938 | EBAY INC | 4010 N 3RD ST, PHOENIX | 0.7 | 49.2 | 2.8 |
| 26 | EMPIRE MACHINERY CO | 1725 S COUNTRY CLUB DR, MESA | 2.3 | 8.9 | 2.2 |
| 130260 | ENTRUSTED PETS, INC | 2237 S 15TH ST, PHOENIX | 0.0 | 0.1 | 0.0 |
| 1505 | EXECUTIVE DOOR COMPANY | 3939 W CLARENDON AVE, PHOENIX | 0.3 | | |
| 1488 | FARMER'S GIN INC | 8400 S TURNER RD, BUCKEYE | 0.0 | 0.3 | 0.0 |
| 59426 | FEDERAL EXPRESS-PHXR | 3002 E OLD TOWER RD #100, PHOENIX | 0.4 | 0.8 | 0.2 |
| 132911 | FINECRAFT CUSTOM WOODWORKS LLC | 5775 N 51ST AVE, GLENDALE | 2.5 | | |
| 107758 | FIREBIRD PRODUCTS, LLC | 6010 N 53RD DR, GLENDALE | 8.4 | | |
| 128991 | FISHER SAND & GRAVEL | PORTABLE #3 | 2.7 | 12.1 | 9.8 |
| 85509 | FISHER SAND & GRAVEL COMPANY | PORTABLE #2 | 1.3 | 15.4 | 3.3 |
| 1087 | FLEX FOAM DIVISION | 617 N 21ST AVE, PHOENIX | 1.8 | 0.2 | 0.2 |

| ID | Business name | Street address and city | VOC | $NO_x$ | CO |
|---|---|---|---|---|---|
| 27728 | FLIPCHIP INTERNATIONAL LLC | 3701 E UNIVERSITY DR, PHOENIX | 17.4 | 0.4 | 0.4 |
| 1375 | FOREST DESIGNS | 3230 E ROESER RD #10, PHOENIX | 3.9 | | |
| 4206 | FUJI FILM ELECTRONIC MATERIALS USA | 6550 S MOUNTAIN RD, MESA | 3.2 | 1.5 | 1.2 |
| 36258 | G & K SERVICES | 4804 W ROOSEVELT ST, PHOENIX | 5.3 | 1.0 | 0.8 |
| 132482 | G & L POWERS INC | 1483 W HARVARD ST, GILBERT | 0.5 | | |
| 41751 | GCR TIRE CENTERS | 2815 N 32ND AVE, PHOENIX | 0.3 | | |
| 902 | GENERAL DYNAMICS C4 SYSTEMS | 8201 E MCDOWELL RD, SCOTTSDALE | 3.1 | 1.4 | 0.7 |
| 73110 | GLENN WEINBERGER TOPSOIL INC | 39500 S 99TH AVE, MOBILE | 0.0 | 0.2 | 0.0 |
| 2411 | GLENROSA SERVICE CENTER | 4019 W GLENROSA AVE, PHOENIX | 0.3 | | |
| 1418 | GOODRICH CORPORATION | 3414 S 5TH ST, PHOENIX | 15.0 | 0.0 | 0.0 |
| 515 | GOODYEAR COMMERCIAL TIRE SERVICE CTR | 3007 N 31ST AVE, PHOENIX | 0.7 | | |
| 131841 | GRANITE EXPRESS | , MORRISTOWN | 0.5 | 6.3 | 1.3 |
| 10 | GREEN ACRES MORTUARIES & CEMETERIES | 401 N HAYDEN RD, SCOTTSDALE | 0.0 | 0.0 | 0.0 |
| 1182 | GREENWOOD MEMORY LAWN MORTUARY | 2300 W VAN BUREN ST, PHOENIX | 0.0 | 0.9 | 0.1 |
| 141 | GRO-WELL BRANDS INC | 2807 S 27TH AVE, PHOENIX | 0.2 | | |
| 28393 | HAMILTON SUNDSTRAND/UTC AEROSPACE SYS | 1007 E UNIVERSITY DR, PHOENIX | 1.2 | | |
| 699 | HANSON AGGREGATES OF ARIZONA INC | 4002 S 51ST AVE, PHOENIX | 2.9 | 3.6 | 4.1 |
| 131334 | HELIAE DEVELOPMENT LLC | 614 E GERMANN RD, GILBERT | 4.9 | 0.2 | 0.0 |
| 31565 | HENRY PRODUCTS INC | 302 S 23RD AVE, PHOENIX | 10.9 | 0.4 | 0.4 |
| 129711 | HERITAGE CREMATORY | 12525 NW GRAND AVE, EL MIRAGE | 0.0 | 0.4 | 0.0 |
| 3536 | HOLSUM BAKERY INC | 2322 W LINCOLN ST, PHOENIX | 25.6 | 3.6 | 3.1 |
| 39213 | HOLSUM OF TOLLESON LLC | 9600 W BUCKEYE RD, TOLLESON | 23.3 | 2.9 | 2.4 |
| 1059 | HONEYWELL ENGINES SYS & SERVICE PHX R&O | 1944 E SKY HARBOR CIR, PHOENIX | 12.2 | 1.4 | 2.6 |
| 355 | HONEYWELL INTERNATIONAL INC | 111 S 34TH ST, PHOENIX | 32.9 | 42.0 | 13.7 |
| 247 | HONEYWELL INTERNATIONAL INC (TEMPE, AZ) | 1300 W WARNER RD, TEMPE | 7.4 | 3.3 | 2.3 |
| 348 | HONEYWELL PHOENIX AVIONICS DEER VALLEY | 21111 N 19TH AVE, PHOENIX | 2.6 | 1.4 | 0.6 |
| 131198 | IMPERIAL WOODWORKING LLC | 4012 W TURNEY AVE #6, PHOENIX | 1.9 | | |
| 354 | IMSAMET OF ARIZONA | 3829 S ESTRELLA PKWY, GOODYEAR | 10.4 | 6.4 | 63.9 |
| 4444 | INFINEON TECHNOLOGIES EPI SERVICES INC | 550 W JUANITA AVE, MESA | 0.6 | 0.1 | 0.0 |
| 777 | INSULFOAM | 3401 W COCOPAH ST, PHOENIX | 29.4 | 0.6 | 0.5 |
| 31617 | INTEL CORP CHANDLER CAMPUS (FAB 6) | 5000 W CHANDLER BLVD, CHANDLER | 8.1 | 14.5 | 7.8 |
| 3966 | INTEL CORP-OCOTILLO CAMPUS | 4500 S DOBSON RD, CHANDLER | 91.2 | 27.0 | 37.5 |
| 89885 | INTERCO PRINT | 4501 W POLK ST, PHOENIX | 1.5 | 0.2 | 0.2 |
| 130597 | INTERNATIONAL FLORA TECHNOLOGIES | 28633 W PATTERSON RD, BUCKEYE | 21.5 | 0.1 | 0.1 |
| 43832 | INTERNATIONAL PAPER | 660 S 83RD AVE, TOLLESON | 6.9 | 0.9 | 2.3 |
| 131226 | INTERSAN MANUFACTURING | 1746 W FILLMORE ST, PHOENIX | 0.1 | | |
| 130265 | IO PHOENIX ONE, LLC | 615 N 48TH ST, PHOENIX | 0.4 | 7.6 | 0.7 |
| 40471 | IRONWOOD CUSTOM FINISHING | 1822 E MADISON ST, PHOENIX | 6.1 | | |
| 983 | ISOLA GROUP S A R L | 165 S PRICE RD, CHANDLER | 11.8 | 10.6 | 3.2 |
| 732 | JABIL | 615 S RIVER DR, TEMPE | 1.0 | | |
| 121 | JACKS TIRE & OIL | 5925 W MONROE ST, PHOENIX | 0.3 | 0.0 | 0.0 |
| 121873 | JAMES EDWARD FURNITURE | 1555 E JACKSON ST, PHOENIX | 4.7 | | |
| 101 | JBS TOLLESON INC | 651 S 91ST AVE, TOLLESON | 11.5 | 12.4 | 5.2 |
| 25823 | JOY GLOBAL - SURFACE MINING | 112 W IRON AVE, MESA | 1.3 | 0.0 | 0.0 |
| 1027 | JPCI SERVICES | PORTABLE | 6.0 | 3.3 | 0.7 |
| 130981 | KELLER ELECTRICAL INDUSTRIES INC | 1881 E UNIVERSITY DR, PHOENIX | 0.6 | 0.1 | 0.1 |
| 114904 | KILAUEA CRUSHERS INC | 16402 S TUTHILL RD, BUCKEYE | 0.1 | 1.0 | 0.2 |
| 128509 | KILAUEA CRUSHERS INC | SR 85 & BUCKEYE HILLS DR, BUCKEYE | 0.1 | 0.8 | 0.2 |

| ID | Business name | Street address and city | VOC | $NO_X$ | CO |
|---|---|---|---|---|---|
| 857 | L-3 COMMUNICATIONS CORPORATION | 1215 S 52ND ST, TEMPE | 15.2 | 0.3 | 0.1 |
| 121236 | LANDMARK AVIATION | 14600 N AIRPORT DR, SCOTTSDALE | 0.4 | | |
| 30357 | LARON INC | 3550 S 16TH ST, PHOENIX | 0.6 | 0.1 | 0.1 |
| 96886 | LEGENDS FURNITURE | 10300 W BUCKEYE RD, TOLLESON | 55.7 | | |
| 131339 | LGS AZ, LLC DBA LOOK TRAILERS | 8230 N EL MIRAGE RD, EL MIRAGE | 16.1 | | |
| 130111 | LIFEPLAN CREMATORY INC | 1216 N 17TH AVE, PHOENIX | 0.0 | 0.7 | 0.0 |
| 39914 | LOVE'S COUNTRY STORE #296 | 820 W PIMA RD, GILA BEND | 13.3 | | |
| 3300 | LUKE AFB - 56TH FIGHTER WING | 14002 W MARAUDER ST, GLENDALE | 13.9 | 7.7 | 3.5 |
| 744 | M E GLOBAL INC | 5857 S KYRENE RD, TEMPE | 22.3 | 11.5 | 49.5 |
| 1248 | MAAX SPAS INDUSTRIES CORP | 25605 S ARIZONA AVE, CHANDLER | 50.0 | | |
| 31261 | MADISON GRANITE SUPPLIES | 29925 N NORTH VALLEY PKWY, PHOENIX | 0.5 | 25.9 | 4.0 |
| 148 | MAGELLAN AEROSPACE, GLENDALE INC | 5440 W MISSOURI AVE, GLENDALE | 10.4 | 1.0 | 0.8 |
| 353 | MARLAM INDUSTRIES INC | 834 E HAMMOND LN, PHOENIX | 14.9 | 0.0 | 0.0 |
| 15445 | MAYO CLINIC ARIZONA | 13400 E SHEA BLVD, SCOTTSDALE | 4.1 | 2.6 | 2.1 |
| 1200 | MEDTRONIC - TEMPE | 2343 W MEDTRONIC WAY, TEMPE | 5.1 | 0.5 | 0.4 |
| 244 | MELCHER MISSION CHAPEL AND CREMATORY | 6625 E MAIN ST, MESA | 0.0 | 0.8 | 0.0 |
| 596 | MELDRUM MORTUARY & CREMATORY | 52 N MACDONALD, MESA | 0.0 | 0.1 | 0.0 |
| 128760 | MERIDIAN OPTICAL | 3711 E ATLANTA AVE, PHOENIX | 0.8 | | |
| 82244 | MESA COMMUNITY COLLEGE MORTUARY SCI | 7440 E TAHOE AVE, MESA | 0.0 | 0.0 | 0.0 |
| 3326 | MESA FULLY FORMED LLC | 1111 S SIRRINE ST, MESA | 8.1 | | |
| 1203 | MICROCHIP TECHNOLOGY INC | 2355 W CHANDLER BLVD, CHANDLER | 0.4 | 0.9 | 0.5 |
| 1875 | MICROCHIP TECHNOLOGY INC | 1200 S 52ND ST, TEMPE | 10.8 | 11.6 | 6.4 |
| 53593 | MICROSEMI CORP | 3601 E UNIVERSITY DR, PHOENIX | 2.1 | | |
| 3724 | MISSION FOODS-TEMPE | 5860 S ASH AVE, TEMPE | 2.7 | 2.8 | 2.4 |
| 882 | MORTON SALT, INC | 13000 W GLENDALE AVE, GLENDALE | 0.6 | 8.0 | 2.3 |
| 264 | MOUNTAIN VIEW FUNERAL HOME & CEMETERY | 7900 E MAIN ST, MESA | 0.2 | 0.1 | 0.0 |
| 132523 | MOUNTAINVIEW CUSTOM CABINETS | 23306 N 15TH AVE, PHOENIX | 6.9 | | |
| 128379 | MURPHY WALL PRODUCTS INTERNATIONAL INC | 228 E ARIZONA EASTERN AVE, BUCKEYE | 0.0 | | |
| 121682 | MUSKET CORPORATION | 816 N 19TH AVE, PHOENIX | 0.0 | 0.0 | 0.0 |
| 34197 | NATIONAL GYPSUM COMPANY | 1414 E HADLEY ST, PHOENIX | 8.3 | 9.8 | 13.8 |
| 114015 | NATIONAL SPECIALTY AGGREGATES LLC | 4310 S 80TH ST, MESA | 0.0 | 0.0 | 0.0 |
| 910 | NELTEC INC | 1420 W 12TH PL, TEMPE | 9.4 | 3.6 | 1.3 |
| 128696 | NIELS ANDERSEN SCULPTURES LLC | 2630 E MOHAWK LN SUITE 124, PHOENIX | 0.7 | | |
| 590 | NK ASPHALT PARTNERS | 7110 W NORTHERN AVE, GLENDALE | 3.7 | 5.9 | 5.0 |
| 129677 | NO WASTE GRINDINGS | PORTABLE #1, PHOENIX | 0.5 | 6.2 | 1.3 |
| 620 | NORTHWEST WATER RECLAMATION PLANT | 960 N RIVERVIEW, MESA | 1.3 | 3.5 | 3.1 |
| 881 | NXP SEMICONDUCTORS | 1300 N ALMA SCHOOL RD, CHANDLER | 34.4 | 12.9 | 15.0 |
| 56506 | OAK CREEK FURNITURE INC | 5355 N 51ST AVE #7, GLENDALE | 1.6 | | |
| 3953 | OAKCRAFT INC | 7733 W OLIVE AVE, PEORIA | 45.0 | 0.1 | 0.1 |
| 31637 | OLAM COTTON | 25500 W SOUTHERN AVE, BUCKEYE | 0.0 | 0.1 | 0.0 |
| 53 | OLDCASTLE PRECAST INC | 411 E FRYE RD, CHANDLER | 5.1 | 1.9 | 0.4 |
| 4147 | OPT CO | PORTABLE | 0.5 | 6.1 | 1.3 |
| 101348 | ORBITAL SCIENCES CORPORATION | 1721 W ELLIOT RD, GILBERT | 0.4 | 0.5 | 0.4 |
| 528 | PACKAGING CORPORATION OF AMERICA INC | 441 S 53RD AVE, PHOENIX | 2.6 | 1.5 | 1.3 |
| 98 | PALO VERDE NUCLEAR GENERATING STATION | 5801 S WINTERSBURG RD, TONOPAH | 11.0 | 48.7 | 12.8 |
| 428 | PALOMA GIN PROPERTIES LLC | 57525 S POTATOE RD, GILA BEND | 0.0 | 0.1 | 0.1 |
| 130656 | PALOMA READY MIX & MATERIALS LLC | PORTABLE #1, (blank) | 0.0 | 0.4 | 0.1 |
| 733 | PAN GLO SERVICES LLC | 2401 W SHERMAN ST, PHOENIX | 17.7 | 0.5 | 0.4 |

| ID | Business name | Street address and city | VOC | $NO_x$ | CO |
|---|---|---|---|---|---|
| 4004 | PAN JIT | 2502 W HUNTINGTON DR, TEMPE | 2.0 | 0.0 | 0.0 |
| 49047 | PARADISE MEMORIAL CREMATORY | 9300 E SHEA BLVD BLDG C, SCOTTSDALE | 0.0 | 1.2 | 0.1 |
| 1055 | PARAMOUNT PETROLEUM CORP OF AZ INC | 1935 W MCDOWELL RD, PHOENIX | 5.1 | 9.3 | 7.8 |
| 419 | PARKER HANNIFIN CORP | 7777 N GLEN HARBOR BLVD, GLENDALE | 22.3 | | |
| 1398 | PATRICIAN MARBLE CO | 3333 W OSBORN RD, PHOENIX | 2.3 | | |
| 4241 | PEPSICO | 409 S 104TH AVE, TOLLESON | 3.7 | 10.0 | 16.6 |
| 29244 | PET & ANIMAL LOVERS SERVICE (PALS) | 3629 N 40TH AVE, PHOENIX | 0.0 | 2.5 | 0.1 |
| 69 | PHOENIX HEAT TREATING INC | 2405 W MOHAVE RD, PHOENIX | 3.7 | 1.9 | 1.6 |
| 1491 | PHOENIX METALCRAFT INC | 3845 N 29TH AVE, PHOENIX | 3.5 | | |
| 27946 | PHOENIX-MESA GATEWAY AIRPORT AUTHORITY | 5835 S SOSSAMAN RD, MESA | 3.7 | 0.2 | 0.2 |
| 1154 | PING INC | 2201 W DESERT COVE AVE, PHOENIX | 8.8 | 0.1 | 0.1 |
| 132990 | PRECISE METAL PRODUCTS | 4534 N 44TH AVE, PHOENIX | 0.6 | | |
| 4007 | PRECISION TRUCK PAINTING & REPAIR INC | 2212 N 27TH AVE, PHOENIX | 2.6 | | |
| 116742 | PREFERRED PACKAGING & CONTAINER | 3330 W COCOPAH ST #1, PHOENIX | 4.4 | 0.1 | 0.1 |
| 108860 | PRISMA GRAPHIC CORPORATION | 2937 E BROADWAY RD, PHOENIX | 9.4 | 0.2 | 0.1 |
| 75998 | PRO PETROLEUM PHOENIX TERMINAL | 408 S 43RD AVE, PHOENIX | 2.3 | 0.0 | 0.0 |
| 60889 | PURCELLS WESTERN STATES TIRE | 420 S 35TH AVE, PHOENIX | 6.2 | 0.1 | 0.1 |
| 1335 | QUALITY BLOCK INC | 3035 S 35TH AVE, PHOENIX | 0.0 | 0.4 | 0.3 |
| 3307 | QUIKJET LLC | 5119 W MONROE ST, PHOENIX | 25.5 | | |
| 131898 | QUIKTRIP DISTRIBUTION - PHOENIX | 8501 W LATHAM ST, TOLLESON | 1.8 | 1.1 | 0.6 |
| 537 | RED MOUNTAIN MINING INC | 4520 N POWER RD, MESA | 0.5 | 6.2 | 1.3 |
| 54 | REDBURN TIRE CO | 3801 W CLARENDON AVE, PHOENIX | 1.1 | | |
| 131795 | REDSTONE INDUSTRIES, INC | 13770 W PEORIA AVE, SURPRISE | 2.9 | | |
| 128324 | REGENCY MORTUARY SERVICES INC | 9850 W THUNDERBIRD RD, SUN CITY | 0.0 | 0.1 | 0.0 |
| 44356 | RITCHIE BROS AUCTIONEERS (AMERICA) INC | 5410 W LOWER BUCKEYE RD, PHOENIX | 0.5 | 0.0 | 0.0 |
| 4318 | RIVER RANCH PLANT #40 | 5159 N EL MIRAGE RD, LITCHFIELD PK | 0.1 | 0.1 | 0.0 |
| 131080 | ROBERTSON FUEL SYSTEMS LLC | 800 W CARVER RD #101, TEMPE | 2.4 | 0.1 | 0.1 |
| 133058 | ROCK SOLID INC | 11500 W BEARDSLEY RD, SUN CITY | 0.0 | 0.0 | 0.0 |
| 133589 | ROCK SOLID INC | 6204 W SOUTHERN AVE, PHOENIX | 0.0 | 0.0 | 0.0 |
| 759 | ROGERS CORP/ADVANCED CIRCUIT MATERIALS | 100 S ROOSEVELT AVE, CHANDLER | 15.3 | 6.5 | 2.9 |
| 4174 | ROGERS CORPORATION | 2225 W CHANDLER BLVD, CHANDLER | 0.0 | 0.3 | 0.1 |
| 4543 | ROHRER CORPORATION | 159 W 1ST AVE, MESA | 8.6 | | |
| 29474 | SA RECYCLING LLC | 3640 S 35TH AVE, PHOENIX | 0.1 | | |
| 132784 | SAM'S CLUB #6605 | 1225 N GILBERT RD, GILBERT | 7.8 | 0.1 | 0.0 |
| 403 | SAPA EXTRUSIONS NORTH AMERICA, LLC | 249 S 51ST AVE, PHOENIX | 21.6 | 10.9 | 9.9 |
| 132227 | SCHAUMAPLAST PRECISION FOAM MOLDING LP | 21 N 39TH AVE, PHOENIX | 9.8 | 0.5 | 0.4 |
| 4072 | SCHREIBER FOODS INC | 2122 S HARDY DR, TEMPE | 1.4 | 4.2 | 12.8 |
| 266 | SCHUFF STEEL CO | 420 S 19TH AVE, PHOENIX | 18.2 | 9.3 | 2.0 |
| 246 | SCHULT HOMES | 231 N APACHE RD, BUCKEYE | 11.9 | | |
| 39309 | SENERGY PETROLEUM LLC | 622 S 56TH AVE, PHOENIX | 2.5 | | |
| 3528 | SENERGY PETROLEUM, LLC | 306 S COUNTRY CLUB DR, MESA | 9.6 | | |
| 1351 | SERENITY MORTUARY SERV INC | 2514 S 6TH AVE, PHOENIX | 0.0 | 1.3 | 0.1 |
| 1169 | SHAMROCK FOODS CO | 2228 N BLACK CANYON HWY, PHOENIX | 0.6 | 10.8 | 9.1 |
| 4050 | SIGNATURE BREADS INC | 1120 W FAIRMONT DR STE #6-12, TEMPE | 4.5 | 0.3 | 0.3 |
| 27933 | SKUNK CREEK LANDFILL | 3165 W HAPPY VALLEY RD, PHOENIX | 3.5 | 3.6 | 3.4 |
| 39980 | S-L SNACKS AZ, LLC | 1200 N BULLARD AVE, GOODYEAR | 11.5 | 6.3 | 5.3 |
| 131682 | SOLJET, LLC | 5601 W VAN BUREN ST, PHOENIX | 2.2 | 0.1 | 0.1 |
| 4086 | SOUTH BAY CIRCUITS INC | 6409 W COMMONWEALTH PL, CHANDLER | 2.6 | | |

| ID | Business name | Street address and city | VOC | $NO_X$ | CO |
|---|---|---|---|---|---|
| 2108 | SOUTHWEST AIRLINES CO | 4153 E SKY HARBOR BLVD, PHOENIX | 4.3 | 0.3 | 0.1 |
| 131861 | SOUTHWEST ARCHITECTURAL CASTINGS | 5343 W MOHAVE ST, PHOENIX | 0.2 | | |
| 52776 | SOUTHWEST BAKING COMPANY | 9604 W BUCKEYE RD, TOLLESON | 0.0 | 0.0 | 0.0 |
| 31643 | SOUTHWEST REGIONAL LANDFILL | 24427 S HWY 85, BUCKEYE | 0.7 | 8.2 | 1.7 |
| 2110 | SPECIAL DEVICES INC | 3431 N RESEDA CIR, MESA | 11.9 | | 0.0 |
| 80437 | SR 85 LANDFILL | 28633 W PATTERSON RD, BUCKEYE | 4.7 | 4.0 | 8.2 |
| 582 | STONE CREEK INC | 4221 E RAYMOND ST #102, PHOENIX | 15.2 | | |
| 388 | STOROPACK INC | 77 N 45TH AVE #2, PHOENIX | 2.5 | 0.1 | 0.1 |
| 131720 | STP PERFORMANCE COATING LLC | 406 E PIONEER ST, PHOENIX | 0.6 | 0.1 | 0.1 |
| 827 | STP PERFORMANCE COATING, LLC | 1131 W WATKINS ST, PHOENIX | 2.0 | 0.5 | 0.4 |
| 1214 | SULZER EMS INC | 2412 W DURANGO ST, PHOENIX | 1.4 | 0.0 | 0.0 |
| 4400 | SUMCO SOUTHWEST CORPORATION | 19801 N TATUM BLVD, PHOENIX | 9.0 | 13.9 | 6.0 |
| 71801 | SUMIKA ELECTRONIC MATERIALS INC | 3832 E WATKINS ST, PHOENIX | 0.2 | 0.3 | 0.1 |
| 31 | SUNLAND MEMORIAL PARK/MORT/CREM CTR | 15826 N DEL WEBB BLVD, SUN CITY | 0.0 | 0.0 | 0.0 |
| 41431 | SUPER RADIATOR COILS LTD | 2610 S 21ST ST, PHOENIX | 0.0 | 0.3 | 0.3 |
| 37546 | SUPERLITE BLOCK | 4626 N 42ND AVE, PHOENIX | 2.0 | 1.1 | 0.9 |
| 39376 | SWIFT TRANSPORTATION CO INC | 2200 S 75TH AVE, PHOENIX | 3.5 | | |
| 131377 | SWIM PLATFORMS INC | 3220 S 38TH ST, PHOENIX | 6.0 | | |
| 131453 | SYSCO ARIZONA INC | 611 S 80TH AVE, TOLLESON | 0.0 | 1.0 | 0.2 |
| 249 | THE BOEING COMPANY | 5000 E MCDOWELL RD, MESA | 26.9 | 2.1 | 1.8 |
| 133082 | TRANSWESTERN PIPELINE COMPANY, LLC | W TABLE MESA RD, NEW RIVER | 1.1 | 1.7 | 3.2 |
| 1122 | TRIUMPH MANUFACTURING LLC | 2130 S INDUSTRIAL PARK AVE, TEMPE | 1.9 | | |
| 819 | TRW VEHICLE SAFETY SYSTEMS INC | 11202 E GERMANN RD, MESA | 2.8 | 0.3 | 0.4 |
| 234 | UNITED DAIRYMEN OF ARIZONA | 2008 S HARDY DR, TEMPE | 2.4 | 27.0 | 38.2 |
| 132907 | UNITED METAL PRODUCTS, INC | 1920 E ENCANTO DR, TEMPE | 2.8 | 0.6 | 0.5 |
| 63962 | UPPER CRUST BAKERY | 3655 W WASHINGTON ST, PHOENIX | 9.4 | 1.7 | 1.4 |
| 131506 | USAA (UNITED SERVICES AUTOMOBILE ASSOC) | 1 N NORTERRA DR, PHOENIX | 0.0 | 1.4 | 0.2 |
| 187 | VERCO DECKING INC | 4340 N 42ND AVE, PHOENIX | 0.5 | 0.1 | 0.1 |
| 1415 | VULCAN MATERIALS CO | 7845 W BROADWAY RD, PHOENIX | 6.9 | 12.2 | 27.5 |
| 132528 | VULCAN MATERIALS COMPANY | 3410 E VIRGINIA ST, MESA | 1.6 | 3.0 | 2.2 |
| 2 | VULCAN MATERIALS CO-WESTERN DIVISION | 14521 N 115TH AVE, EL MIRAGE | 0.8 | 3.0 | 36.4 |
| 90 | VULCAN MATERIALS CO-WESTERN DIVISION | 4830 S 43RD AVE, PHOENIX | 0.8 | 4.6 | 3.8 |
| 131642 | W L GORE ASSOCIATES, INC | 32340 N NORTH VALLEY PKWY, PHOENIX | 2.7 | 0.8 | 1.0 |
| 130002 | WASTE MGMT 7TH AVE TRANSFER & LANDFILL | 3000 S 7TH AVE, PHOENIX | 0.3 | 3.9 | 0.9 |
| 113519 | WASTE MGMT PHX HAUL CONTAINER SHOP | 2441 S 40TH ST, PHOENIX | 1.6 | | |
| 134014 | WASTEBUILT SOUTHWEST LLC | 4020 S 15TH AVE, PHOENIX | 4.9 | | |
| 1149 | WEAVER QUALITY SHUTTERS INC | 218 S 15TH ST, PHOENIX | 2.4 | | |
| 131585 | WEST COAST SAND AND GRAVEL | 13333 W SOUTHERN AVE, AVONDALE | 0.9 | 10.5 | 2.3 |
| 1240 | WESTERN MILLWORK INC | 2525 W CORONADO RD, PHOENIX | 3.9 | | |
| 1339 | WESTERN REFINING TERMINALS, LLC | 3050 S 19TH AVE, PHOENIX | 0.3 | 1.2 | 0.6 |
| 2703 | WESTERN STATES PETROLEUM | 450 S 15TH AVE, PHOENIX | 11.5 | | |
| 820 | WESTSIDE CREMATORY | 11211 W MICHIGAN AVE, YOUNGTOWN | 0.0 | 0.4 | 0.0 |
| 121588 | WICKENBURG FUNERAL HOMES INC | 187 N ADAMS ST, WICKENBURG | 0.0 | 0.1 | 0.0 |
| 128707 | WOOD UNLIMITED INC (AIR) | 9801 N LITCHFIELD RD, EL MIRAGE | 1.8 | 9.1 | 5.0 |
| 1382 | WOODCASE FINE CABINETRY INC | 3255 W OSBORN RD, PHOENIX | 26.3 | | |

# Appendix E. 2014 Ozone Periodic Emissions Inventory Responsiveness Summary

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RESPONSIVENESS SUMMARY

2014 OZONE PERIODIC EMISSIONS INVENTORY

The 2014 Ozone Periodic Emissions Inventory was included in the MAG 2017 Eight –Hour Ozone Moderate Plan for the Maricopa Nonattainment Area. An advertised public hearing was conducted on October 17, 2016. The draft document was made available for public review on September 16, 2016. No comments were received during the public comment period. The MAG public hearing process documentation for the MAG 2017 Eight –Hour Ozone Moderate Plan for the Maricopa Nonattainment Area can be found at the following link: https://www.azmag.gov/Documents/EP_2016-12-09_MAG-2017-EightHour-Ozone-Moderate-Area-Plan-Appendices-Volume5.pdf.