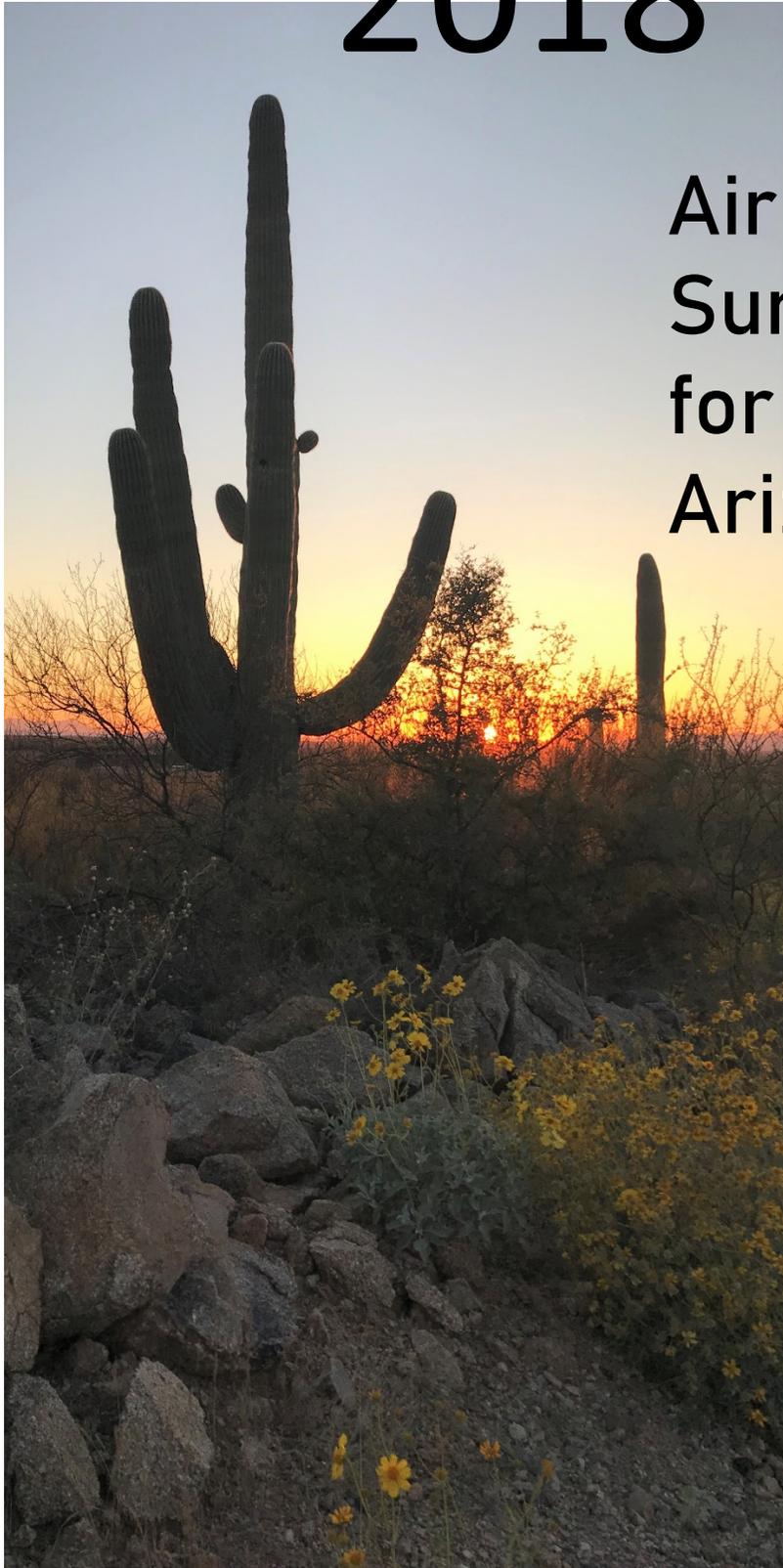


# 2018

## Air Quality Summary Report for Pima County, Arizona



Pima County  
Department of Environmental Quality  
33 North Stone Avenue  
Tucson, Arizona 85701  
AQ-403

# **2018 Air Quality Summary Report**

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**AQ-403**

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## List of Abbreviations / Acronyms

<b>ADEQ</b>	<b>Arizona Department of Environmental Quality</b>
<b>AQI</b>	<b>Air Quality Index - an index used to report air pollutant concentrations and associated health effects to the public.</b>
<b>CO</b>	<b>The chemical symbol for carbon monoxide, one of the criteria air pollutants.</b>
<b>EPA</b>	<b>United States Environmental Protection Agency</b>
<b>FRM</b>	<b>Federal Reference Method</b>
<b>NAAQS</b>	<b>National Ambient Air Quality Standards - the levels of pollutant concentration which are established to protect human health and welfare. Currently, there are six principal pollutants, which are called “criteria” air pollutants, with established levels.</b>
<b>NO<sub>2</sub></b>	<b>The chemical symbol for nitrogen dioxide, one of the criteria air pollutants.</b>
<b>NO<sub>x</sub></b>	<b>Total oxides of nitrogen (NO + NO<sub>2</sub>)</b>
<b>O<sub>3</sub></b>	<b>The chemical symbol for ozone, one of the criteria air pollutants.</b>
<b>Pb</b>	<b>The chemical symbol for lead, one of the criteria air pollutants.</b>
<b>PDEQ</b>	<b>Pima County Department of Environmental Quality</b>
<b>PM<sub>10</sub></b>	<b>Particulate Matter with an aerodynamic diameter of 10 micrometers or less, one of the criteria air pollutants.</b>
<b>PM<sub>2.5</sub></b>	<b>Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers, one of the criteria air pollutants.</b>
<b>ppm</b>	<b>Parts per million, a unit of concentration, commonly used to express gaseous concentrations.</b>
<b>ppb</b>	<b>Parts per billion, a unit of concentration used to express gaseous concentrations, 1000 ppb = 1 ppm.</b>
<b>SLAMS</b>	<b>State and Local Air Monitoring Stations</b>
<b>SO<sub>2</sub></b>	<b>The chemical symbol for sulfur dioxide, one of the criteria air pollutants.</b>
<b>SP</b>	<b>Special Purpose site</b>
<b>TSP</b>	<b>Total Suspended Particulates. A former criteria air pollutant which was replaced by PM<sub>10</sub>.</b>
<b>µg/m<sup>3</sup></b>	<b>Micrograms per cubic meter, a metric unit used to express concentration.</b>
<b>VOC</b>	<b>Volatile Organic Compound</b>

**Pima County Department of Environmental Quality  
2018 Air Quality Summary**

**Table 1**

Map No. (page 14)	Location of Monitoring Stations	Carbon Monoxide (CO) ppm		Ozone (O <sub>3</sub> ) ppm	Particulate Matter (PM <sub>10</sub> ) µg/m <sup>3</sup>	Particulate Matter (PM <sub>2.5</sub> ) µg/m <sup>3</sup>		Nitrogen Dioxide (NO <sub>2</sub> ) ppm		Sulfur Dioxide (SO <sub>2</sub> ) ppm
		Max Conc. 1 Hour	Max Conc. 8 Hour	4th Highest Conc. 8 Hour	Max Conc. 24 Hour	Max Conc. 24 Hour	Annual Mean	Annual Mean	Max Conc. 1 Hour	Max Conc. 1 Hour
		35 ppm	9 ppm	0.070 ppm	150 µg/m <sup>3</sup>	35 µg/m <sup>3</sup>	12 µg/m <sup>3</sup>	53 ppb	100 ppb	75 ppb
2	22 <sup>nd</sup> & Craycroft	<b>1.2</b>	<b>0.6</b>	<b>0.068</b>				<b>8.36</b>	<b>45.6</b>	
3	22 <sup>nd</sup> & Alvernon	<b>2.0</b>	<b>1.0</b>							
4	Geronimo				<b>107</b>	<b>37</b>	<b>6.3</b>			
5	South Tucson				<b>94</b>					
8	Corona de Tucson				<b>33</b>					
9	Santa Clara				<b>50</b>					
10	Green Valley			<b>0.065</b>	<b>131</b>	<b>14</b>	<b>4.1</b>			
11	Children's Park NCore	<b>0.9</b>	<b>0.7</b>	<b>.070</b>		<b>10.7</b>	<b>5.8</b>	<b>8.14</b>	<b>43.6</b>	<b>5.1</b>
						<b>24.6</b>	<b>4.5</b>			
12	Orange Grove				<b>75</b>	<b>41</b>	<b>5.5</b>			
13	Tangerine			<b>0.068</b>	<b>40</b>					
14	Rose Elementary			<b>0.066</b>		<b>16</b>	<b>5.2</b>			
15	Coachline			<b>0.070</b>		<b>33</b>	<b>5.5</b>			
16	Cherry & Glenn	<b>1.4</b>	<b>1.2</b>							
17	Fairgrounds			<b>0.069</b>						
18	Saguaro National Park East			<b>0.071</b>						
23	Golf Links & Kolb	<b>1.0</b>	<b>0.8</b>							

## Introduction



Pima County Department of Environmental Quality (PDEQ) monitors ambient (outdoor) air pollutants throughout eastern Pima County, including the Tucson metropolitan area and Green Valley. There are six principal pollutants, called “criteria” pollutants that are monitored in accordance with the National Ambient Air Quality Standards (NAAQS) set by the Environmental Protection Agency (EPA) to comply with the Federal Clean Air Act. The NAAQS were established to protect public health and the environment from harmful levels of air pollution.

PDEQ monitors for five criteria pollutants: carbon monoxide (CO), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), nitrogen dioxide (NO<sub>2</sub>) and sulfur dioxide (SO<sub>2</sub>) Locations of these monitors (page 14) are based on emission source distribution and population exposure (40 CFR, Part 58, App. D). Table 2, page 7, includes a description of the criteria pollutants and the potential health effects.

**Criteria Pollutants  
Table 2**

<b>Pollutant</b>	<b>Description</b>	<b>Sources</b>	<b>Other Information</b>	<b>Health Effects</b>
<b>Carbon Monoxide (CO)</b>	A colorless, odorless gas formed from the combustion of carbon compounds	Major source is motor vehicles; Minor sources are aircraft, trains, and burning of vegetation (wood)	Plants, animals, coal, gasoline, oil and wood (all living or once living organisms) contain carbon compounds. When they are burned in the presence of oxygen, the carbon will be converted to carbon dioxide gas (CO <sub>2</sub> ). When there is not enough oxygen present to form CO <sub>2</sub> then CO will form instead.	Carbon monoxide enters the bloodstream and reduces the delivery of oxygen to the body's organs and tissues. Can cause fatigue in healthy people and chest pains at low concentrations.
<b>Ozone (O<sub>3</sub>)</b>	A gas formed when volatile organic compounds (VOCs) and NO <sub>x</sub> react in the presence of heat and sunlight; at ground level, ozone is harmful to living things; key ingredient for smog	A compound not emitted directly from a source; the sources of volatile organic compounds and nitrogen oxides which cause the formation of ozone are primarily from vehicle exhaust and industrial processes	Stratospheric ozone occurs naturally about 15 to 30 miles above the Earth's surface and is a protective layer, providing a filter for the damaging ultraviolet light emitted by the sun.	Ozone can irritate the respiratory system and reduce lung function, causing wheezing and coughing and breathing difficulties.
<b>Particulate Matter (PM)</b>	Particulate matter (PM <sub>10</sub> ) are particles less than 10 microns in size. Particulate matter (PM <sub>2.5</sub> ) are particles less than 2.5 microns in size.	Major sources: vehicle exhaust, especially diesel fuels, road dust from traffic and unpaved roadways; Minor sources: construction activities, agricultural activities, industrial processes and combustion sources such as wood burning and wildfires	Particulate matter is a term for solid or liquid particles found in the air. It plays a large part in visibility with larger particles, seen as soot or smoke, to smaller particles, involved in light scattering or absorption, causing urban haze.	PM <sub>2.5</sub> has an impact on human health because of its ability to penetrate deep into the respiratory system. PM <sub>2.5</sub> can affect lung and heart function.
<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>	A highly reactive gas that is formed primarily when fuel is burned at high temperatures.	Major sources: automobile exhaust; Minor sources: industry, power plants and from the oxidation of NO in the atmosphere	A precursor to the formation of ozone (smog); can cause a reduction in visibility	NO <sub>2</sub> can irritate the respiratory system and reduce lung function.
<b>Sulfur Dioxide (SO<sub>2</sub>)</b>	A pungent gas	Major sources: coal burning and copper smelters; burning of diesel fuel	SO <sub>2</sub> gas can combine with water vapor and oxygen to form sulfuric acid (H <sub>2</sub> SO <sub>4</sub> ), which is a very corrosive chemical that can damage buildings, plants and aquatic life.	SO <sub>2</sub> can irritate the respiratory system and reduce lung function.
<b>Lead (Pb)</b>	A metal that can be poisonous if ingested or inhaled	Major sources: leaded gasoline; battery manufacturing and recycling		Lead can accumulate in the blood, bones and tissues causing neurological disorders and can damage organs.

**Table 3** below lists the Primary and Secondary NAAQS for each pollutant in terms of pollutant level and averaging time used to evaluate compliance with the standard. The primary standard is intended to protect public health, in particular, the health of the most susceptible individuals, such as children, elderly and those with respiratory illnesses. The secondary standard is to protect against damage to crops and vegetation, decreased visibility, and harm to animals and ecosystems. The averaging times, such as a 24-hour average or an annual average, protect the population from adverse health effects associated with peak short term exposure or long term exposure to these air pollutants.

An exceedance of the standard occurs when a recorded pollutant concentration is greater than the standard level concentration. A violation of the standard is when the recorded pollutant levels exceed the standard the number of times indicated in the NAAQS.

**Table 3**  
**National Ambient Air Quality Standards (NAAQS)**

Pollutant	Primary (Health Related)		Secondary (Welfare Related)	
	Type of Average	Standard Level Concentration <sup>a</sup>	Type of Average	Standard Level Concentration
<b>CO</b>	1-Hour <sup>b</sup>	35 ppm (40 µg/m <sup>3</sup> ) <sup>a</sup>	No Secondary Standard	
	8-Hour <sup>b</sup>	9 ppm (10 µg/m <sup>3</sup> ) <sup>a</sup>	No Secondary Standard	
<b>O<sub>3</sub></b>	8-Hour <sup>c</sup>	0.070 ppm	Same as Primary	
<b>PM<sub>10</sub></b>	24-Hour <sup>d</sup>	150 µg/m <sup>3</sup>	Same as Primary	
<b>PM<sub>2.5</sub></b>	Annual Arithmetic Mean <sup>e</sup>	12 µg/m <sup>3</sup>	Same as Primary	
	24-Hour <sup>e</sup>	35 µg/m <sup>3</sup>	Same as Primary	
<b>NO<sub>2</sub></b>	Annual Arithmetic Mean	53 ppb	Same as Primary	
	1-Hour <sup>f</sup>	100 ppb	None	
<b>SO<sub>2</sub></b>	1-Hour <sup>g</sup>	75 ppb	3-Hour <sup>h</sup>	0.5 ppm
<b>Pb</b>	Rolling 3-month Average	0.15 µg/m <sup>3</sup>	Same as Primary	

- a Parenthetical value is an approximately equivalent concentration (40 CFR, Part 50).
- b Not to be exceeded more than once per year.
- c The standard is met when the three year average of the annual fourth highest daily maximum concentration is less than or equal to 0.070ppm (effective December 28, 2015).
- d The 24-hour standard is met when the expected number of exceedances in a year averaged over three years is less than or equal to one (App. K). The annual standard was revoked December 17, 2006.
- e The 24-hour standard is met when the three year average of the 98th percentile value is less than or equal to 35 µg/m<sup>3</sup> (effective December 14, 2012). The annual standard is met when the annual average of the quarterly concentrations is less than or equal to 12 µg/m<sup>3</sup>, when averaged over 3 years.
- f The 1- hour standard is met when the three year average of the 98th percentile of the daily maximum 1- hour average at each monitor within an area does not exceed 100 ppb (effective January 22, 2010)
- g The 1- hour standard is met when the three year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area does not exceed 75 ppb. (effective June 2, 2010)
- h Not to be exceeded more than once per year.

**Reference:** [Http://www.epa.gov/air/criteria.html](http://www.epa.gov/air/criteria.html)

## Tucson Area Topography and Meteorology

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### Topography

Pima County is located in the southern part of Arizona with an area approximately 9,200 square miles. About 95% of the population resides in eastern Pima County. The 2010 Census population count for Pima County is 980,263 with the city of Tucson population at 520,116. The 2018 estimated population count for Pima County is at 1,039,073. The Tucson basin, located in eastern Pima County, has an elevation between 2,000 and 3,000 feet with several mountain ranges surrounding it with elevations exceeding 9,000 feet in the Santa Catalina, Santa Rita and Rincon ranges.

### Meteorology

The Tucson basin has abundant sunshine. The summer season is hot and runs from May through September. Tucson has mild winter temperatures and low rainfall averaging about twelve inches per year.

Wind direction is affected by the topography of the area, as well as the change of season and time of day. Air flows generally tend to be downvalley (from the southeast) at night and early morning hours, reversing to the upvalley direction (from the northwest) during the day.

The summer monsoon occurs in the months of June through September with the conditions having a yearly variability both in intensity and timing. The monsoon brings high relative humidity, cloud cover, wind events and frequent, often severe, thunderstorms.

Higher levels of pollution can occur in the winter when the air is calmest. Under these conditions, especially during winter mornings, pollutants become trapped by temperature inversions. The temperature inversions begin after the sun goes down and the air closest to the ground is cooled rapidly by heat radiating out through the clear dry air of the desert. As the sun rises in the morning, the upper air is heated rapidly and becomes warmer than the air closest to the ground. This traps the cold air next to the ground and holds it there until the sun is able to heat the ground and slowly raise the temperature of the trapped air. Once heated, the trapped air is able to rise and mix with the layers of air above and disperse the concentrated pollutants. These conditions, often referred to as temperature inversions, are common during the winter, and are less severe in the summer months.

## Tucson Area Status of Criteria Pollutants

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### Carbon Monoxide

Carbon monoxide concentrations have declined in the past four decades. This has been attributed mostly to the use of cleaner burning oxygenated fuels, catalytic converters, fuel efficient computer controlled vehicles, locally adopted Clean Air and Travel Reduction Programs and various local traffic control measures. The levels of CO remain below 10% of the standard but with population growth and increased number of cars on the roads, higher CO levels may be measured in the future.

The Tucson area generally has higher CO readings in the winter months due to stagnant air conditions in the colder mornings, as demonstrated by **Figure 4** in the seasonal trends section (page 19). The CO cannot mix due to stagnant air and tends to build up, especially near congested intersections.

There were no exceedances of the NAAQS for carbon monoxide in 2018. The national health standard for ambient CO specifies the 1-hour level at 35 ppm and the 8-hour level at 9 ppm. These levels cannot be exceeded more than once per year without incurring a violation of the NAAQS. The highest 1-hour reading in 2018 was 2.0 ppm at the 22<sup>nd</sup> & Alvernon location. The highest 8-hour reading was 1.2 ppm at the Cherry & Glenn location.

PDEQ monitors CO at five locations. **Table 6** (page 15) lists all the CO sites in the network and the maximum concentrations.

### Ozone

The 2008 primary standard for ozone was 0.075 ppm. EPA strengthened the ozone standard, in 2015 to 0.070 ppm. The revised standard is met when the three year average of the annual fourth highest daily eight hour average ozone concentration is less than or equal to 0.070 ppm. Pima County ozone standard concentrations reached .071 at the Saguaro Park site in 2018. The status of this exceedance will be considered at the next NAAQS designation review.

Ground level ozone concentrations are the highest in the summer months due to the intense sunlight and heat, as demonstrated by **Figure 5** in the seasonal trends section (page 19). Oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) are the “precursor” pollutants that react in the presence of sunlight to form ozone. In the Tucson area, ozone levels generally decline after sunset as the photochemical reactions cease. The highest ozone levels generally are not found near major intersections. Instead they are found when precursor pollutants are released and travel, due to wind or simple dispersion, away from the area of concentration before reacting with sunlight to form ozone. The Saguaro National Park East site generally records the highest ozone levels.

Pima County Department of Environmental Quality will issue an ozone advisory or watch to the media to protect very sensitive members of our population when the predicted ozone levels are elevated. Ten ozone advisories and six watches were issued in 2018.

The highest 4<sup>th</sup> highest 8-hour average ozone level in 2018 was 0.071 ppm at the Saguaro National Park location. **Table 7** (page 15) lists the maximum concentrations for ozone and the locations of the eight PDEQ ozone monitors.

## Nitrogen Dioxide and Sulfur Dioxide

The other criteria pollutants measured by PDEQ are nitrogen dioxide and sulfur dioxide. No significant changes in the levels of these two pollutants have been seen in the past 20 years.

Nitrogen dioxide is measured at the Children's Park and 22<sup>nd</sup> Street & Craycroft locations. Nitrogen dioxide levels remain low during the summer but act as a precursor to ozone formation. Most noticeable during wintertime temperature inversions, NO<sub>2</sub> is a contributing factor to urban haze, the "brown cloud" that limits visibility in the Tucson basin. Motor vehicles are a major source of NO<sub>2</sub> in Pima County.

There were no exceedances of the NO<sub>2</sub> standard in 2018. Concentrations in Pima County average about 30% of the standard. **Table 10** (page 17) contains the nitrogen dioxide information for 2018.

Sulfur dioxide is measured at the Children's Park NCore location. Tucson has no significant sources of SO<sub>2</sub> and the levels continue to be extremely low with averages at around 7% of the standard. **Table 11** (page 17) contains the sulfur dioxide information for 2018.

## Particulate Matter (PM<sub>10</sub>, PM<sub>2.5</sub>)

PM<sub>10</sub> is particulate matter with an aerodynamic diameter of 10 microns or less and PM<sub>2.5</sub> is particulate matter with an aerodynamic diameter of 2.5 microns or less. Particulate matter is a health concern because when inhaled, the particles are able to pass through the body's protective filtration system and enter the lungs.

Particulate matter concentrations are often higher near unpaved roads, during localized activities such as construction, during extended dry periods, and when strong winds are present. Pima County violated the PM<sub>10</sub> standard in 1999 with four recorded exceedances of the standard at the Orange Grove location. High winds and unusually long periods without rain are considered factors contributing to the high particulate readings for that year. A Natural Events Action Plan (NEAP) was submitted to ADEQ and EPA and the resulting ordinance was adopted December 3, 2002. This plan included measures to minimize contributing controllable sources using the Best Available Control Measures (BACM), increased enforcement and education to help protect public health and welfare on days with high levels of PM<sub>10</sub>. Pima County currently follows the Exceptional Events Rule instituted by EPA on November 21, 2008 for exceedances of the standard. **Table 4** next page lists the Particulate Matter (PM<sub>10</sub>) exceedances recorded at our monitoring sites from 1990 to 2018.

Pima County will issue a particulate matter advisory or watch to the public when there are elevated levels recorded. There were three advisories and three watches issued in 2018.

The 24-hour NAAQS for PM<sub>10</sub> is 150 micrograms per cubic meter (µg/m<sup>3</sup>). The highest level recorded in Pima County in 2018 was 131 µg/m<sup>3</sup> at the Green Valley location. **Table 8** (page 16) lists the seven PM<sub>10</sub> sites in the network and their maximum concentrations.

Particulate matter 2.5 microns or smaller (PM<sub>2.5</sub>) travels deeper into the lungs and can be more harmful than PM<sub>10</sub>. It can also be composed of toxic substances such as metals and organic compounds. PM<sub>2.5</sub> has been linked to health problems including respiratory and heart problems, and can also contribute to poor visibility and urban haze. There have been no exceedances of the NAAQS for PM<sub>2.5</sub> since monitoring began for this pollutant in 1999. The 24-hour NAAQS for PM<sub>2.5</sub> is 35 µg/m<sup>3</sup> (98<sup>th</sup> percentile averaged over three years). The highest 24-hour PM<sub>2.5</sub> concentration in 2018 in Pima County was 41 µg/m<sup>3</sup> at the Orange Grove location. **Table 9** (page 16) lists the six PM<sub>2.5</sub> sites in the network and their maximum concentrations.

**Table 4  
Pima County Particulate Matter Exceedances 1990- 2018**

<b>Date of Exceedance</b>	<b>Location</b>	<b>Exceptional Event Designation</b>
3-7-1999	Orange Grove, South Tucson	High Winds, Drought
10-20-1999	Orange Grove	High Winds, Drought
12-3-1999	Orange Grove, South Tucson	High Winds, Drought
12-23-1999	Orange Grove	High Winds, Drought
7-09-2002	Orange Grove, South Tucson	None
7-10-2002	South Tucson	None
7-11-2003	Orange Grove	Fire , Santa Catalina Mt. Range
10-27-2008	Santa Clara	High Winds
7-22-2009	Orange Grove, South Tucson, Geronimo	High Winds
4-8-2013	South Tucson	High Winds
4-9-2013	South Tucson Geronimo Green Valley	High Winds
7-25-2014	Geronimo Green Valley Orange Grove	Mexico and western Arizona storms

## Lead

On October 15, 2008, EPA strengthened the lead standard. The primary standard of 1.5ug/m<sup>3</sup> was lowered to 0.15ug/m<sup>3</sup>, measured as total suspended particles (TSP). The secondary standard being identical to the primary standard. Pima County has no sources of lead of one ton or more, which according to the 2005 National Air Emissions Inventory (NEI) from EPA, required Pima County to perform only area monitoring at the Children's Park location. This monitoring began in January, 2012, and was discontinued May 2016, per approval from EPA due to negligible levels of lead detected.

## Air Quality Monitoring Locations and Map

**Table 5**

Site Map #	Site Name	Address	Pollutant
2	22 <sup>nd</sup> & Craycroft	1237 S. Beverly	CO, O <sub>3</sub> , NO <sub>2</sub>
3	22 <sup>nd</sup> & Alvernon	3895 E. 22 <sup>nd</sup>	CO
4	Geronimo	2498 N. Geronimo	PM <sub>2.5</sub> , PM <sub>10</sub>
5	South Tucson	1601 S. 6 <sup>th</sup> Ave.	PM <sub>10</sub>
8	Corona de Tucson	22000 S. Houghton Rd.	PM <sub>10</sub>
9	Santa Clara School	6910 S. Santa Clara Ave.	PM <sub>10</sub>
10	Green Valley	601 N. La Canada Dr.	O <sub>3</sub> , PM <sub>10</sub> , PM <sub>2.5</sub>
11	Children's Park NCore	400 W. River Rd.	CO, O <sub>3</sub> , SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>2.5</sub>
12	Orange Grove	3401 W. Orange Grove Rd.	PM <sub>10</sub> , PM <sub>2.5</sub>
13	Tangerine	12101 N. Camino de Oeste	O <sub>3</sub> , PM <sub>10</sub>
14	Rose Elementary	710 W. Michigan Street	O <sub>3</sub> , PM <sub>2.5</sub>
15	Coachline	9597 N. Coachline Blvd.	O <sub>3</sub> , PM <sub>2.5</sub>
16	Cherry & Glenn	2745 N. Cherry	CO
17	Fairgrounds	11330 S. Houghton Rd.	O <sub>3</sub>
18	Saguaro National Park, East	3905 S. Old Spanish Tr.	O <sub>3</sub>
23	Golf Links & Kolb	2601 S. Kolb Rd.	CO



## Data Summary

**Table 6  
Carbon Monoxide Summary Values<sup>1</sup> for 2018**

Site	Map No.	Site Type	Max 1-Hr Value <sup>2</sup>	Max 8-Hr Value <sup>3</sup>	% Data Recovery <sup>4</sup>
<b>22<sup>nd</sup> / Craycroft</b>	<b>2</b>	<b>SLAMS</b>	<b>1.2</b>	<b>0.6</b>	<b>98</b>
<b>22<sup>nd</sup> / Alvernon</b>	<b>3</b>	<b>SLAMS</b>	<b>2.0</b>	<b>1.0</b>	<b>99</b>
<b>Children's Park NCore</b>	<b>11</b>	<b>NCore</b>	<b>0.9</b>	<b>0.7</b>	<b>99</b>
<b>Cherry / Glenn<sup>5</sup></b>	<b>16</b>	<b>SP<sup>6</sup></b>	<b>1.4</b>	<b>1.2</b>	<b>99</b>
<b>Golf Links / Kolb<sup>5</sup></b>	<b>23</b>	<b>SP<sup>6</sup></b>	<b>1.0</b>	<b>0.8</b>	<b>99</b>

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard one hour average for carbon monoxide is 35 ppm
3. National Ambient Air Quality Standard eight hour average for carbon monoxide is 9 ppm
4. Percent data recovery rounded to the nearest whole number
5. Seasonal monitor, no sampling from 04/01/2018 through 09/30/2018
6. Special Purpose site

**Table 7  
Ozone Summary Values<sup>1</sup> for 2018**

Site	Map No.	Site Type	Max 1-Hr Value	4 <sup>th</sup> Max 8-Hr Value <sup>2</sup>	% Data Recovery <sup>3</sup>
<b>22<sup>nd</sup> / Craycroft</b>	<b>2</b>	<b>SLAMS</b>	<b>0.078</b>	<b>0.068</b>	<b>98</b>
<b>Green Valley</b>	<b>10</b>	<b>SLAMS</b>	<b>0.070</b>	<b>0.065</b>	<b>99</b>
<b>Children's Park NCore</b>	<b>11</b>	<b>SLAMS</b>	<b>0.082</b>	<b>0.070</b>	<b>99</b>
<b>Tangerine</b>	<b>13</b>	<b>SLAMS</b>	<b>0.077</b>	<b>0.068</b>	<b>98</b>
<b>Rose Elementary</b>	<b>14</b>	<b>SLAMS</b>	<b>0.076</b>	<b>0.066</b>	<b>94</b>
<b>Coachline</b>	<b>15</b>	<b>SLAMS</b>	<b>0.079</b>	<b>0.070</b>	<b>97</b>
<b>Fairgrounds</b>	<b>17</b>	<b>SLAMS</b>	<b>0.079</b>	<b>0.069</b>	<b>99</b>
<b>Saguaro National Park, East</b>	<b>18</b>	<b>SLAMS</b>	<b>0.082</b>	<b>0.071</b>	<b>99</b>

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard three year average of the 4<sup>th</sup> highest eight hour average for ozone is 0.070 ppm
3. Percent data recovery rounded to the nearest whole number

**Table 8**  
**Particulate Matter (PM<sub>10</sub>) Summary Values<sup>1</sup> for 2018**

Site	Map No.	Site Type	Max 24-Hr Value <sup>2</sup>	2 <sup>nd</sup> Max 24-Hr Value	% Data Recovery <sup>3</sup>
South Tucson	5	SLAMS	94	76	98
Corona de Tucson	8	SLAMS	33	31	98
Santa Clara	9	SLAMS	50	44	98
Green Valley	10	SLAMS	131	118	97
Orange Grove	12	SLAMS	75	70	97
Geronimo	4	SLAMS	107	86	98
Tangerine	13	SLAMS	40	39	100

1. Measured in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )
2. National Ambient Air Quality Standard 24-hour average for particulate matter (PM<sub>10</sub>) is 150  $\mu\text{g}/\text{m}^3$
3. Percent data recovery rounded to the nearest whole number

**Table 9**  
**Particulate Matter (PM<sub>2.5</sub>) Summary Values<sup>1</sup> for 2018**

Site	Map No.	Site Type	Annual Average <sup>2</sup>	Max 24-Hr Value <sup>3</sup>	98 <sup>th</sup> Percentile	% Data Recovery <sup>4</sup>
Geronimo	4	OTHER	6.3	37	13.3	98
Green Valley	10	OTHER	4.1	14	9.6	95
Children's Park NCore (Method 145 <sup>5</sup> )	11	SLAMS	5.8	10.7	10.5	98
Children's Park NCore (Method 170 <sup>5</sup> )	11	SLAMS	4.5	24.6	10.5	96
Orange Grove	12	SLAMS	5.5	41.2	12.2	98
Rose Elementary	14	OTHER	5.2	16	11.2	98
Coachline	15	OTHER	5.5	33	12.7	97

1. Measured in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )
2. National Ambient Air Quality Standard annual average averaged over three years for particulate matter (PM<sub>2.5</sub>) is 12  $\mu\text{g}/\text{m}^3$
3. National Ambient Air Quality Standard 24-hour average 98<sup>th</sup> percentile value averaged over three years for particulate matter (PM<sub>2.5</sub>) is 35  $\mu\text{g}/\text{m}^3$
4. Percent data recovery rounded to the nearest whole number
5. Particulate Matter (PM<sub>2.5</sub>) method 145 is from a filter based monitor that runs for 24- hours that uses gravimetric analysis in order to calculate the concentration. Particulate Matter (PM<sub>2.5</sub>) method 170 is from a monitor that runs continuously giving hourly measurements that are then averaged for a 24-hour measurement.

**Table 10**  
**Nitrogen Dioxide Summary Values<sup>1</sup> for 2018**

Site	Map No.	Site Type	Annual Average <sup>2</sup>	Max 1-Hr Value <sup>3</sup>	98 <sup>th</sup> Percentile	% Data Recovery <sup>4</sup>
<b>22<sup>nd</sup> &amp; Craycroft</b>	<b>2</b>	<b>SLAMS</b>	<b>8.36</b>	<b>45.6</b>	<b>41.2</b>	<b>98</b>
<b>Children's Park NCore</b>	<b>11</b>	<b>SLAMS</b>	<b>8.14</b>	<b>43.6</b>	<b>35.7</b>	<b>99</b>

1. Measured in parts per billion (ppb)
2. National Ambient Air Quality Standard annual mean for nitrogen dioxide is 53 ppb
3. National Ambient Air Quality Standard 1-hour average is the 98<sup>th</sup> percentile value averaged over three years for nitrogen dioxide is 100 ppb
4. Percent data recovery rounded to the nearest whole number

**Table 11**  
**Sulfur Dioxide Summary Values<sup>1</sup> for 2018**

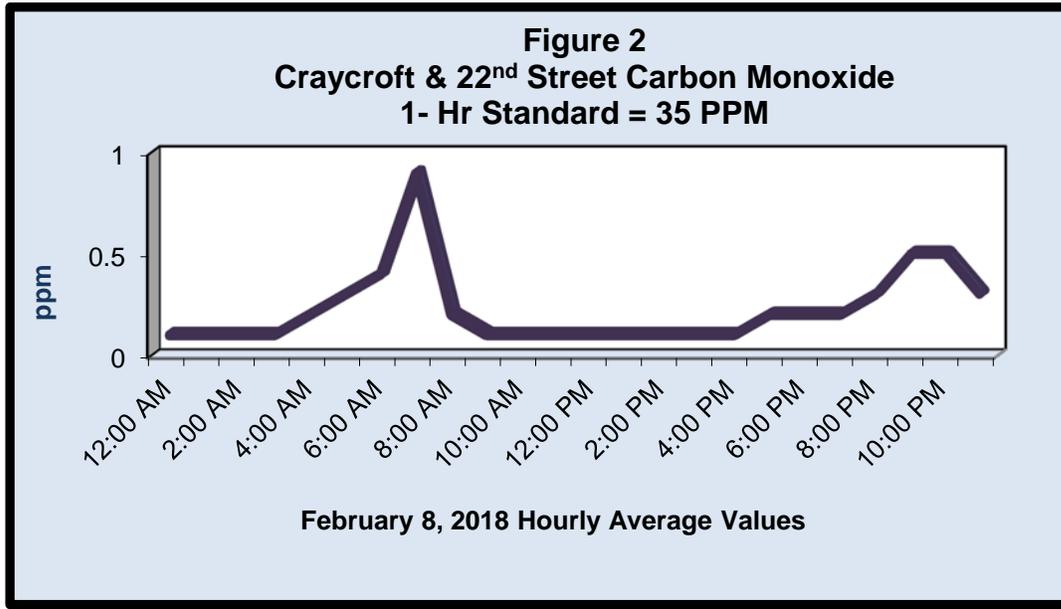
Site	Map No.	Site Type	Max 1-Hr Value <sup>2</sup>	99 <sup>th</sup> Percentile	% Data Recovery <sup>3</sup>
<b>Children's Park NCore</b>	<b>11</b>	<b>SLAMS</b>	<b>5.1</b>	<b>2.3</b>	<b>98</b>

1. Measured in parts per billion (ppb)
2. National Ambient Air Quality Standard 1-hour daily maximum 99<sup>th</sup> percentile, averaged over 3 years for sulfur dioxide is 75 ppb
3. Percent data recovery rounded to the nearest whole number

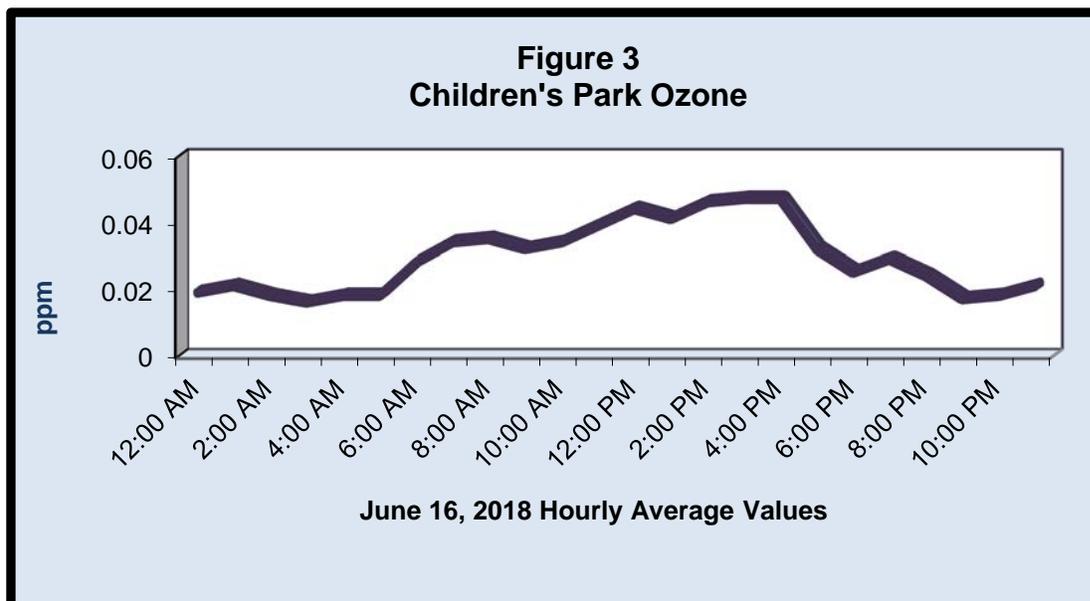
## Air Quality Trends

### Daily Trends

**Figure 2** illustrates how the carbon monoxide concentrations follow the traffic flow. The rush hour traffic becomes more congested and slower moving, causing higher concentrations of carbon monoxide to build up and be recorded at the monitor site.

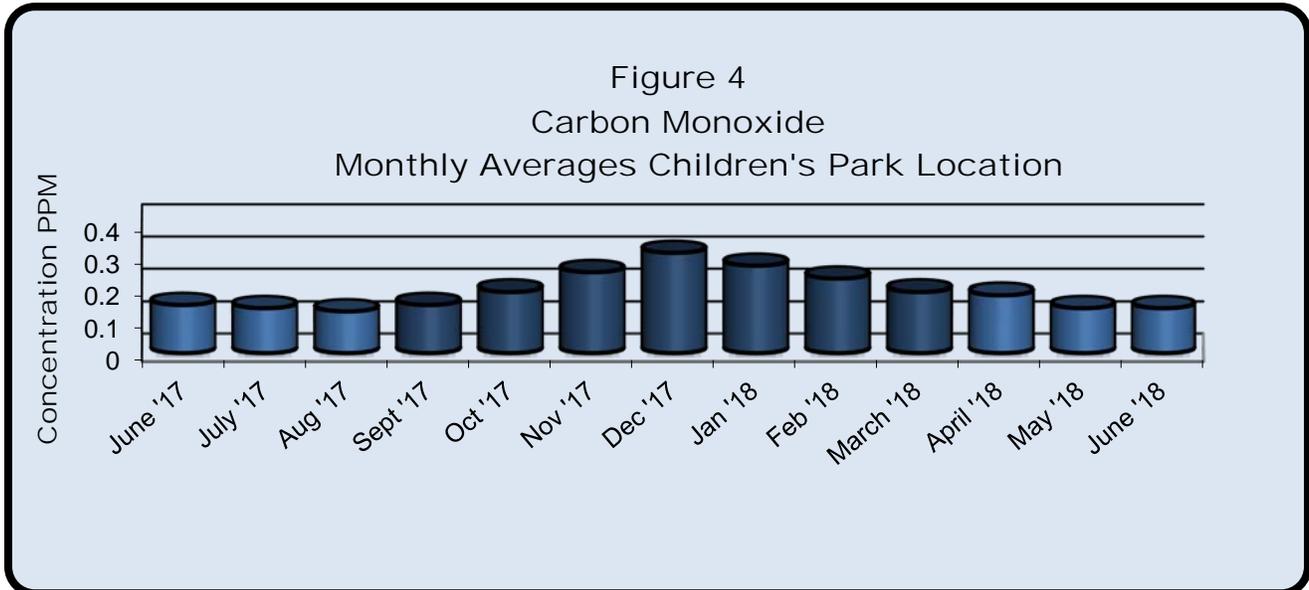


**Figure 3** shows the diurnal cycle of ozone in the Tucson area. As the sun begins to react on the VOCs and  $\text{NO}_2$ , ozone formation increases. This increase continues through the day, as long as there is sunlight, or until either the VOCs or the  $\text{NO}_2$  are exhausted. Once this point is reached, the levels begin to drop. At night the VOC and  $\text{NO}_2$  concentrations may increase but, without the sun to act on them, ozone will not be produced.

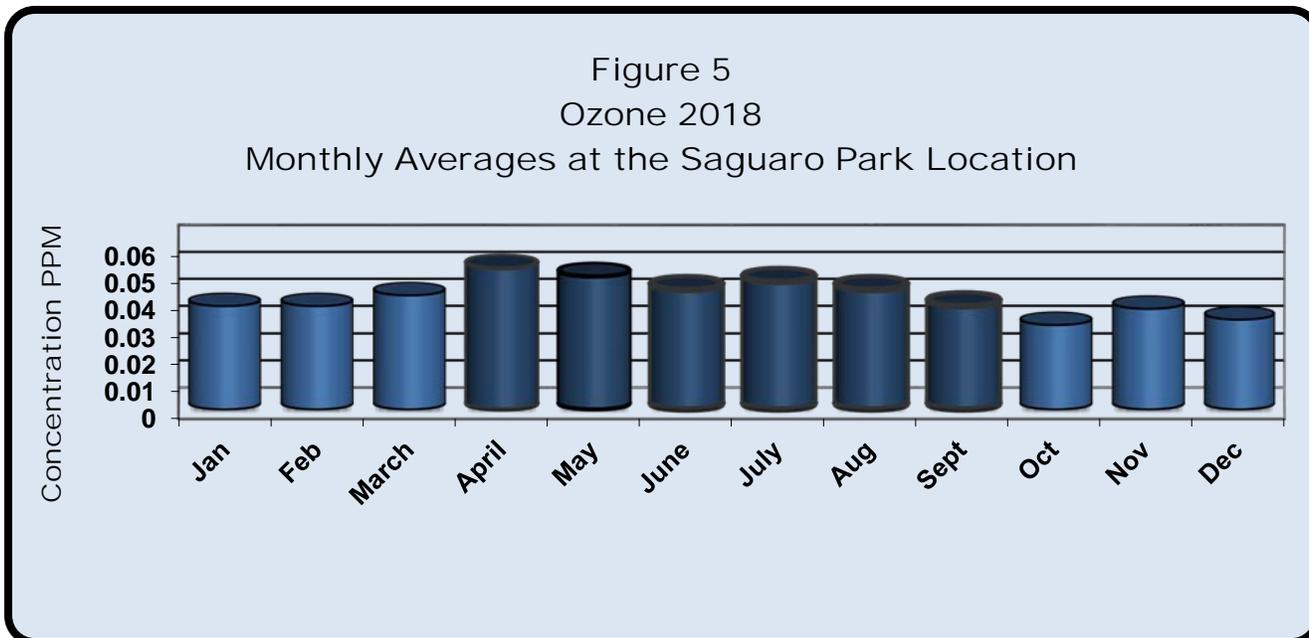


## Seasonal Trends

**Figure 4** –The “Carbon Monoxide Season” occurs during the months of October through March. The winter months have higher carbon monoxide levels due to the stable air conditions that occur, inhibiting mixing in the atmosphere. The accumulation of carbon monoxide tends to be higher at congested intersections due to the direct emission of the pollutant from automobiles.

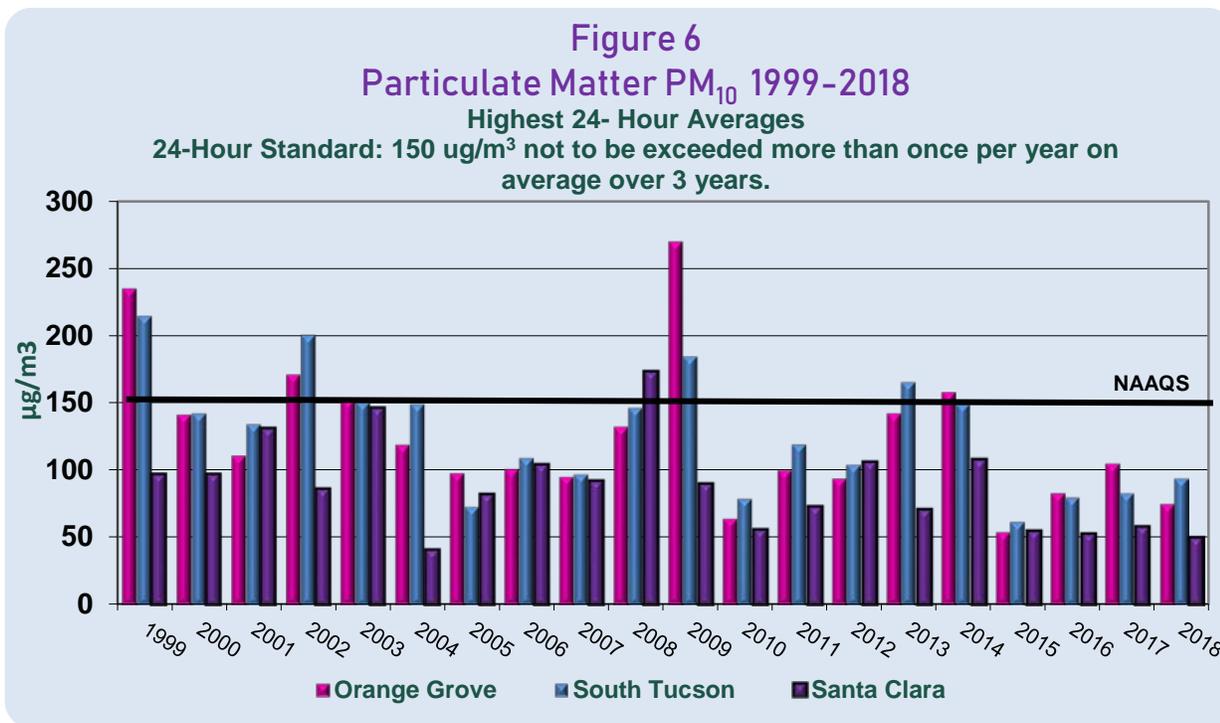


**Figure 5** – The “Ozone Season” occurs during the months of April through September. Ozone levels increase in the summer months due to long sunny days, higher temperatures and emissions of oxides of nitrogen and volatile organic compounds. The photochemical reactions that take place between the emissions, sunlight and heat form ozone.

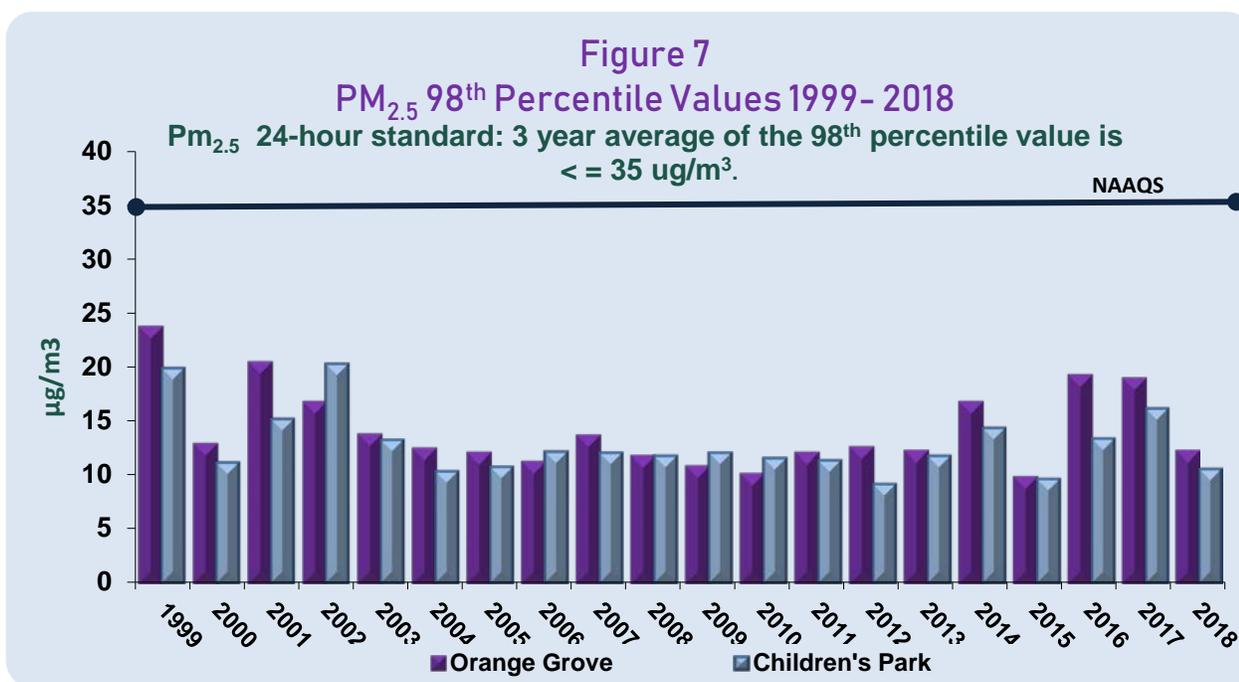


## Historical Trends

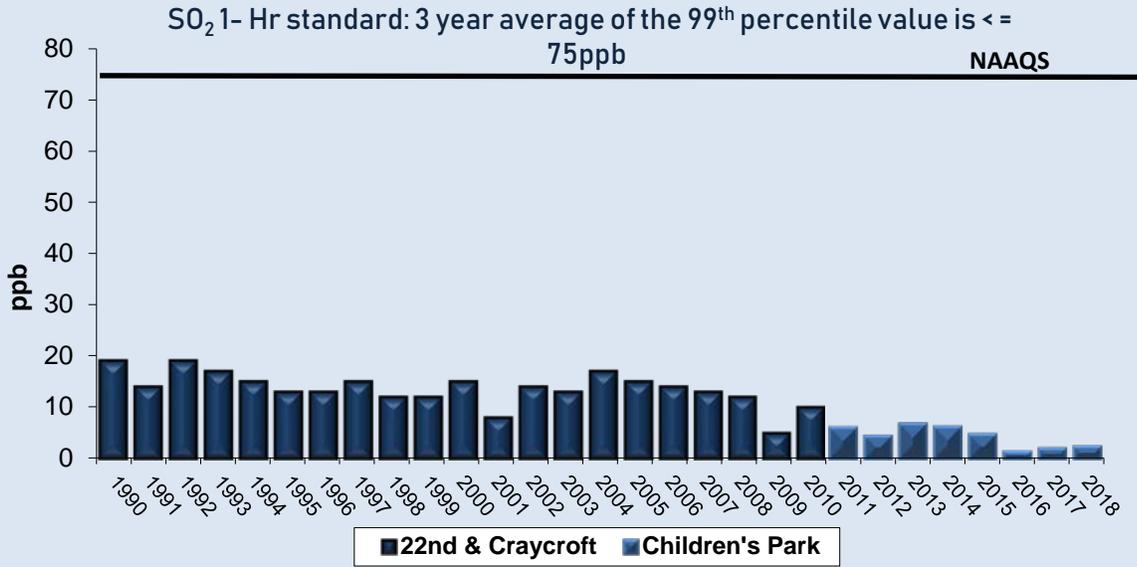
Particulate (PM<sub>10</sub>) levels (**Figure 6**) can be dependent on localized conditions. Tucson area has suffered from drought conditions and several very high wind days, which contributed to the higher than normal particulate readings during those years.



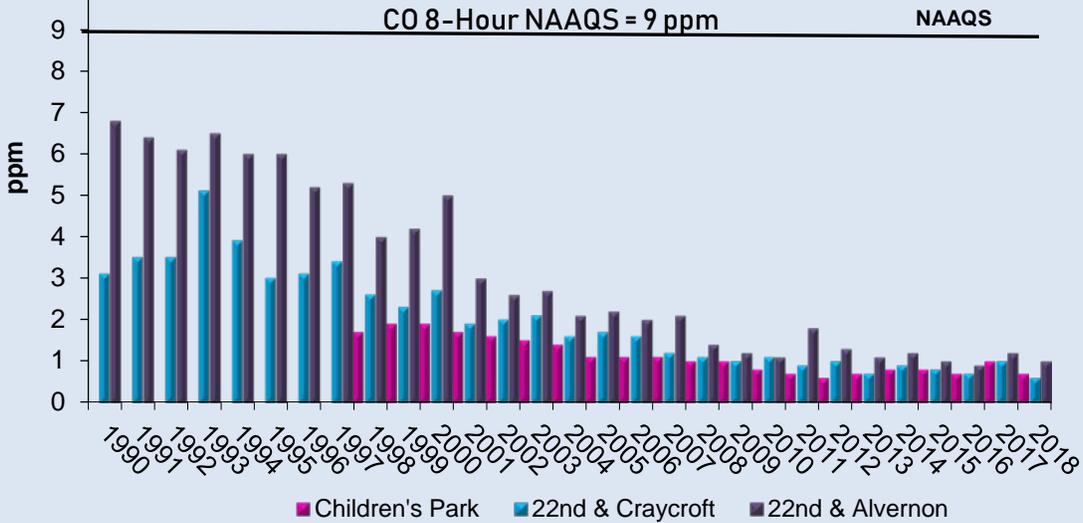
Fine particulate (PM<sub>2.5</sub>) monitoring began in 1999 at the Orange Grove and Children’s Park locations and at four other sites in 2001. Pima County’s 24-hour concentrations remain low but there are often peaks during activities such as fireworks displays and fireplace usage. **Figure 7** illustrates the particulate matter (PM<sub>2.5</sub>) levels from 1999 to 2018.



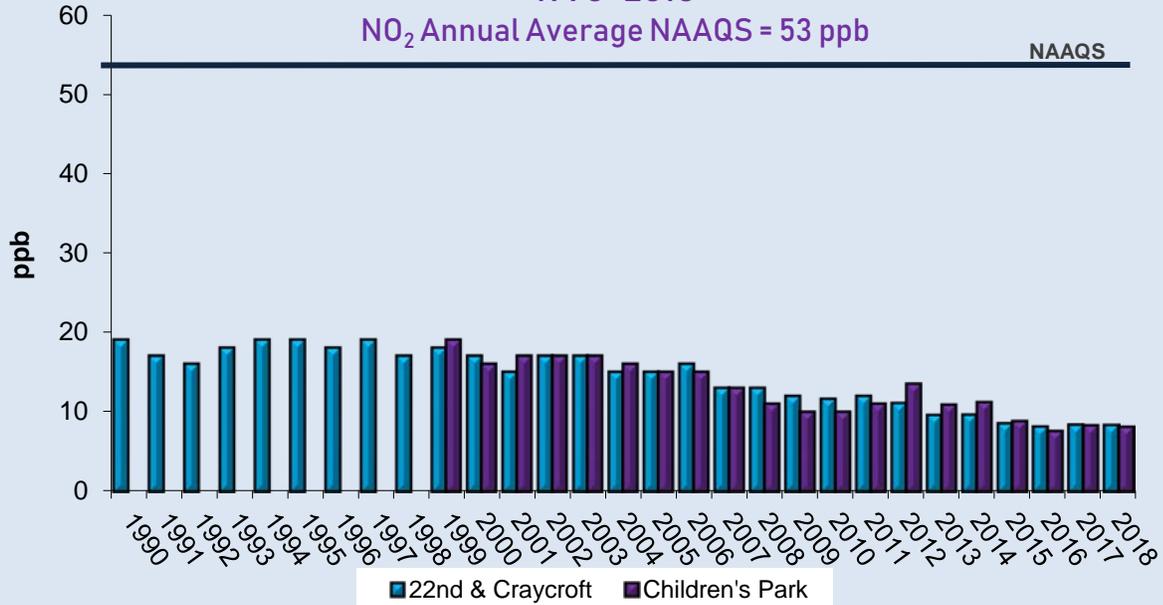
**Figure 8**  
**Sulfur Dioxide 99<sup>th</sup> Percentile Concentration**  
**1990-2018**



**Figure 9**  
**Carbon Monoxide Highest 8-Hour Average**  
**Concentration**  
**1990-2018**

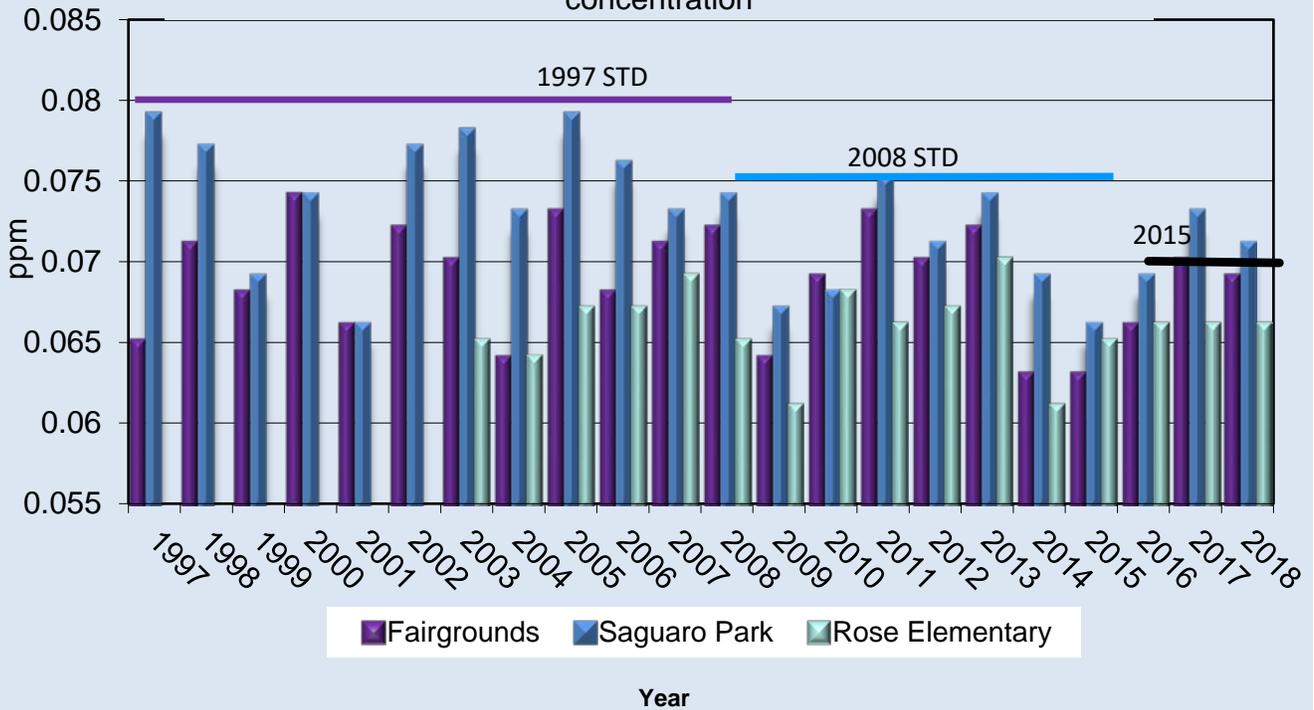


**Figure 10**  
**Nitrogen Dioxide Annual Average Concentration**  
**1990-2018**



**Figure 11**  
**Ozone 1997 - 2018**

4th Highest 8-Hour Average Concentration  
 Ozone 8- Hr standard: 3 year average of the 4<sup>th</sup> highest 8 -Hr average concentration



## Air Quality Index

The Air Quality Index (AQI) is the uniform procedure by which daily air pollution levels are reported to the public. AQI levels are set by the Environmental Protection Agency in accordance with section 319 of the Federal Clean Air Act.

Air quality information is collected by the Pima County Department of Environmental Quality monitors located throughout Eastern Pima County. The monitors collect concentration information in parts per million and parts per billion for gases and micrograms per cubic meter for particulates. These concentrations have corresponding Air Quality Index levels. The level of pollution measured in the air and the related health effects are relayed to the public using the Air Quality Index. If a pollutant such as ozone has an AQI value of 59, the corresponding qualitative descriptor would be MODERATE. The AQI value of 100 generally corresponds to the National Ambient Air Quality Standard for the pollutant. AQI values below 100 are considered satisfactory while numbers above 100 are considered to be unhealthy. Pages 24 and 25, (Tables 12 & 13) contain the breakpoint levels for each pollutant and its corresponding qualitative descriptor, health effects statement, and cautionary statement.

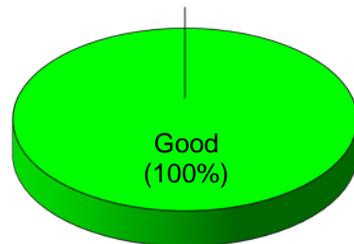
The AQI is the highest value for the pollutant in a 24-hour period. Ozone and CO use an 8- hour average, and PM<sub>10</sub> and PM<sub>2.5</sub> use a 24-hour average. These values can be found under the reports tab on the left at <http://envista.pima.gov/>.

A modification of the AQI called the Air Index Now (AIN) gives more accurate estimates of what is currently in the air based on the EPA's AirNow formulas <http://www.airnow.gov/>. The AIN is updated hourly and can be found at [http://webcms.pima.gov/government/environmental\\_quality/air/air\\_monitoring/](http://webcms.pima.gov/government/environmental_quality/air/air_monitoring/)

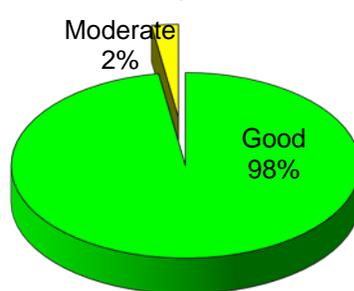
**Figure 12** illustrates the 2018 AQI category percentages of each pollutant.

Figure 12

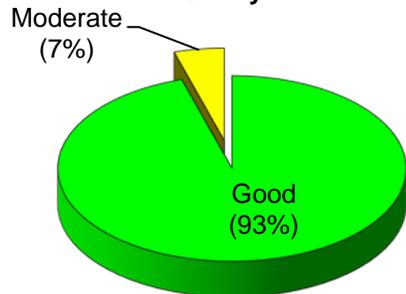
### Carbon Monoxide Air Quality Index 2018



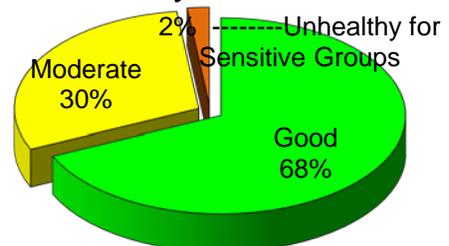
### Particulate Matter (PM2.5) Air Quality Index 2018



### Particulate Matter (PM10) Air Quality Index 2018



### Ozone Air Quality Index 2018



**Table 12**  
**AQI Reporting Table**

AQI Category	Ozone			Carbon Monoxide		
	8-hour			8-hour		
	Concentration	Health Effects Statement	Cautionary Statement	Concentration	Health Effects Statement	Cautionary Statement
<b>Good</b> 0-50	0.00-0.059 ppm			0.0-4.4 ppm		
<b>Moderate</b> 51-100	0.060-0.075 ppm	Unusually sensitive individuals may experience respiratory symptoms.	Unusually sensitive people should consider limiting prolonged outdoor exertion.	4.5-9.4 ppm		
<b>Unhealthy for Sensitive Groups</b> 101-150	0.076-0.095 ppm	Increased likelihood of respiratory symptoms and breathing discomfort in active children and adults and people with respiratory disease, such as asthma.	Active children, adults and people with respiratory disease should limit outdoor exertion.	9.5-12.4 ppm	Increased likelihood of reduced exercise tolerance due to increased cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should limit heavy exertion and avoid sources of CO, such as heavy traffic.
<b>Unhealthy</b> 151-200	0.096-0.115 ppm	Greater likelihood of respiratory symptoms and breathing difficulty in active children and adults and people with respiratory disease; possible respiratory effects in general population.	Active children, adults and people with respiratory disease should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.	12.5-15.4 ppm	Reduced exercise tolerance due to increased cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should limit moderate exertion and avoid sources of CO, such as heavy traffic.
<b>Very Unhealthy</b> 201-300	0.116-0.374 ppm	Increased severe symptoms and impaired breathing likely in sensitive groups; increased likelihood of respiratory effects in general population.	Active children, adults and people with respiratory disease should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.	15.5-30.4 ppm	Significant aggravation of cardiovascular symptoms in people with cardiovascular disease.	People with cardiovascular disease should avoid exertion and avoid sources of CO, such as heavy traffic.
<b>Hazardous</b> 301-500	0.375-above ppm	Severe respiratory effects and impaired breathing likely in active children, adults and people with respiratory disease; increased severe respiratory effects likely in general population.	Everyone should avoid all outdoor exertion.	30.5-above ppm	Serious aggravation of cardiovascular symptoms in people with cardiovascular disease; impairment of strenuous activities in general population.	People with cardiovascular disease should avoid exertion and avoid sources of CO, such as heavy traffic; everyone else should limit heavy exertion.

**Table 13**  
**AQI Reporting Table**

AQI Category	Particulate Matter (24-hour)					
	December 14, 2012 Standard PM <sub>2.5</sub>			PM <sub>10</sub>		
	Concentration	Health Effects Statement	Cautionary Statement	Concentration	Health Effects Statement	Cautionary Statement
Good 0-50	0.0-12.0 µg/m <sup>3</sup>			0-54 µg/m <sup>3</sup>		
Moderate 51-100	12.1-35.4 µg/m <sup>3</sup>			55-154 µg/m <sup>3</sup>		
Unhealthy for Sensitive Groups 101-150	35.5 -55.4 µg/m <sup>3</sup>	Increased likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion.	155-254 µg/m <sup>3</sup>	Increased likelihood of respiratory symptoms and aggravation of lung disease, such as asthma.	People with respiratory disease, such as asthma, should limit outdoor exertion.
Unhealthy 151-200	55.5-150.4 µg/m <sup>3</sup>	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should limit prolonged exertion; everyone else should limit prolonged exertion.	255-354 µg/m <sup>3</sup>	Increased respiratory symptoms and aggravation of lung disease; possible respiratory effects in general population.	People with respiratory disease should avoid moderate or heavy exertion; everyone else, should limit prolonged exertion.
Very Unhealthy 201-300	150.5-250.4 µg/m <sup>3</sup>	Significant increase in respiratory symptoms in children and adults, aggravation of heart and lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.	People with respiratory or heart disease, the elderly and children should avoid any outdoor exertion; everyone else should limit prolonged exertion.	355-424 µg/m <sup>3</sup>	Significant increase in respiratory symptoms, and aggravation of lung disease.	People with respiratory disease should avoid moderate or heavy exertion; everyone else, especially children and elderly, should avoid prolonged exertion.
Hazardous 301-500	250.5- above µg/m <sup>3</sup>	Serious aggravation of heart and lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.	Everyone should avoid any outdoor exertion; people with respiratory and heart disease, the elderly, and children should remain indoors.	425-above µg/m <sup>3</sup>	Serious risk of respiratory symptoms and aggravation of lung disease; respiratory effects likely in general population.	Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.

## Technical Operations Section



Pima County Department of Environmental Quality, Technical Operations personnel. From left: Deborah Jentoft, Dale Eaton, Victor Malkin, Rupesh Patel, Trinidad Alvarez, and Mike Draper.

The Technical Operations Section of the Pima County Department of Environmental Quality (PDEQ) is committed to producing and disseminating reliable and accurate air quality information to the public. The Technical Operations Section maintains all aspects of the air quality network which includes: site selection and installation of all monitoring equipment; maintenance of all monitoring equipment; quality control and quality assurance; data acquisition and analysis; reporting to the public via web pages and to the Environmental Protection Agency's AQS database (EPA web site <http://www.epa.gov>). The section is also responsible for operating a visibility web camera and conducting special projects.

Pima County DEQ conducts *special projects*, including maintaining a National Core monitoring station (NCore) for the Tucson Metropolitan area, one of only 75 stations of this type nationwide. This station monitors pollutants accurately at low concentrations using trace-level instrumentation, for analysis and modeling on a local as well as national scale. The NCore site is located at the current Children's Park monitoring site. A PM<sub>2.5</sub> speciation monitor is also at this location which samples for total mass, forty-eight elements, cations, nitrate, sulfate, organic and elemental carbon. The filters are sent to EPA's national contractor for analysis and reporting.

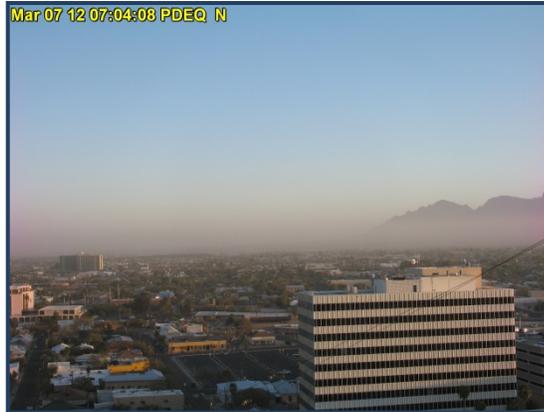
## Visibility Camera Photographs

Located at: <http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=61365>.

*Clean air day. Good levels were recorded on this day.*



*Dirty air day. High particulate readings were recorded on this day.*



## Air Quality Information – Web Sites & Phone Numbers

- <http://airinfnow.pima.gov> Pima County Department of Environmental Quality web site; Air Index Now reporting of real time air quality data; historical air quality data, daily AQI reports, up to the hour pollution report information for each monitoring site and site photographs.
- <http://webcms.pima.gov/cms/One.aspx?portalId=169&pageId=65878> Pima County Department of Environmental Quality web site; Clean Air Program
- <http://www.epa.gov/airnow/>. Environmental Protection Agency web site; air quality information.
- <http://www.pagnet.org> Pima Association of Governments; air quality planning information.
- [Phone # \(520\)724-7400](tel:(520)724-7400) Pima County Department of Environmental Quality front desk.