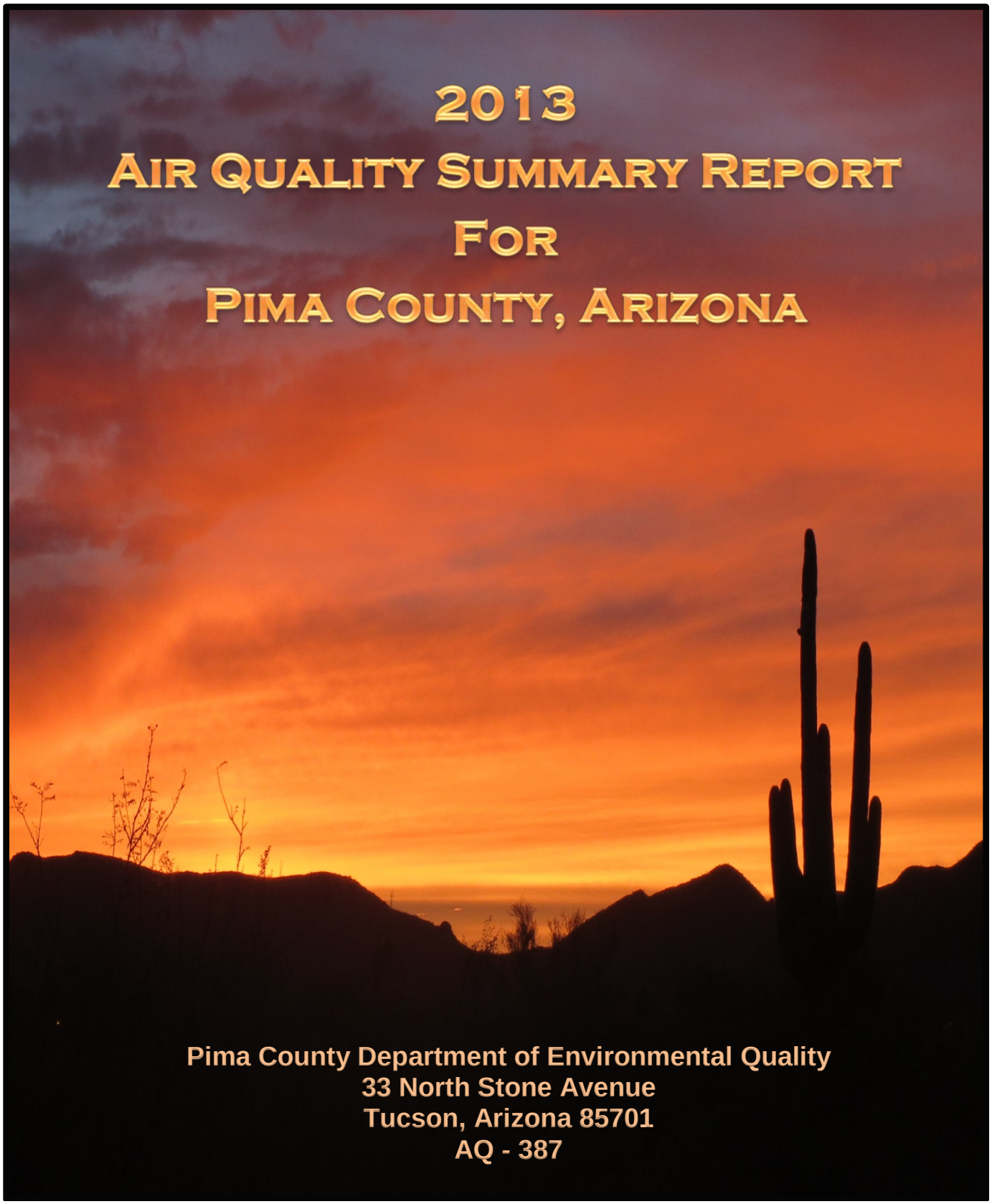

2013 Air Quality Summary Report For Pima County, Arizona

Pima County Department of Environmental Quality
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Tucson, Arizona 85701
AQ - 387

2013 Air Quality Summary Report

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List of Abbreviations / Acronyms

ADEQ	**Arizona Department of Environmental Quality**
AQI	**Air Quality Index - an index used to report air pollutant concentrations and associated health effects to the public.**
CO	**The chemical symbol for carbon monoxide, one of the criteria air pollutants.**
EPA	**United States Environmental Protection Agency**
FRM	**Federal Reference Method**
NAAQS	**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.**
NO_2	**The chemical symbol for nitrogen dioxide, one of the criteria air pollutants.**
NOx	**Total oxides of nitrogen (NO + NO_2)**
O_3	**The chemical symbol for ozone, one of the criteria air pollutants.**
Pb	**The chemical symbol for lead, one of the criteria air pollutants.**
PDEQ	**Pima County Department of Environmental Quality**
PM_{10}	**Particulate Matter with an aerodynamic diameter of 10 micrometers or less, one of the criteria air pollutants.**
$PM_{2.5}$	**Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers, one of the criteria air pollutants.**
ppm	**Parts per million, a unit of concentration, commonly used to express gaseous concentrations.**
ppb	**Parts per billion, a unit of concentration used to express gaseous concentrations, 1000 ppb = 1 ppm.**
SLAMS	**State and Local Air Monitoring Stations**
SO_2	**The chemical symbol for sulfur dioxide, one of the criteria air pollutants.**
SP	**Special Purpose site**
TSP	**Total Suspended Particulates. A former criteria air pollutant which was replaced by PM_{10}.**
$\mu g/m^3$	**Micrograms per cubic meter, a metric unit used to express concentration.**
VOC	**Volatile Organic Compound**

Pima County Department of Environmental Quality
2013 Air Quality Summary
Table 1

		Carbon Monoxide (CO) ppm		Ozone ppm	Particulate Matter (PM_{10}) $\mu g/m^3$	Particulate Matter ($PM_{2.5}$) $\mu g/m^3$		Lead $\mu g/m^3$	Nitrogen Dioxide (NO_2) ppm		Sulfur Dioxide (SO_2) ppm
Map No.	Location of Monitoring Stations ***NAAQS***	Max Conc. 1 Hr ***35 ppm***	Max Conc. 8 Hr ***9 ppm***	4th Highest Conc. 8 Hr ***0.075 ppm***	Max Conc. 24 Hr ***150 $\mu g/m^3$***	Max Conc. 24 Hr ***35 $\mu g/m^3$***	Arith. Annual Mean ***12 $\mu g/m^3$***	Rolling 3 month average ***0.15 $\mu g/m^3$***	Arith. Annual Mean ***53 ppb***	Max Conc. 1 Hr ***100 ppb***	Max Conc. 1 Hr ***75 ppb***
2	22nd & Craycroft	**1.6**	**0.7**	**.063**					**9.68**	**48.1**	
3	22nd & Alvernon	**2.3**	**1.1**								
4	Geronimo				**187**	**33.6**	**9.3**				
5	South Tucson				**165**						
6	Prince Road				**75**						
8	Corona de Tucson				**66**						
9	Santa Clara				**71**						
10	Green Valley			**.069**	**434**	**78.2**	**4.9**				
11	Children's Park NCore	**1.0**	**0.7**	**.071**		**16.5 method 118 and 32.4 method 170**	**5.0 method 118 and 6.8 method 170**	**.0044**	**10.98**	**44.6**	**7.5**
12	Orange Grove				**142**	**21.3**	**5.2**				
13	Tangerine			**.066**	**73**						
14	Rose Elementary			**.070**		**37.5**	**7.4**				
15	Coachline			**.066**		**25.3**	**6.1**				
16	Cherry & Glenn	**2.1**	**1.2**								
17	Fairgrounds			**.072**							
18	Saquaro National Park East			**.074**							
23	Golf Links & Kolb	**1.4**	**0.9**								

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 all six criteria pollutants, which are: carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and lead (Pb). 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.

The EPA periodically reviews the standards and makes revisions accordingly. Recent changes currently affecting Pima County and known future NAAQS and regulatory requirement revisions are listed on page 9.

Table 2
Criteria Pollutants

Pollutant	Description	Sources	Other Information	Health Effects
Carbon Monoxide (CO)	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_2). When there is not enough oxygen present to form CO_2 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.
Ozone (O_3)	A gas formed when volatile organic compounds (VOCs) and NOx 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 Earths 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.
Particulate Matter (PM)	Particulate matter (PM_{10}) are particles less than 10 microns in size. Particulate matter ($PM_{2.5}$) 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.	$PM_{2.5}$ has an impact on human health because of its ability to penetrate deep into the respiratory system. $PM_{2.5}$ can affect lung and heart function.
Nitrogen Dioxide (NO_2)	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_2 can irritate the respiratory system and reduce lung function.
Sulfur Dioxide (SO_2)	A pungent gas	Major sources: coal burning and copper smelters; burning of diesel fuel	SO_2 gas can combine with water vapor and oxygen to form sulfuric acid (H_2SO_4), which is a very corrosive chemical that can damage buildings, plants and aquatic life.	SO_2 can irritate the respiratory system and reduce lung function.
Lead (Pb)	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 [a]	Type of Average	Standard Level Concentration
CO	1-Hour [b]	35 ppm (40 µg/m^3) [a]	No Secondary Standard	
	8-Hour [b]	9 ppm (10 µg/m^3) [a]	No Secondary Standard	
O_3	8-Hour [c]	0.075 ppm	Same as Primary	
PM_{10}	24-Hour [d]	150 µg/m^3	Same as Primary	
$PM_{2.5}$	Annual Arithmetic Mean [e]	12 µg/m^3	Same as Primary	
	24-Hour [e]	35 µg/m^3	Same as Primary	
NO_2	Annual Arithmetic Mean	53 ppb	Same as Primary	
	1-Hour [f]	100 ppb	None	
SO_2	1-Hour [g]	75 ppb	None	
Pb	Rolling 3-month Average	0.15 µg/m^3	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 0.075ppm (effective May 27, 2008).
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/m3 (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/m3, 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)

Reference: Http://www.epa.gov/air/criteria.html

EPA's Revisions to the NAAQS and Regulatory Requirements

- On October 15, 2008, EPA strengthened the lead standard. Pima County is required to perform area monitoring at the Children's Park location. Lead monitoring began January 2012.
- Particulate Matter NAAQS was revised December 14, 2012. EPA strengthened the annual $PM_{2.5}$ standard from 15 µg/m^3 to 12.0 µg/m^3. The 24-hour $PM_{2.5}$ standard remains the same at 35 µg/m^{3}and the PM_{10} standard also remains the same at 150 µg/m^3.

Tucson Area Topography and Meteorology

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 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, July and August 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

Carbon Monoxide

Carbon monoxide concentrations have declined in the past three 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 around 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 20). 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 2013. 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 2013 was 2.3 ppm at the 22nd & 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 16) lists all the CO sites in the network and the maximum concentrations.

Ozone

Pima County's ground level ozone concentrations have remained relatively steady at 95% of the standard. The 2008 primary standard for ozone is 0.075 ppm, which is the three year average of the fourth highest daily maximum eight hour average concentration.

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 20). Oxides of nitrogen (NOx) and volatile organic compounds (VOCs) are the "precurser" 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.

There were no violations of the NAAQS for ozone in 2013. Pima County Department of Environmental Quality will issue an ozone advisory to the media to protect very sensitive members of our population when the predicted ozone levels are elevated. There were no ozone advisories issued in 2013.

The highest 4th highest 8-hour average ozone level in 2013 was 0.074 ppm at the Saguaro National Park location. **Table 7** (page 16) 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 22nd 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_2 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_2 in Pima County.

There were no exceedances of the NO_2 standard in 2013. Concentrations in Pima County average about 30% of the standard. **Table 10** (page 18) contains the nitrogen dioxide information for 2013.

Sulfur dioxide is measured at the Children's Park NCore location. Tucson has no significant sources of SO_2 and the levels continue to be extremely low with averages at around 7% of the standard. **Table 11** (page 18) contains the sulfur dioxide information for 2013.

Particulate Matter (PM_{10}, $PM_{2.5}$)

PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less and $PM_{2.5}$ 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_{10} 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_{10}.

Pima County currently follows the Exceptional Events Rule instituted by EPA on November 21, 2008 for exceedances of the standard.

Table 4
Pima County Particulate Matter Exceedances 1990- 2013

Date of Exceedance	Location	Exceptional Event Designation
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

Pima County will issue a particulate matter advisory to the public when there are elevated levels recorded. Three advisories were issued in 2013.

The highest 24-hour PM_{10} and $PM_{2.5}$ concentrations recorded in Pima County in 2013 occurred during a major regional wind event. The magnitude of the event resulted in monitors statewide recording very high particulate concentrations, well above the NAAQS. This event has been submitted to EPA for consideration as an Exceptional Event, and if approved, the particulate concentrations recorded during the event will not be considered in the calculation for violation of the standard. Under normal conditions, Pima County particulate concentrations are generally well below both the levels recorded during this event, and the NAAQS.

The 24-hour NAAQS for PM_{10} is 150 micrograms per cubic meter ($\mu g/m^3$). The highest level recorded in Pima County in 2013 was 434 $\mu g/m^3$ at the Green Valley location. The second highest level recorded in Pima County was 187 $\mu g/m^3$ at the Geronimo location. **Table 8** (page 17) lists the eight PM_{10} sites in the network and their maximum concentrations.

Particulate matter 2.5 microns or smaller ($PM_{2.5}$) travels deeper into the lungs and can be more harmful than PM_{10}. It can also be composed of toxic substances such as metals and organic compounds. $PM_{2.5}$ 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 $PM_{2.5}$ since monitoring began for this pollutant in 1999. The 24-hour NAAQS for

$PM_{2.5}$ is 35 µg/m^3. The highest 24-hour $PM_{2.5}$ concentration in 2013 in Pima County was 78.2 µg/m^3 at the Green Valley location. The second highest level recorded was 37.5 at the Rose Elementary location. **Table 9** (page 17) lists the six $PM_{2.5}$ sites in the network and their maximum concentrations.

Lead

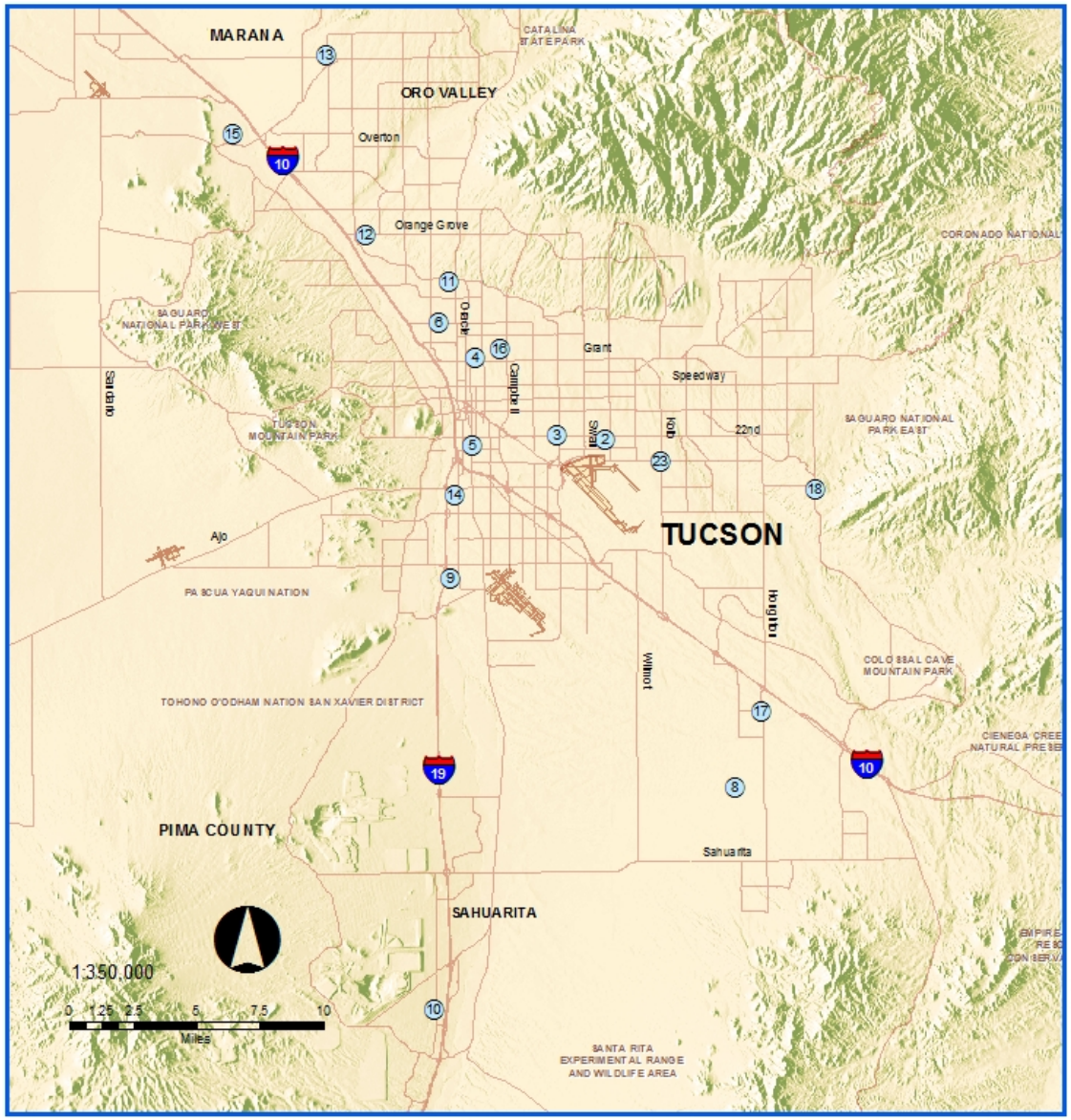
Lead sampling and analysis was discontinued at the end of March, 1997, in Pima County. The Environmental Protection Agency regulations allowed for the cessation of ambient lead monitoring in most areas of the country, except in areas with stationary sources of lead. Most urban areas have seen a dramatic decrease in ambient lead levels since the phase out and ban of lead in gasoline.

On October 15, 2008, EPA strengthened the lead standard. Research and technology has shown that adverse health effects occur at much lower levels of lead in blood than previously thought. Children are particularly vulnerable to the effects of lead. The primary standard of 1.5 ug/m^3 has been lowered to 0.15ug/m^3, measured as total suspended particles (TSP). The secondary standard is identical to the primary standard. According to the 2005 National Air Emissions Inventory (NEI) from EPA, Pima County has no sources of lead of one ton or more, so Pima County is required to perform only area monitoring at the Children's Park location. Monitoring began in January 2012. For 2013, Pima County recorded lead averages around 3% of the standard.

Air Quality Monitoring Locations and Map

Table 5

Site Map #	Site Name	Address	Pollutant
2	22nd & Craycroft	1237 S. Beverly	CO, O_3, NO_2
3	22nd & Alvernon	3895 E. 22nd	CO
4	Geronimo	2498 N. Geronimo	$PM_{2.5}$, PM_{10}
5	South Tucson	1601 S. 6th Ave.	PM_{10}
6	Prince Road	1016 W. Prince Rd.	PM_{10}
8	Corona de Tucson	22000 S. Houghton Rd.	PM_{10}
9	Santa Clara School	6910 S. Santa Clara Ave.	PM_{10}
10	Green Valley	601 N. La Canada Dr.	O_3, PM_{10}, $PM_{2.5}$
11	Children's Park NCore	400 W. River Rd.	CO, O_3, SO_2, NO_2, Pb, $PM_{2.5}$
12	Orange Grove	3401 W. Orange Grove Rd.	PM_{10}, $PM_{2.5}$
13	Tangerine	12101 N. Camino de Oeste	O_3, PM_{10}
14	Rose Elementary	710 W. Michigan Street	O_3, $PM_{2.5}$
15	Coachline	9597 N. Coachline Blvd.	O_3, $PM_{2.5}$
16	Cherry & Glenn	2745 N. Cherry	CO
17	Fairgrounds	11330 S. Houghton Rd.	O_3
18	Saguaro National Park, East	3905 S. Old Spanish Tr.	O_3
23	Golf Links & Kolb	2601 S. Kolb Rd.	CO



Pima County Monitoring Sites

2 - 22nd / Craycroft
3 - 22nd / Alvernon
4 - Geronimo
5 - South Tucson
6 - Prince Road
8 - Corona de Tucson
9 - Santa Clara
10 - Green Valley
11 - Children's Park NCore
12 - Orange Grove
13 - Tangerine
14 - Rose Elementary
15 - Coachline
16 - Cherry / Glenn
17 - Fairgrounds
18 - Saguaro National Park East
23 - Golf Links / Kolb

PDEQ Monitoring Sites
Major Streets

Revised: June 2012

Comments
All information is provided as is, with all faults, and without warranty of any kind, expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Prepared By
Pima County Department
of
Environmental Quality

PIMA MONITORING SITES 2012

Data Summary

Table 6
Carbon Monoxide Summary Values[1] for 2013

Site	Map No.	Site Type	Max 1-Hr Value[2]	Max 8-Hr Value[3]	% Data Recovery[4]
22nd / Craycroft	**2**	**SLAMS**	**1.6**	**0.7**	**99**
22nd / Alvernon	**3**	**SLAMS**	**2.3**	**1.1**	**97**
Children's Park NCore	**11**	**NCore**	**1.0**	**0.7**	**99**
Cherry / Glenn[5]	**16**	**SP[6]**	**2.1**	**1.2**	**99**
Golf Links / Kolb[5]	**23**	**SP[6]**	**1.4**	**0.9**	**99**

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 04/01/2013 through 09/30/2013
6. Special Purpose site

Table 7
Ozone Summary Values[1] for 2013

Site	Map No.	Site Type	Max 1-Hr Value	4nd Max 8-Hr Value[2]	% Data Recovery[3]
22nd / Craycroft	**2**	**SLAMS**	**.083**	**.063**	**100**
Green Valley	**10**	**SP[4]**	**.079**	**.069**	**98**
Children's Park NCore	**11**	**NCore**	**.082**	**.071**	**100**
Tangerine	**13**	**SP[4]**	**.085**	**.066**	**99**
Rose Elementary	**14**	**SP[4]**	**.082**	**.070**	**99**
Coachline	**15**	**SP[4]**	**.080**	**.066**	**99**
Fairgrounds	**17**	**SP[4]**	**.087**	**.072**	**99**
Saguaro National Park, East	**18**	**SLAMS**	**.084**	**.074**	**99**

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard three year average of the 4th highest eight hour average for ozone is 0.075 ppm
3. Percent data recovery rounded to the nearest whole number
4. Special Purpose site

Table 8
Particulate Matter (PM_{10}) Summary Values[1] for 2013

Site	Map No.	Site Type	Max 24-Hr Value[2]	2nd Max 24-Hr Value	% Data Recovery[4]
South Tucson	**5**	**SLAMS**	**165**	**156**	**99**
Prince Road	**6**	**SLAMS**	**75**	**64**	**100**
Corona de Tucson	**8**	**SLAMS**	**66**	**34**	**98**
Santa Clara	**9**	**SP[3]**	**71**	**71**	**98**
Green Valley	**10**	**SP[3]**	**434**	**95**	**99**
Orange Grove	**12**	**SLAMS**	**142**	**115**	**100**
Geronimo	**4**	**SP[3]**	**187**	**149**	**97**
Tangerine	**13**	**SP[3]**	**73**	**72**	**98**

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

Table 9
Particulate Matter ($PM_{2.5}$) Summary Values[1] for 2013

Site	Map No.	Site Type	Annual Average[2]	Max 24-Hr Value[3]	98th Percentile	% Data Recovery[5]
Geronimo	**4**	**SP[4]**	**9.32**	**33.6**	**23.0**	**91**
Green Valley	**10**	**SP[4]**	**4.90**	**78.2**	**11.0**	**98**
Children's Park NCore (Method 118 [6])	**11**	**NCore**	**5.04**	**16.5**	**11.7**	**99**
Children's Park NCore (Method 170 [6])	**11**	**NCore**	**6.81**	**32.4**	**15.7**	**98**
Orange Grove	**12**	**SLAMS**	**5.24**	**21.3**	**12.2**	**99**
Rose Elementary	**14**	**SP[4]**	**7.49**	**37.5**	**15.0**	**94**
Coachline	**15**	**SP[4]**	**6.12**	**25.3**	**14.0**	**94**

1. Measured in micrograms per cubic meter ($\mu g/m^3$)
2. National Ambient Air Quality Standard annual average averaged over three years for particulate matter ($PM_{2.5}$) is 12 $\mu g/m^3$
3. National Ambient Air Quality Standard 24-hour average 98th percentile value averaged over three years for particulate matter ($PM_{2.5}$) is 35 $\mu g/m^3$
4. Special Purpose site
5. Percent data recovery rounded to the nearest whole number
6. Particulate Matter ($PM_{2.5}$) method 118 is from a filter based monitor that runs for 24- hours that uses gravimetric analysis in order to calculate the concentration. Particulate Matter ($PM_{2.5}$) 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[1] for 2013

Site	Map No.	Site Type	Annual Average[2]	Max 1-Hr Value[3]	98th Percentile[5]	% Data Recovery[4]
22nd & Craycroft	**2**	**SLAMS**	**9.68**	**48.1**	**43.7**	**99**
Children's Park NCore	**11**	**NCore**	**10.98**	**44.6**	**39.7**	**99**

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 98th 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[1] for 2013

Site	Map No.	Site Type	Max 1-Hr Value[2]	99th Percentile	% Data Recovery[3]
Children's Park NCore	**11**	**NCore**	**7.5**	**6.6**	**99**

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

Table 12
Lead Summary Values[1] for 2013

Site	Map No.	Site Type	Max 24-Hr Value[2]	Annual Mean	% Data Recovery[3]
Children's Park NCore	**11**	**NCore**	**.007**	**.002**	**97**

1. Measured in micrograms per cubic meter ($\mu g/m^3$)
2. National Ambient Air Quality Standard Rolling three month average not to exceed 0.15 $\mu g/m^3$
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.

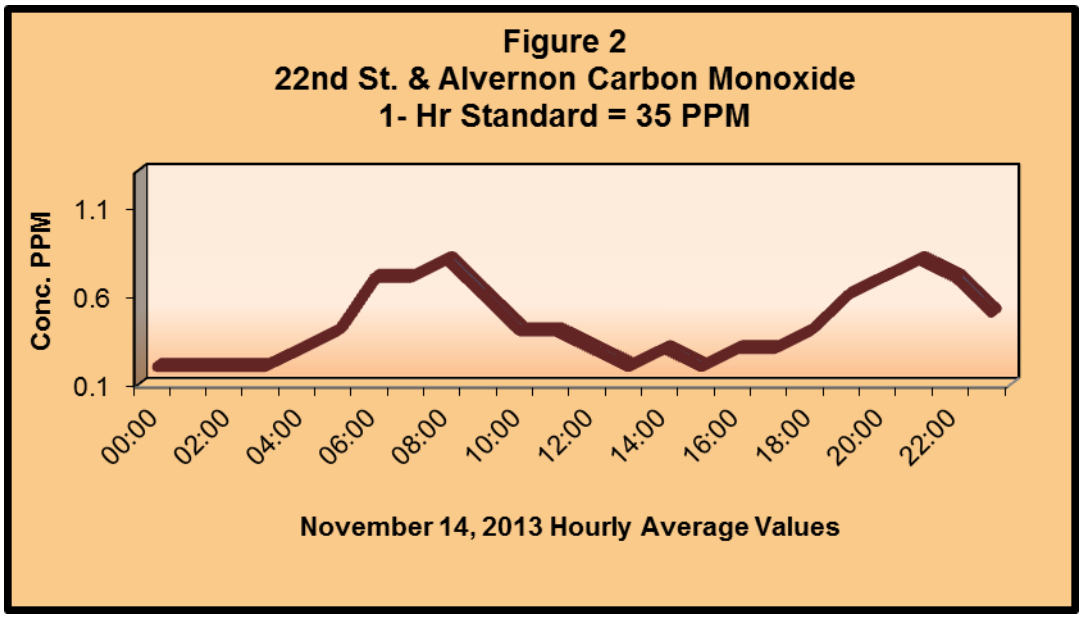
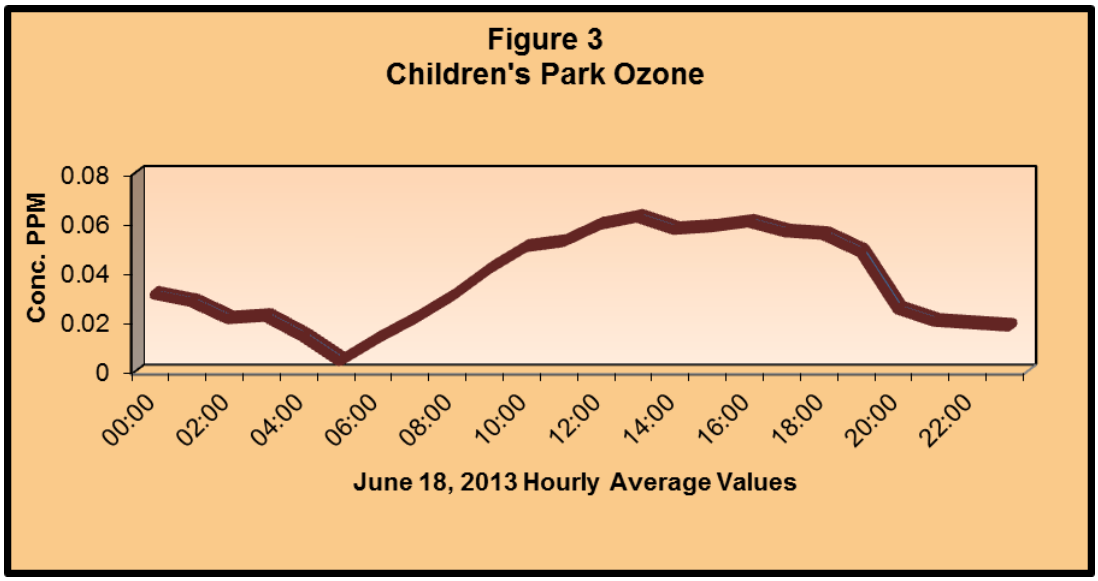


Figure 3 shows the diurnal cycle of ozone in the Tucson area. As the sun begins to react on the VOCs and NO_2, ozone formation increases. This increase continues through the day, as long as there is sunlight, or until either the VOCs or the NO_2 are exhausted. Once this point is reached, the levels begin to drop. At night the VOC and 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.

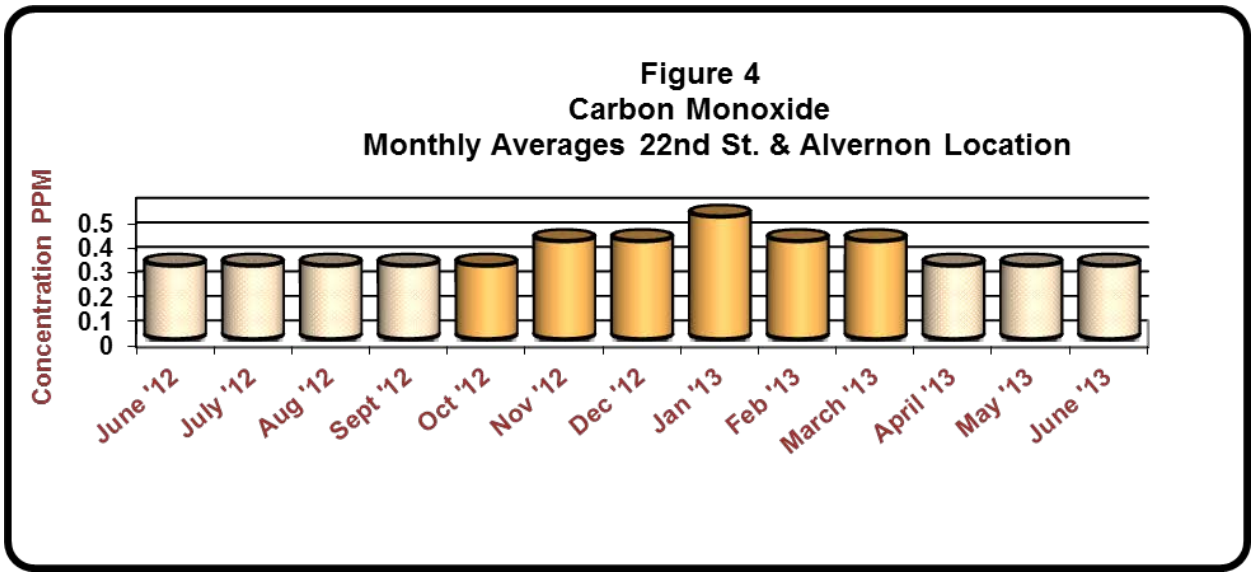
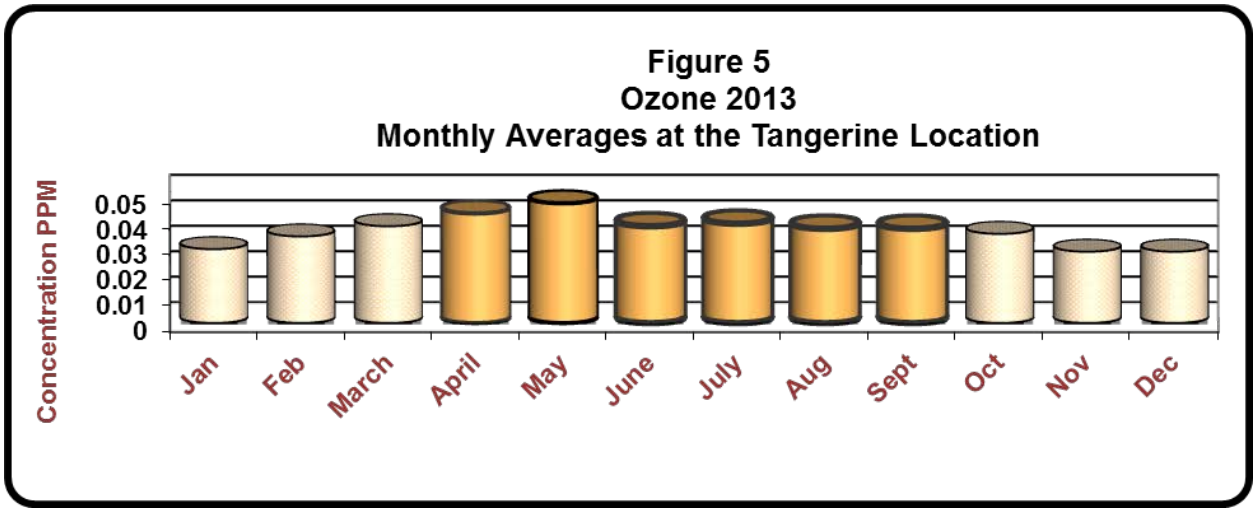
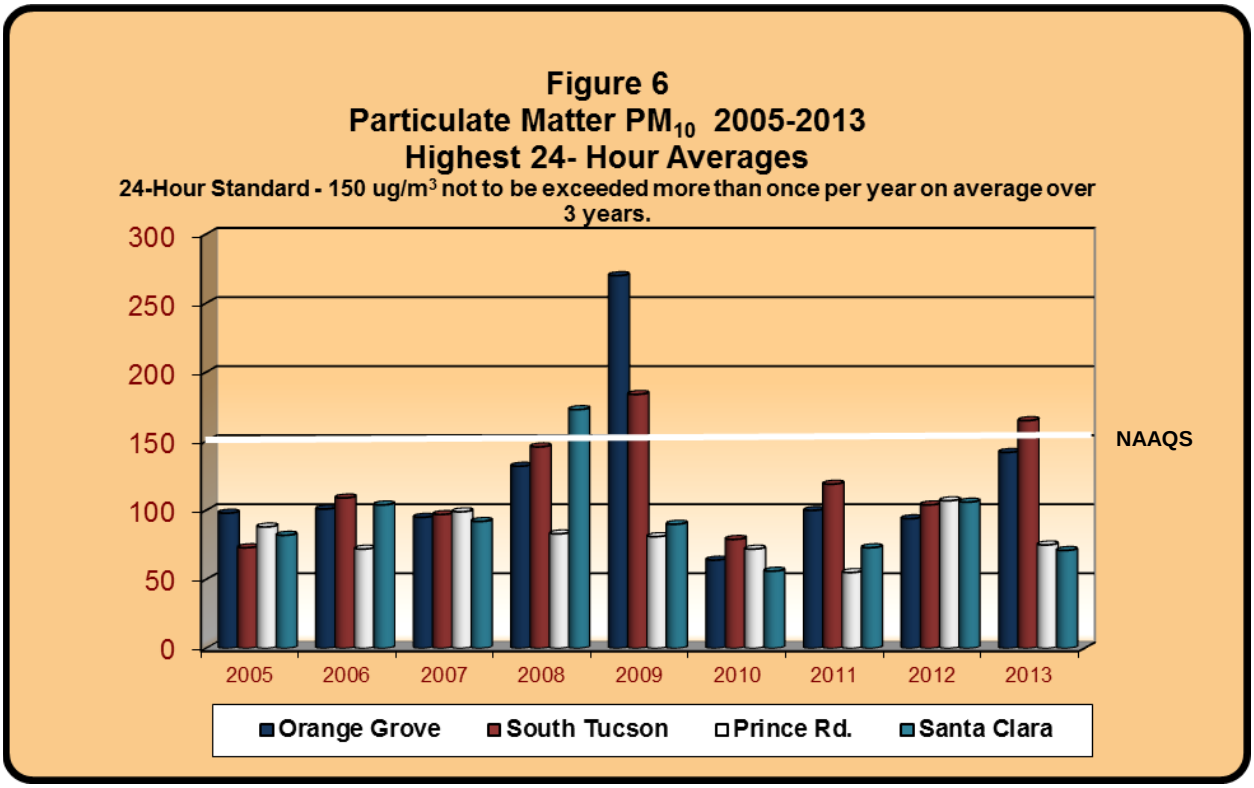


Figure 5 – The "Ozone Season" occurs during the months of April through September. Ozone levels increase in the summer months due to long sunny days, higher temperatures and emissions of oxides of nitrogen and volatile organic compounds. The photochemical reactions that take place between the emissions,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



Historical Trends

Particulate (PM_{10}) levels (**Figure 6**) can be dependent on localized conditions. In 2009 and 2013, the Tucson area suffered from drought conditions and several very high wind days, which contributed to the higher than normal particulate readings during those years.



Fine particulate ($PM_{2.5}$) 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** (next page) illustrates the particulate matter ($PM_{2.5}$) levels from 1999 to 2013.

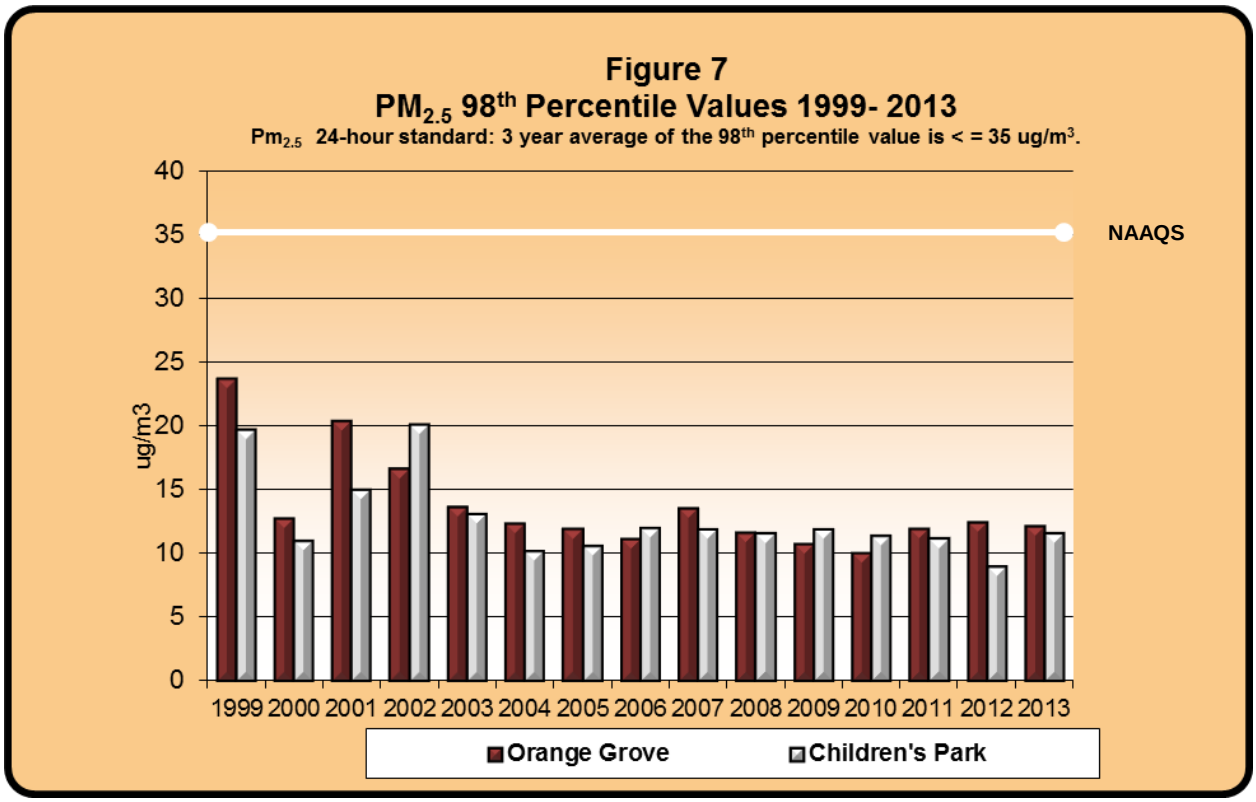


Figure 7
PM2.5 98th Percentile Values 1999- 2013
Pm2.5 24-hour standard: 3 year average of the 98th percentile value is < = 35 ug/m3.
ug/m3
40
35
30
25
20
15
10
5
0
NAAQS
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
Orange Grove
Children's Park

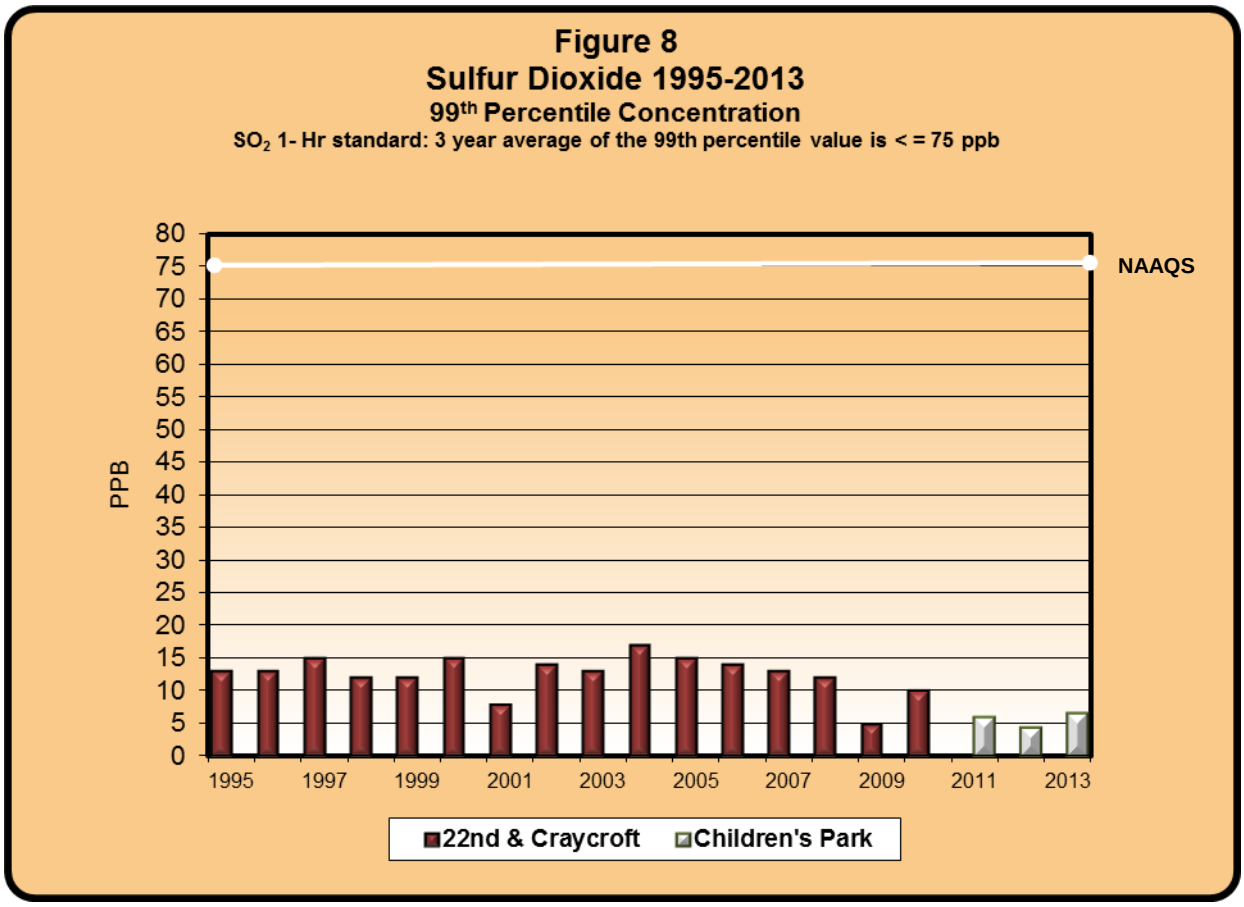


Figure 8
Sulfur Dioxide 1995-2013
99th Percentile Concentration
SO2 1- Hr standard: 3 year average of the 99th percentile value is < = 75 ppb
PPB
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
NAAQS
1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
22nd & Craycroft
Children's Park

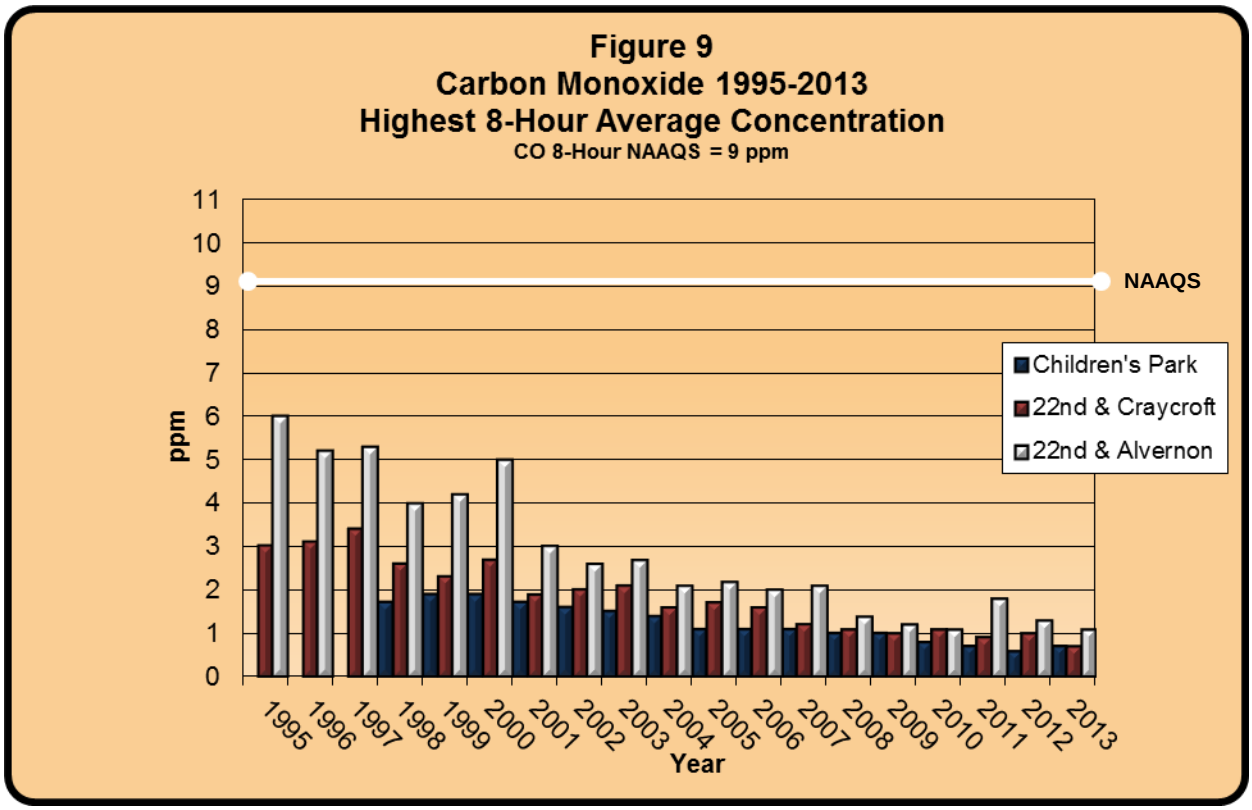


Figure 9
Carbon Monoxide 1995-2013
Highest 8-Hour Average Concentration
CO 8-Hour NAAQS = 9 ppm
ppm
Year
NAAQS
Children's Park
22nd & Craycroft
22nd & Alvernon

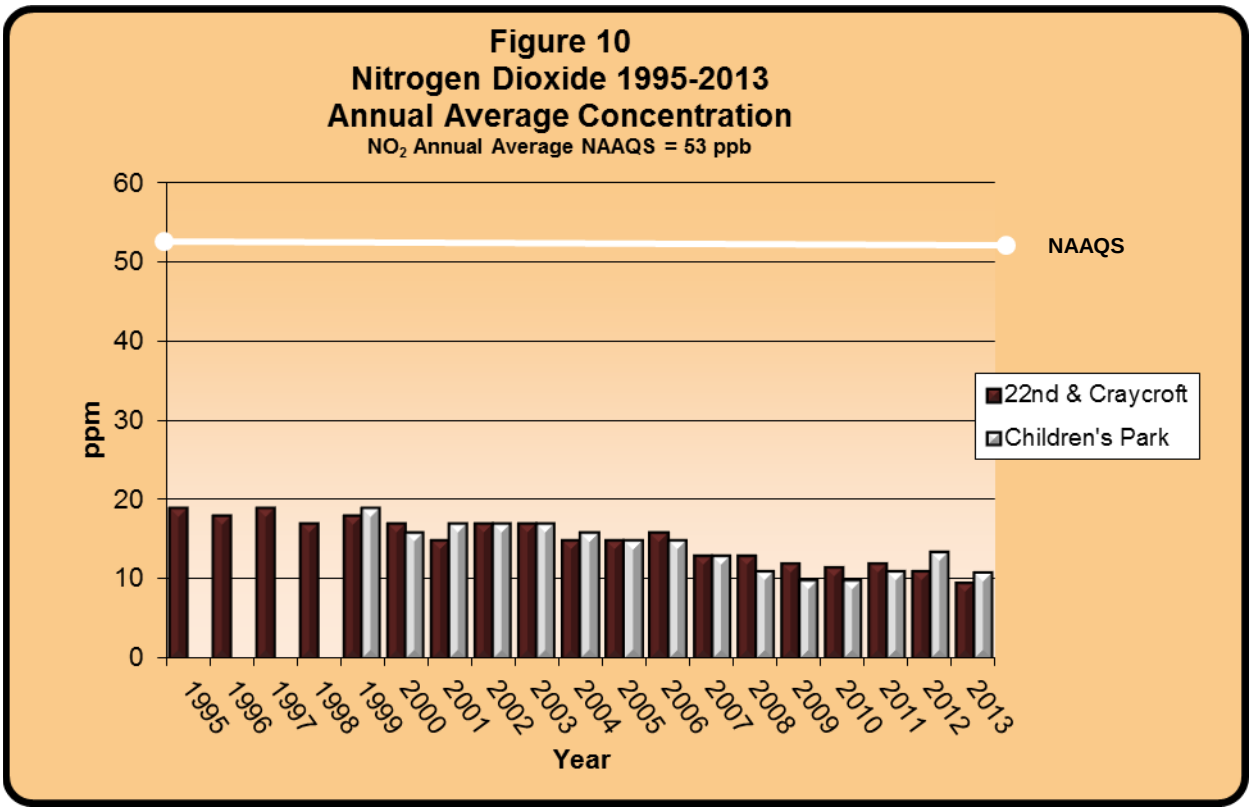
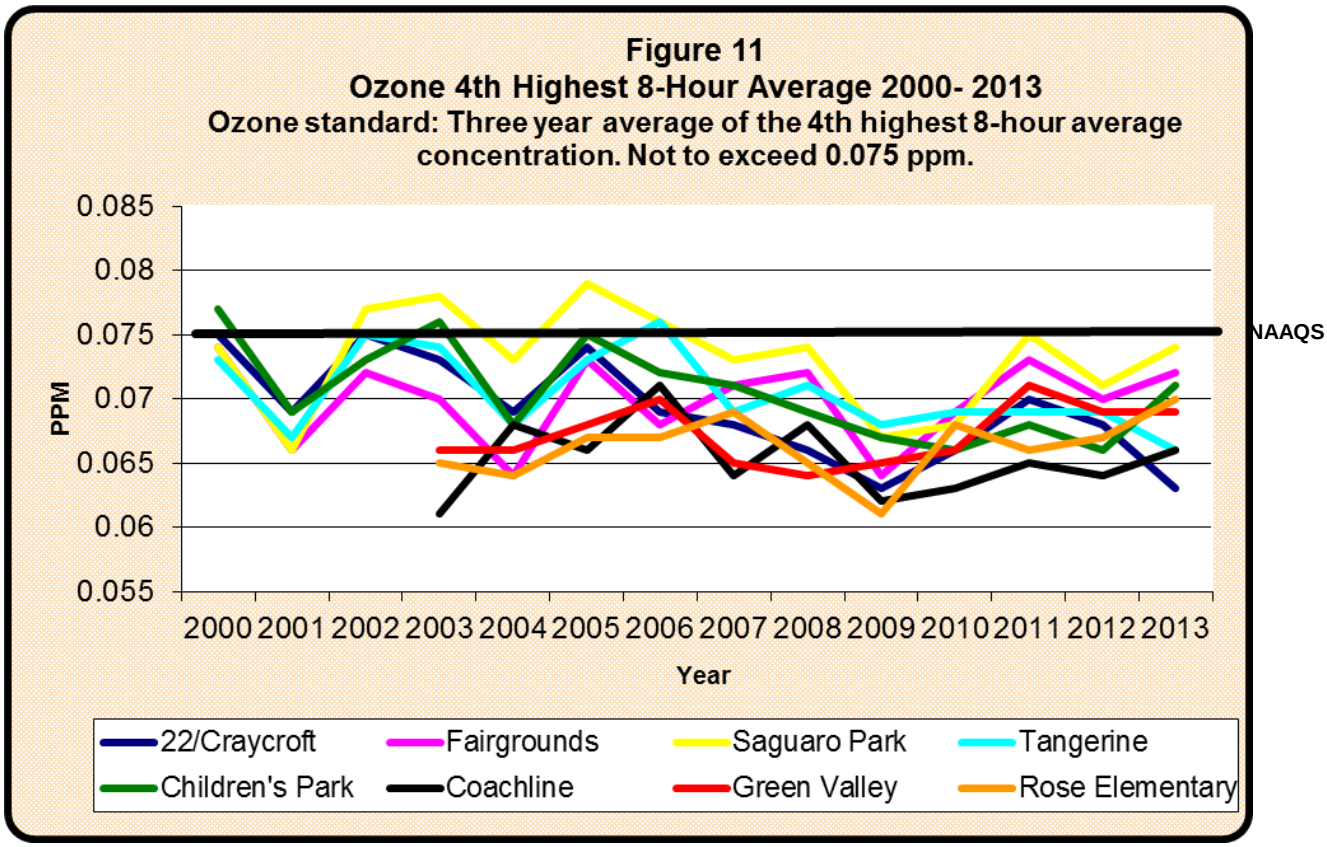


Figure 10
Nitrogen Dioxide 1995-2013
Annual Average Concentration
NO2 Annual Average NAAQS = 53 ppb
ppm
Year
NAAQS
22nd & Craycroft
Children's Park

Figure 11 below illustrates the 4th highest 8-hour average ozone concentration for the past 14 years. Ozone levels have remained relatively steady with the 8-hour average concentrations bordering the current 8-hour ozone NAAQS.



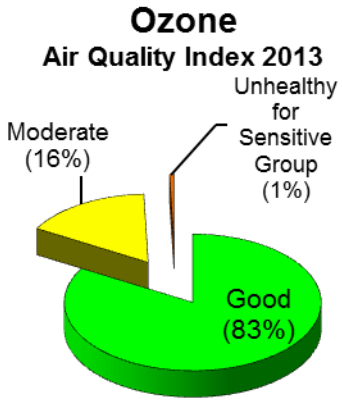
Air Quality Index

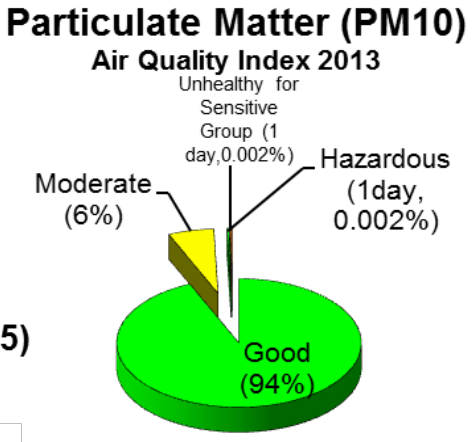
The Air Quality Index (AQI) is the uniform procedure by which daily air pollution levels are reported to the public. AQI levels are set by the Environmental Protection Agency in accordance with section 319 of the Federal Clean Air Act.

Figure 12

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. The level of pollution 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 26 and 27, (**Tables 13 & 14**) 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. The highest 8-hour average for ozone and CO, and the highest 24-hour average for PM_{10} and $PM_{2.5}$ are reported hourly on our web site: http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=61365 and emailed twice daily at 9 a.m. and at 3 p.m., Monday through Friday. **Figure 12** shows the 2013 AQI percentage of the breakpoints for each pollutant.





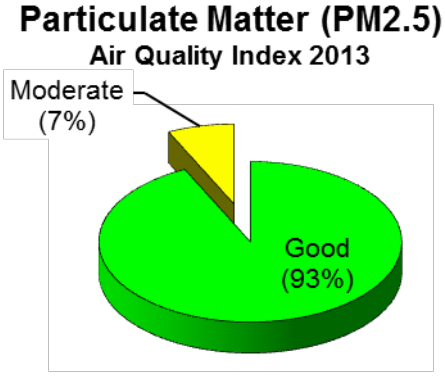


Table 13
AQI Reporting Table

AQI Category	Ozone			Carbon Monoxide		
	8-hour			8-hour		
	Concen-tration	Health Effects Statement	Cautionary Statement	Concen-tration	Health Effects Statement	Cautionary Statement
Good 0-50	0.00-0.059 ppm			0.0-4.4 ppm		
Moderate 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		
Unhealthy for Sensitive Groups 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.
Unhealthy 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.
Very Unhealthy 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.
Hazardous 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 14
AQI Reporting Table

AQI Category	Particulate Matter (24-hour)					
	December 14, 2012 Standard $PM_{2.5}$			PM_{10}		
	Concen-tration	Health Effects Statement	Cautionary Statement	Concen-tration	Health Effects Statement	Cautionary Statement
Good 0-50	0.0-12.0 $\mu g/m^3$			0-54 $\mu g/m^3$		
Moderate 51-100	12.1-35.4 $\mu g/m^3$			55-154 $\mu g/m^3$		
Unhealthy for Sensitive Groups 101-150	35.5 -55.4 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 $\mu g/m^3$	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 Division

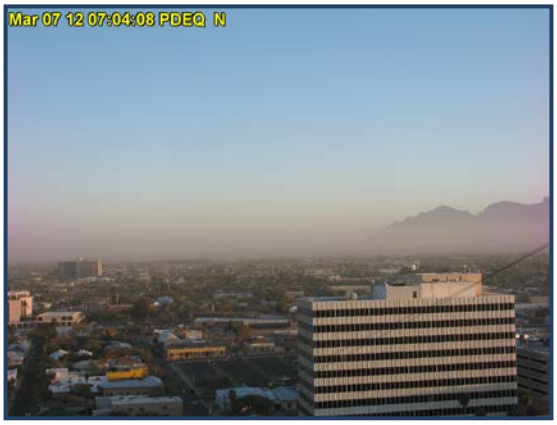
Pima County Department of Environmental Quality, Technical Operations personnel. From left: Mark Rogers, Tom Coffin (retired April, 2014), Andy Poe, Deborah Jentoft, Jim McDonnell, Mike Draper and Ted Gould.

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 filter weigh lab for particulate matter and conducting special projects. Pima County is among the top agencies in Region IX for the percent of data recovery each quarter.

Digital photos located at http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=61365 web site.

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

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



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 $PM_{2.5}$ 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 the Research Triangle Institute for analysis and reporting.

PDEQ ***monitoring lab*** contains a filter weigh lab, which is required for gravimetric analysis of $PM_{2.5}$ filters and must be maintained within specific temperature and humidity ranges, as promulgated by the EPA (40 CFR 50, Appendix L). PDEQ processes all the filters from the $PM_{2.5}$ and PM_{10} networks in the weigh lab, except for the $PM_{2.5}$ speciation filters.

Air Quality Information – Web Sites & Phone Numbers

http://webcms.pima.gov/cms/one.aspx?portalId=169&pageId=61365 Pima County Department of Environmental Quality web site; real time air quality data reporting; historical air quality data, daily AQI reports, up to the hour pollution report information for each monitoring site and site photographs.

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 Pima County Department of Environmental Quality front desk.