2004 Air Quality Summary Report

Pima County Board of Supervisors

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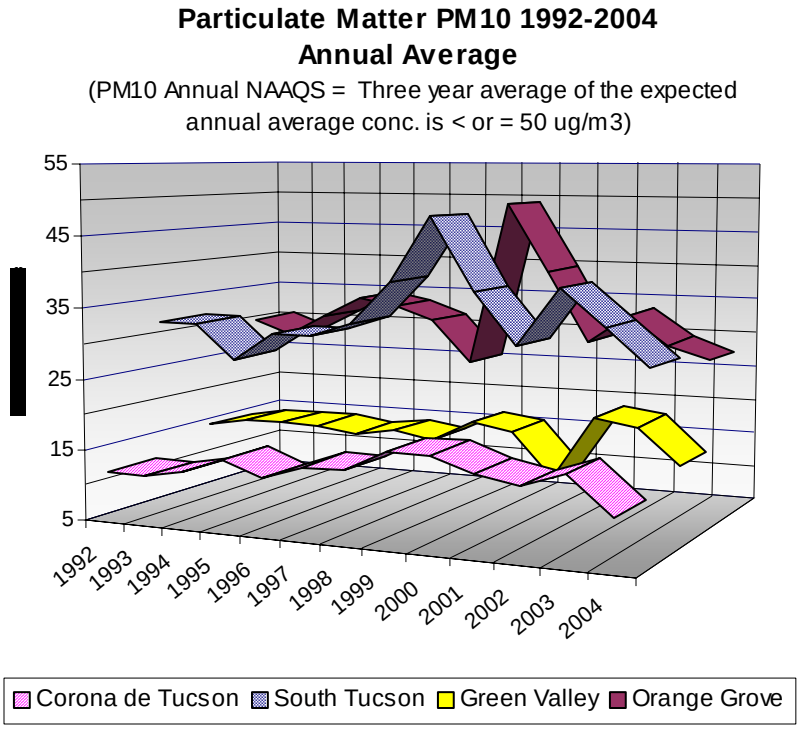
List of Abbreviations / Acronyms

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.
NAMS	National Air Monitoring Stations
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 1000 ppb = 1 ppm. Used to express gaseous concentrations.
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

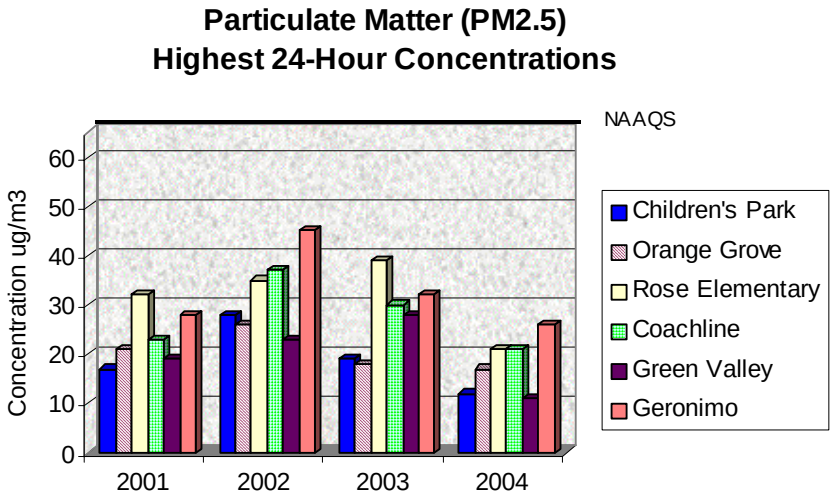
Executive Summary

The Pima County Department of Environmental Quality (PDEQ) monitors air pollutants in eastern Pima County. The National Ambient Air Quality Standards (NAAQS) are followed for the monitoring and analysis of "criteria" pollutants which are: carbon monoxide (CO), ground level ozone (O_3), particulate matter ($PM_{2.5}$, PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and lead (Pb). There were no violations of the NAAQS in Pima County in 2004.

Two sizes of particulate matter are monitored in Pima County. ***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. In 1999, Pima County violated the PM_{10} standard set by the Environmental Protection Agency (EPA). After this violation, PDEQ provided technical documentation that showed the exceedances to be the result of natural events. A Natural Events Action Plan (NEAP) was submitted to Arizona Department of Environmental Quality (ADEQ) and EPA in June, 2001. The resulting ordinance was adopted on December 3, 2002. This plan allows Pima County to remain in attainment status for PM_{10} by following the Best Available Control Measures outlined in the NEAP. The NEAP has been put in place in an effort to protect public health and welfare on days with high ambient levels of PM_{10}. 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 2004 was 149 $\mu g/m^3$ at the South Tucson location.



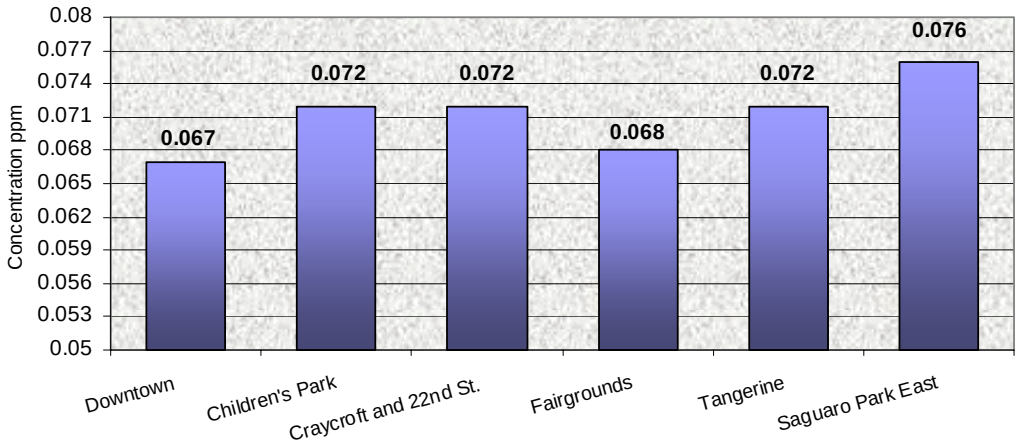
Pima County monitors ***$PM_{2.5}$*** at 6 locations. $PM_{2.5}$ has been linked to health problems including respiratory and heart problems, and can also contribute to poor visibility and urban haze. There have been no exceedances of the NAAQS for $PM_{2.5}$ since monitoring began in 1999. The 24-hour NAAQS for $PM_{2.5}$ is 65 µg/m^3. The highest 24-hour $PM_{2.5}$ concentration in 2004 in Pima County was 26 µg/m^3 at the Geronimo location.



Carbon monoxide concentrations have declined in the past decade. This has been attributed mostly to the use of cleaner burning oxygenated fuels, 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 20% 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 1-hour NAAQS for CO is 35 ppm. The highest 1-hour reading in 2004 was 5.5 ppm at the Downtown location.

Ground level ***ozone*** concentrations have remained relatively steady, approaching but not exceeding the NAAQS. The highest levels of ozone are recorded during the summer months, because of the intense sunlight and warmer temperatures. The increased pollutant emissions such as motor vehicle exhaust can contribute to the formation of ozone and push Pima County into a violation. The 8-hour standard is met when the three year average of the fourth highest daily maximum 8-hour average concentration is less than or equal to 0.080 ppm. The fourth highest 8-hour ozone level in 2004 was 0.073 ppm at the Saguaro National Park East location.

Ozone
3-Year Average of the 4th Highest 8-Hour Average
(NAAQS= 0.080 ppm)



The other criteria pollutants measured by PDEQ are ***nitrogen dioxide*** and ***sulfur dioxide***. NO_2 averages about 30% of the standard and SO_2 averages 7% of the standard. No significant changes in the levels of these two pollutants have been seen in the past 15 years.

Lead monitoring was discontinued in Pima County in 1997, after receiving an exemption for lead monitoring from EPA's Region IX. Pima County's negligible lead levels are due in large part to the elimination of lead in gasoline and the lack of any significant stationary point source for lead emissions.

The 2004 Air Quality Summary Chart (page 5) provides a summary of information for the criteria air pollutants for which Pima County monitors, including highest maximum concentrations and annual means. An air quality site map (page 16) is also provided that lists the current monitoring site locations for the PDEQ network. Specific site addresses are listed on the map companion sheet (page 15).

Pima County Department of Environmental Quality
2004 Air Quality Summary Chart

		Carbon Monoxide (CO) ppm		Ozone (O_3) ppm		Particulate Matter (PM_{10}) $\mu g/m^3$		Particulate Matter ($PM_{2.5}$)$\mu g/m^3$		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***	Max Conc. 1 Hr ***0.12 ppm***	4th Highest Conc. 8 Hr ***0.08 ppm***	Max Conc. 24 Hr ***150 $\mu g/m^3$***	Arith. Annual Mean ***50 $\mu g/m^3$***	Max Conc. 24 Hr ***65 $\mu g/m^3$***	Arith. Annual Mean ***15 $\mu g/m^3$***	Max Conc. 1 Hr	Arith. Annual Mean ***0.053 ppm***	Max Conc. 3 Hr ***0.5 ppm***	Max Conc. 24 Hr ***0.14 ppm***	Arith. Annual Mean ***0.03 ppm***
1	Downtown	**5.5**	**3.7**	**.076**	**.063**									
2	22nd & Craycroft	**3.6**	**1.6**	**.079**	**.069**					**.059**	**.0153**	**.012**	**.006**	**.0014**
3	22nd & Alvernon	**4.0**	**2.1**											
5	South Tucson					**149**	**29.2**							
6	Prince Road					**67**	**28.4**							
8	Corona de Tucson					**37**	**12.4**							
10	Green Valley			**.075**	**.066**	**127**	**13.6**	**11.2**	**3.50**					
12	Orange Grove					**119**	**26.8**	**16.5**	**5.79**					
18	Saquaro National Park East			**.085**	**.073**									
7	Broadway & Swan					**35**	**20.7**							
16	Cherry & Glenn	**4.0**	**2.7**											
17	Fairgrounds			**.078**	**.064**									
13	Tangerine			**.076**	**.068**	**34**	**14.7**							
9	Santa Clara					**41**	**20.4**							
11	Children's Park	**2.2**	**1.4**	**.082**	**.068**			**12.2**	**5.57**	**.063**	**.0159**			
14	Rose Elementary			**.073**	**.064**			**21.0**	**6.32**					
15	Coachline			**.074**	**.068**			**21.1**	**6.36**					
4	Geronimo							**25.8**	**7.03**					
23	Golf Links & Kolb	**3.6**	**2.1**											

Conc. – Concentration
Arith.- Arithmetic
ppm – Parts per Million Parts of Air, by Volume
$\mu g/m^3$ – Micrograms per Cubic Meter of Air
Spaces – The pollutant is not monitored at this site

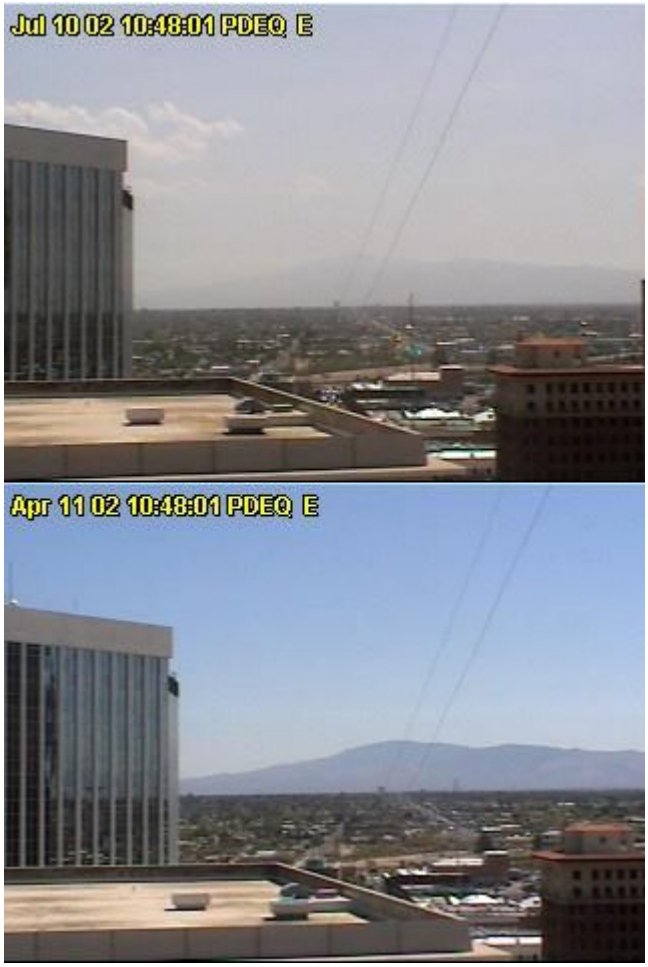
Technical Operations Division

Pima County Department of Environmental Quality, Technical Operations Division personnel. From left: Sergio Martinez, Wayne Byrd, Mike Draper, Tom Coffin, Ted Gould, John Oliver, Deborah Jentoft, Ray Felix and Jim McDonnell.

Above: John Oliver at work in the Downtown laboratory. Across: Jim McDonnell collecting PM_{10} monitor filters at the South Tucson location.

The Technical Operations Division 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 Division maintains all aspects of the air quality network which includes: site selection and installation of all monitoring sites; 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 division is also responsible for maintaining the Visibility and Urban Haze network for ADEQ. Other responsibilities include operating a filter weigh lab for particulate matter and conducting special projects.

Pima County provides air quality information in an easily accessible manner to the public using real time data reporting on the internet (web sites: www.deq.pima.gov and www.airinfonow.org) and with a "call in system" (phone number (520) 882-4AIR). The "Air Info Now" web site and telephone line are available in English and Spanish.



Top: Dirty Air day. *High particulate readings were recorded on this day.*

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

Historical air quality data, daily AQI reports, up to the hour pollution report information for each monitoring site and site photographs are located on the Pima County Department of Environmental Quality's web site http://www.deq.pima.gov. The www.airinfonow.org web site displays current digital photos taken from the roof of the county administration building to track visibility. This web site also has a dynamic ozone map generated by hourly ozone readings which is also sent to EPA's web site at http://www.epa.gov/airnow/.

The 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. PDEQ processes all the filters from the $PM_{2.5}$ and PM_{10} networks in the weigh lab.

Introduction

Pima County Department of Environmental Quality monitors ambient (outdoor) air pollutants throughout eastern Pima County, which includes the Tucson metropolitan area as well as Green Valley. Monitoring for five of the six principal pollutants, called "criteria" pollutants, is performed 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 five air pollutants monitored by PDEQ are: carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10}, $PM_{2.5}$), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Locations of these monitors are based on emission source distribution and population exposure (40 CFR, Part 58, App. D).

Lead monitoring in Pima County was discontinued in March of 1997. The Environmental Protection Agency regulations allowed for the cessation of ambient lead monitoring in Pima County. The reduction of lead readings below a detectable level are due primarily to the federal regulation eliminating lead in automobile gasoline.

Table 1 (next page) lists the Primary and Secondary NAAQS for each pollutant in terms of pollutant level and averaging time used to evaluate compliance. 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.

Table 1
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	8-Hour [b]	9 ppm (10 μg/m^3)	No Secondary Standard	
	1-Hour [b]	35 ppm (40 μg/m^3)	No Secondary Standard	
O_3	1-Hour [c]	0.12 ppm (235 μg/m^3)	Same as Primary	
	8-Hour [d]	0.08 ppm (157 μg/m^3)	Same as Primary	
PM_{10}	Annual Arithmetic Mean [e]	50 μg/m^3	Same as Primary	
	24-Hour [e]	150 μg/m^3	Same as Primary	
$PM_{2.5}$	Annual Arithmetic Mean [f]	15 μg/m^3	Same as Primary	
	24-Hour [f]	65 μg/m^3	Same as Primary	
NO_2	Annual Arithmetic Mean	0.053 ppm (100 μg/m^3)	Same as Primary	
SO_2	Annual Arithmetic Mean	0.03 ppm (80 μg/m^3)	3-Hour [b]	0.50 ppm (1,300 μg/m^3)
	24-Hour [b]	0.14 ppm (365 μg/m^3)		
Pb	Calendar Quarter	1.5 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 attained when the expected number of days per year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one (App. H).
d The standard is met when the three year average of the annual fourth highest daily maximum concentration is less than or equal to 0.08 ppm.
e The 24-hour standard is attained 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 is attained when the three year average of the expected annual arithmetic mean concentration is less than or equal to 50 μg/m^3.
f The 24-hour standard is met when the three year average of the 98^{th} percentile value is less than or equal to 65 μg/m^3.The annual standard is met when the annual average of the quarterly concentrations is less than or equal to 15 μg/m^3, when averaged over 3 years.
Taken from: 40 CFR, Part 50 and EPA National Trends Report 1998.

Tucson's Topography, Meteorology & General Air Quality

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. Pima County's population is estimated at 836,153 based on the 2000 Census. 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 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.

Monsoons occur in the months of 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 occur after the sun goes down when the air closest to the ground is cooled rapidly by radiating heat 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 mix with the layers of air above and disperse the built up pollutants. These conditions are common during the winter, but are less severe in the summer months.

Carbon Monoxide

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 23). The CO cannot mix due to stagnant air and tends to build up, especially near congested intersections. CO concentrations have decreased considerably over the past ten years, primarily due to newer, cleaner burning vehicles and the use of oxygenated fuels.

There were no exceedances of the NAAQS for carbon monoxide in 2004. 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. PDEQ monitors CO at six locations. Table 4 lists all the CO sites in the network and the maximum concentrations.

Ozone

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 23). Oxides of nitrogen (NOx) and volatile organic compounds (VOC's) are the "precurser" pollutants that react in the presence of sunlight and heat 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, rather when precursor pollutants are released from car exhaust they travel, due to wind or simple dispersion, away from the area of concentration before reacting with sunlight to form ozone. The Saguaro National Park site, east of Tucson, generally records the highest ozone levels. There were no violations of the NAAQS for ozone in 2004. When two or more of the monitoring sites exceed 70% of the old one hour ozone standard of 0.120 ppm, Pima County Department of Environmental Quality and the American Lung Association issue a joint ozone advisory to the media to protect very sensitive members of our population. There were no advisories issued in 2004. PDEQ monitors ozone at nine locations. **Tables 5 and 6** list the maximum concentrations for ozone.

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

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 dry periods are considered factors contributing to the high particulate readings for that year. A Natural Events Action Plan (NEAP) was submitted to ADEQ and EPA June, 2001. The resulting ordinance was adopted December 3, 2002. This policy includes 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}. There were three exceedances of the PM_{10} NAAQS in 2002, one at the Orange Grove location and two at the South Tucson location. There was one exceedance in 2003 at the Orange Grove location, this exeedance was considered a Natural Event due to the forest fires in the nearby Catalina Mountain Range. There were no exceedances of the NAAQS in 2004. **Table 7** lists the eight PM_{10} sites in the network and their maximum concentrations. Pima County and the American Lung Association issue a joint particulate matter advisory when there are elevated levels recorded. There was one advisory issued in 2004.

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. There were no exceedances of the $PM_{2.5}$ NAAQS in 2004 at any of the six monitoring sites. **Table 8** contains the $PM_{2.5}$ information for 2004.

Nitrogen Dioxide and Sulfur Dioxide

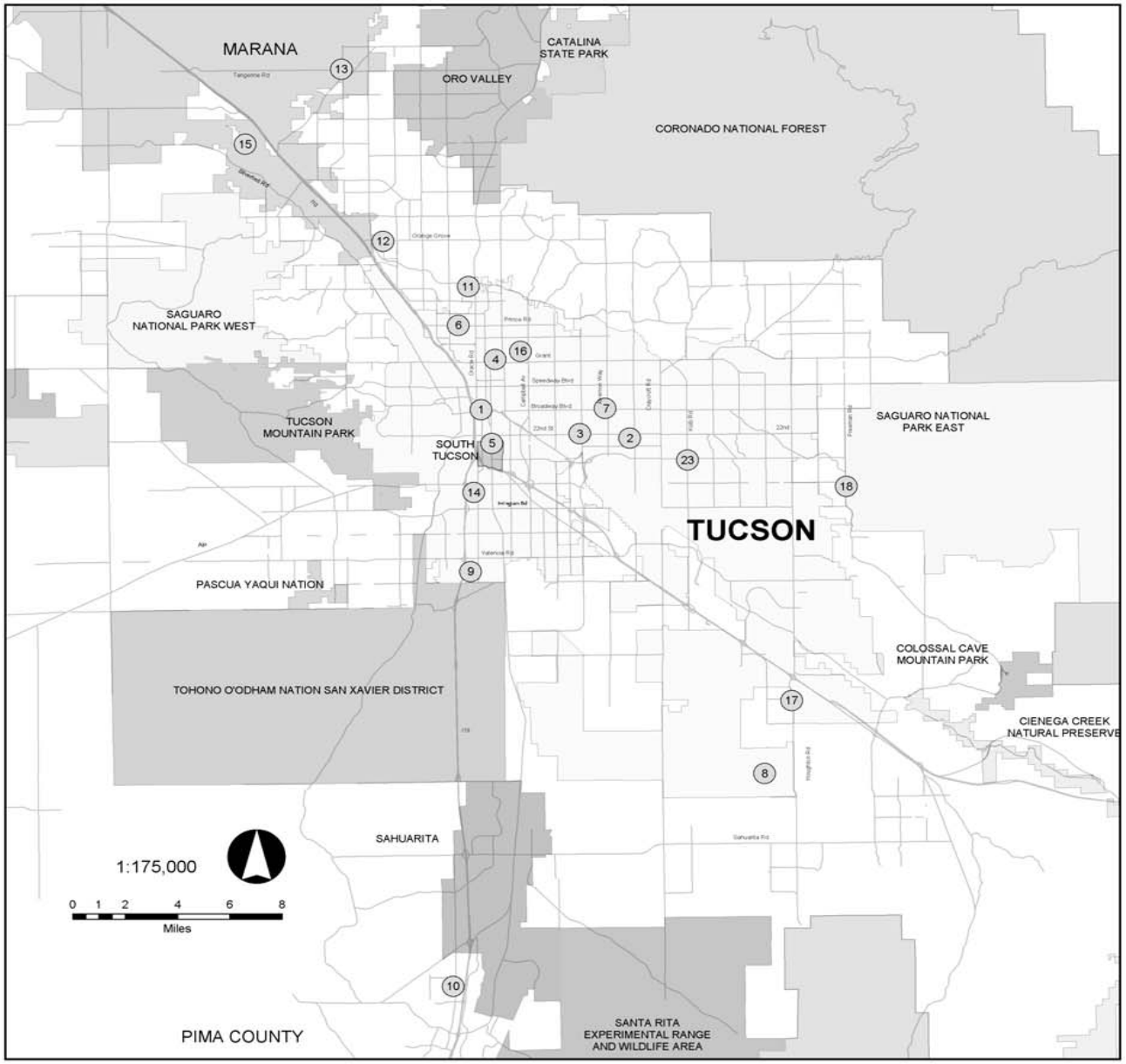
Nitrogen dioxide is measured at the Children's Park and 22nd Street & Craycroft locations. Nitrogen dioxide levels remain low during the summer but act as a precursor to ozone formation. Most noticeable during wintertime temperature inversions, NO_2 is a contributing factor to urban

haze, the "brown cloud" that limits visibility in the Tucson basin. Motor vehicles are a major source of NO_2 in Pima County. **Table 9** contains the nitrogen dioxide information for 2004.

Sulfur dioxide is measured at the 22nd Street & Craycroft location. Tucson has no significant sources of SO_2 and the levels continue to be extremely low. **Table 10** contains the sulfur dioxide information for 2004.

Air Quality Monitoring Locations
Table 2

Site Map #	Site Name	Address	Pollutant
1	Downtown	190 W. Pennington	CO, O_3
2	22nd & Craycroft	1237 S. Beverly	CO, O_3, SO_2, NO_2
3	22nd & Alvernon	3895 E. 22nd	CO
18	Saguaro National Park, East	3905 S. Old Spanish Tr.	O_3
16	Cherry & Glenn	2745 N. Cherry	CO
17	Fairgrounds	11330 S. Houghton Rd.	O_3
13	Tangerine	12101 N. Camino de Oeste	O_3, PM_{10}
11	Children's Park	400 W. River Rd.	CO, O_3, NO_2, $PM_{2.5}$
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}
10	Green Valley	601 N. La Canada Dr.	O_3, PM_{10}, $PM_{2.5}$
12	Orange Grove	3401 W. Orange Grove Rd.	PM_{10}, $PM_{2.5}$
7	Broadway & Swan	4625 E. Broadway	PM_{10}
9	Santa Clara School	6910 S. Santa Clara Ave.	PM_{10}
4	Geronimo	2498 N. Geronimo	$PM_{2.5}$
14	Rose Elementary	710 W. Michigan Street	O_3, $PM_{2.5}$
15	Coachline	9597 N. Coachline Blvd.	O_3, $PM_{2.5}$
23	Golf Links & Kolb	2601 S. Kolb Rd.	CO



Pima County Monitoring Sites

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

Monitoring Sites

Major Streets

Revised: July 2005

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 2004

Criteria Pollutants

Table 3

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.
Ozone (O_3)	A gas formed when 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 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.
Particulate Matter (PM)	Particulate matter (PM_{10}) particles less than 10 microns in size Particulate matter ($PM_{2.5}$) 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	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 deeper into the respiratory system.
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; 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.

Data Summary

Table 4
Carbon Monoxide Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Mean	Max 1-Hr Value[2]	Max 8-Hr Value[3]	% Data Recovery
Downtown	1	SLAMS	0.58	5.5	3.7	99
22nd / Craycroft	2	NAMS	0.37	3.6	1.6	99
22nd / Alvernon	3	NAMS	0.69	4.0	2.1	99
Cherry / Glenn[5]	16	SP[4]	0.56	4.0	2.7	99
Children's Park	11	NAMS	0.41	2.2	1.4	100
Golf Links / Kolb[5]	23	SP[4]	0.68	3.6	2.1	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. Special Purpose site
5. Seasonal monitor, no sampling from 05/03/2004 through 10/01/2004.

Table 5
Ozone One Hour Average Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Mean	Max 1-Hr Value[2]	2nd Max 1-Hr Value	% Data Recovery
Downtown	1	SLAMS	.021	.076	.076	99
22nd / Craycroft	2	NAMS	.026	.079	.078	99
Saguaro National Park, East	18	OTHER[3]	.041	.085	.084	99
Fairgrounds	17	SP[4]	.031	.078	.078	99
Tangerine	13	NAMS	.037	.076	.075	100
Children's Park	11	SLAMS	.026	.082	.077	99
Rose Elementary	14	SP[4]	.024	.073	.072	99
Coachline	15	SP[4]	.023	.074	.073	97
Green Valley	10	SP[4]	.032	.075	.074	99

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard one hour average for ozone is 0.120 ppm
3. Non-EPA, Federal Monitor (National Parks Service)
4. Special Purpose site

Table 6
Ozone Eight Hour Average Summary Values[1] for 2004

Site	1st Maximum	2nd Maximum	3rd Maximum	4th Maximum
Downtown	.070	.070	.064	.063
22nd / Craycroft	.073	.072	.071	.069
Saguaro National Park, East[2]	.075	.074	.073	.073
Fairgrounds	.071	.071	.066	.064
Tangerine	.072	.069	.069	.068
Children's Park	.071	.071	.069	.068
Rose Elementary	.067	.065	.064	.064
Coachline	.069	.068	.068	.068
Green Valley	.071	.070	.067	.066

1. National Ambient Air Quality Standard eight-hour average is 0.080 ppm. The eight hour average standard is the three year average of the fourth highest value.
2. Non-EPA, Federal Monitor (National Park Service)

Table 7
Particulate Matter (PM_{10}) Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Average[2]	Max 24-Hr Value[3]	2nd Max 24-Hr Value
South Tucson	5	SLAMS	29.2	149	117
Prince Road	6	NAMS	28.4	67	50
Corona de Tucson	8	SLAMS	12.4	37	24
Green Valley	10	SLAMS	13.6	127	96
Orange Grove	12	SLAMS	26.8	119	100
Broadway / Swan	7	NAMS	20.7	35	34
Tangerine	13	SP[4]	14.7	34	26
Santa Clara	9	SLAMS	20.4	41	41

1. Measured in micrograms per cubic meter ($\mu g/m^3$)
2. National Ambient Air Quality Standard annual average for particulate matter (PM_{10}) is 50 $\mu g/m^3$
3. National Ambient Air Quality Standard 24-hour average for particulate matter (PM_{10}) is 150 $\mu g/m^3$
4. Special Purpose site

Table 8
Particulate Matter ($PM_{2.5}$) Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Average[2]	Max 24-Hr Value[3]	2nd Max 24-Hr Value
Orange Grove	12	SLAMS	5.79	16.5	15.6
Children's Park	11	SLAMS	5.57	12.2	11.5
Rose Elementary	14	SP[4]	6.32	21.0	20.2
Coachline	15	SP[4]	6.36	21.1	17.6
Green Valley	10	SP[4]	3.50	11.2	9.9
Geronimo	4	SP[4]	7.03	25.8	23.2

1. Measured in micrograms per cubic meter ($\mu g/m^3$)
2. National Ambient Air Quality Standard annual average for particulate matter ($PM_{2.5}$) is 15 $\mu g/m^3$
3. National Ambient Air Quality Standard 24-hour average for particulate matter ($PM_{2.5}$) is 65 $\mu g/m^3$
4. Special Purpose site

Table 9
Nitrogen Dioxide Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Average[2]	Max 1-Hr Value[3]	2nd Max 1-Hr Value	% Data Recovery
22nd & Craycroft	2	SLAMS	.0153	.059	.056	99
Children's Park	11	SLAMS	.0159	.063	.054	99

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard annual mean for nitrogen dioxide is 0.053 ppm

Table 10
Sulfur Dioxide Summary Values[1] for 2004

Site	Map No.	Site Type	Annual Average[2]	Max 24-Hr Value[3]	Max 3-Hr Value[4]	% Data Recovery
22nd & Craycroft	2	SLAMS	.0014	.006	.012	99

1. Measured in parts per million (ppm)
2. National Ambient Air Quality Standard annual average for sulfur dioxide is 0.03 ppm
3. National Ambient Air Quality Standard 24-hour average for sulfur dioxide is 0.14 ppm
4. National Ambient Air Quality Standard 3-hour average for sulfur dioxide is 0.50 ppm

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 2
Golf Links & Kolb Carbon Monoxide
1- Hr Standard = 35 PPM

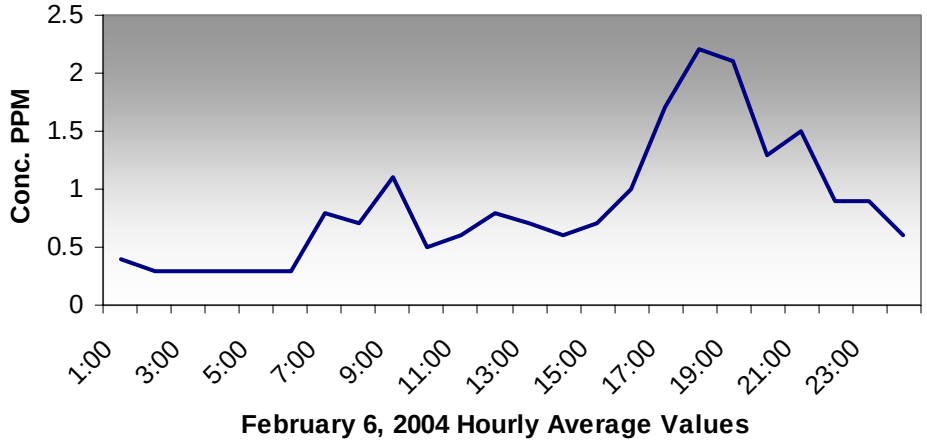
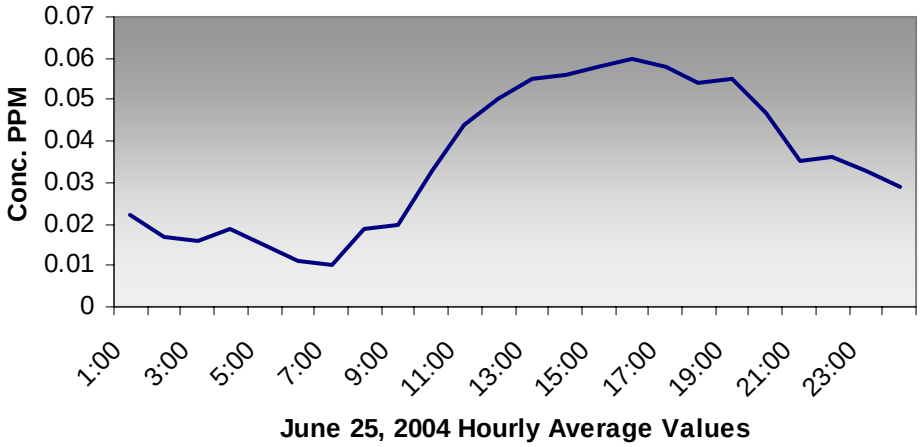


Figure 3 shows the diurnal cycle of ozone in the Tucson area. As the sun begins to react on the VOCs and NO_2, ozone formation increases. This increase continues through the day, as long as there is sunlight, or until either the VOCs or the NO_2 are exhausted. Once this point is reached, the levels begin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

Figure 3
Children's Park Ozone
1 - Hr Standard = 0.12 PPM



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 4
Carbon Monoxide
Monthly Averages 22nd & Craycroft Location

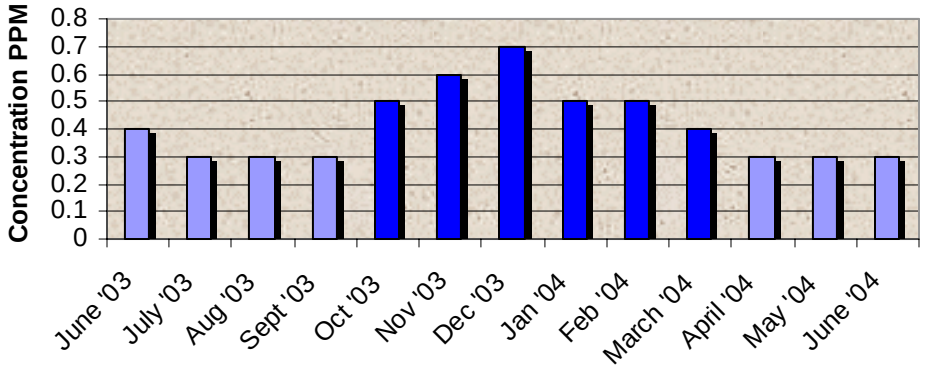
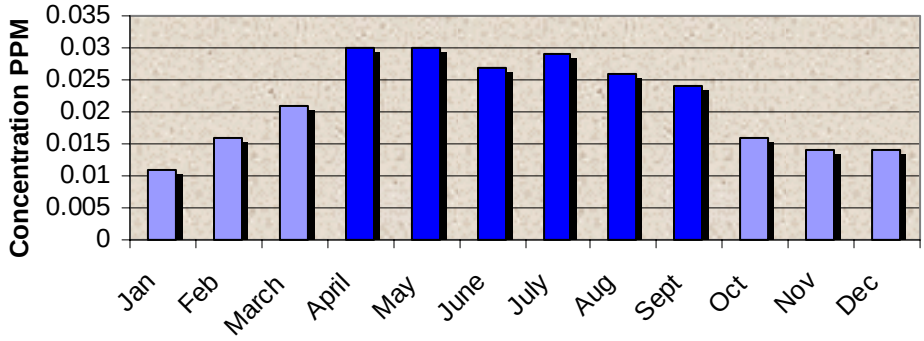


Figure 5 – The "Ozone Season" occurs during the months of April through September. Ozone levels increase in the summer months due to long sunny days and emissions of oxides of nitrogen and volatile organic compounds. The photochemical reactions that take place between the emissions and sunlight form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

Figure 5
Ozone 2004
Monthly Averages at the Downtown Location



Historical Trends

Figures 6 through 9 give a graphical representation of trends for our major air pollutants over the years.

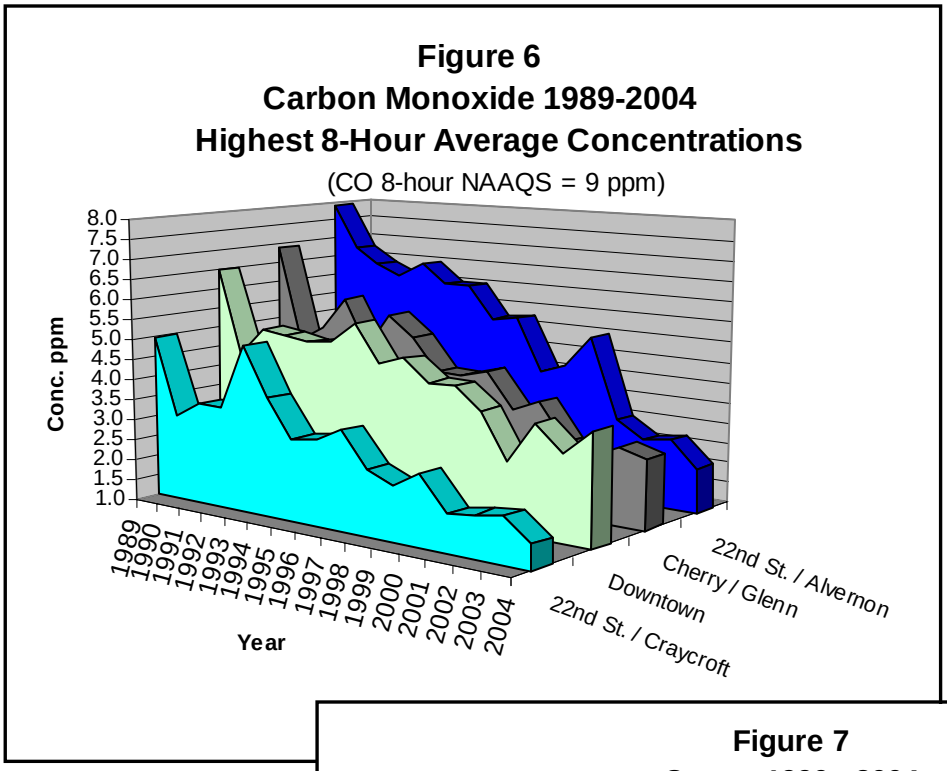


Figure 6 illustrates the general decline in levels of carbon monoxide over the past fifteen years.

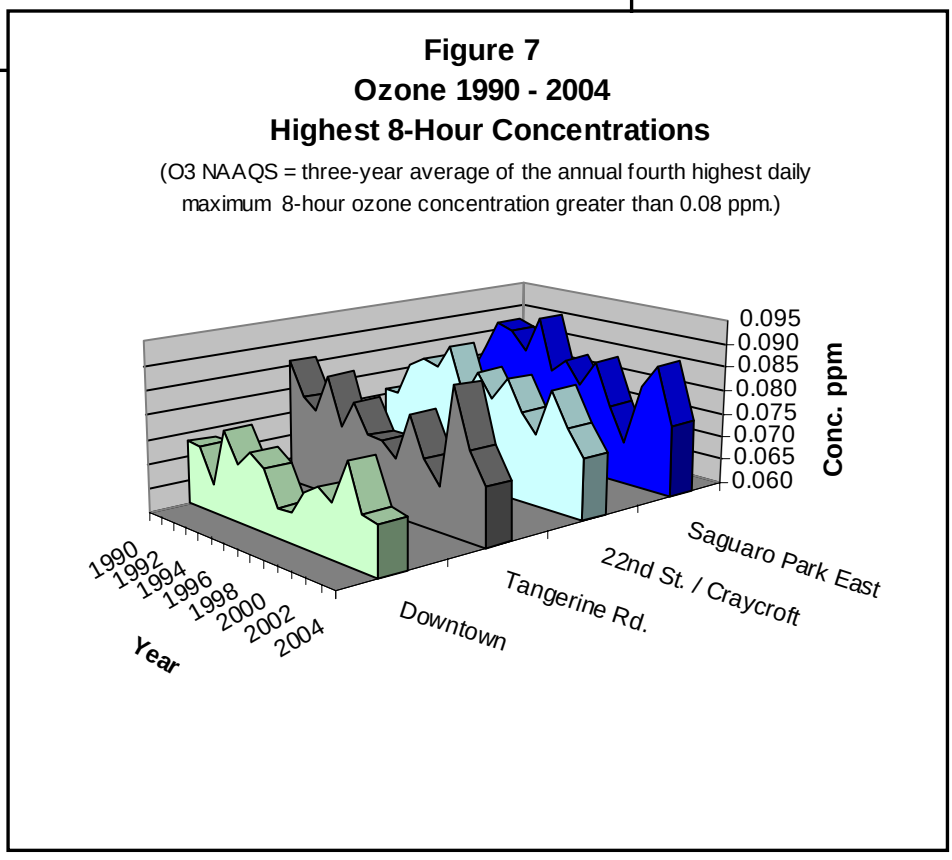
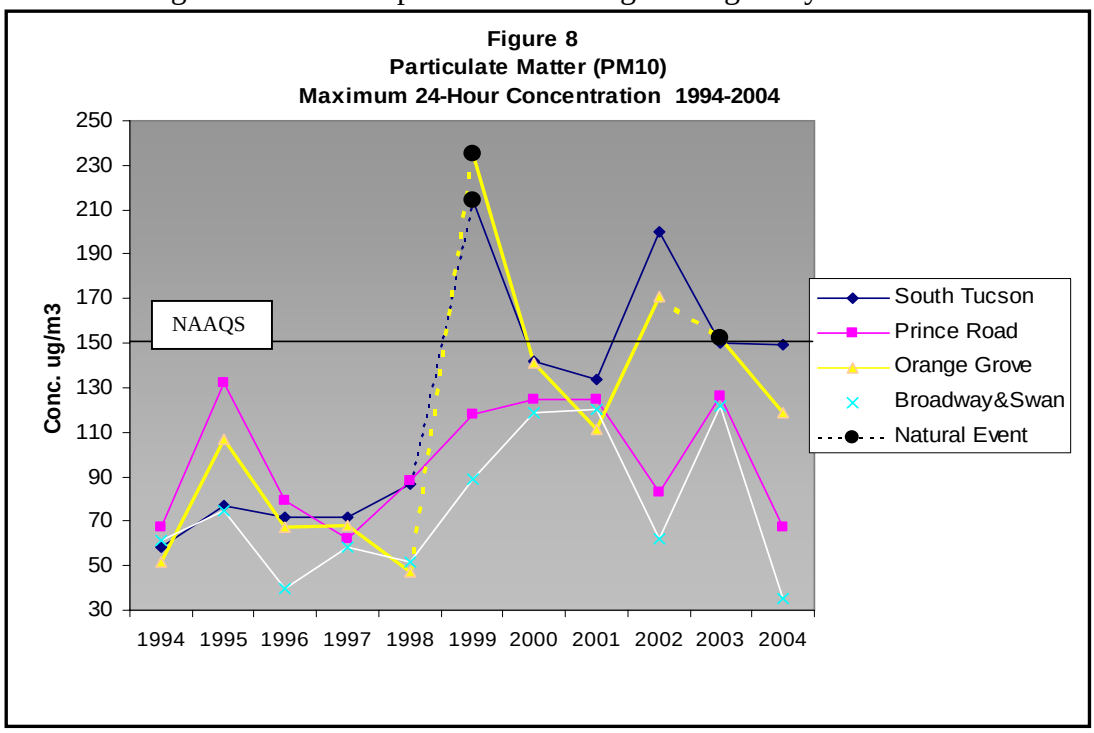


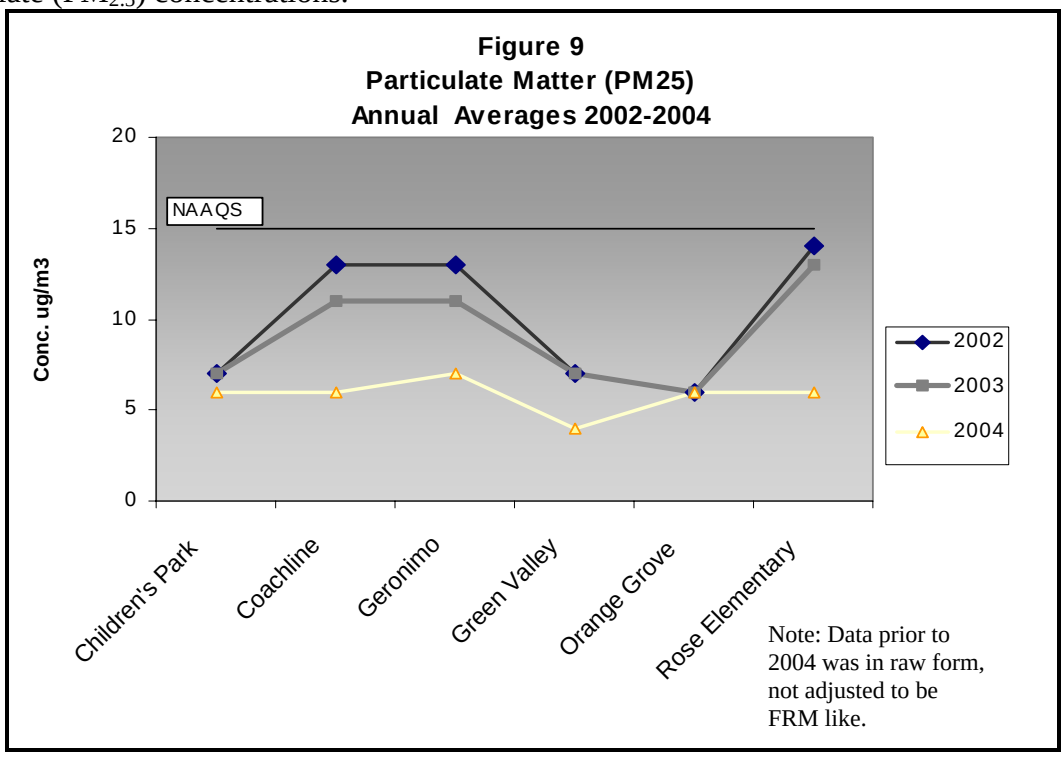
Figure 7 illustrates ozone levels over the past fourteen years. The ozone levels remain near the national ambient air quality standard.

Historical Trends Continued

Particulate (PM_{10}) levels (**Figure 8**) can be dependent on localized conditions. In 1999, the Tucson area suffered from major drought conditions and several very high wind days, which contributed to the higher than normal particulate readings during that year.



Fine particulate ($PM_{2.5}$) monitoring began in 1999 at the Orange Grove and Children's Park locations and at the remaining sites in 2001. **Figure 9** below, illustrates the last three years of particulate ($PM_{2.5}$) concentrations.



Visibility and Urban Haze Network

The visibility monitoring network in Tucson is reported by the Arizona Department of Environmental Quality and maintained by the Pima County Department of Environmental Quality. The visibility and urban haze network is part of an ongoing study to measure the chemical composition of Tucson's atmosphere through optical, gaseous, particulate and meteorological measurements that attempt to explain the nature of the haze and sources that contribute to light extinction (reduced visibility). Light extinction can be analyzed by the measurements of light scattering and light absorption caused by particles and gases in the atmosphere.

Particulates

Field studies in the Tucson and Phoenix areas have shown that particles less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$) cause the majority of light scattering. Nephelometers at four locations throughout the Tucson area (see Table 11 below) measure ground level light scattering caused by fine particulates.

Table 11

Location of Nephelometers
Central (U of A)
22nd St. at Craycroft
Tucson Mountain (TUMO 2)
Children's Park

Gases

Scattering and absorption of light by gases are minor contributors to the light extinction in the Tucson area. Nitrogen dioxide is the gas normally present in the area which absorbs significant quantities of light.

Optical

The network includes a camera located on the roof of the County Administration building downtown, which sends the digital images to the www.airinfonow.org web site. A transmissometer measures the total light extinction coefficient over a sight path in the downtown area. This data is used to quantify changes in the haze during the day.

Meteorological conditions

Low wind speed affects the dispersal of emitted pollutants during stagnant conditions and can contribute to the accumulation of pollutants. Wind direction as well as topography of the area can affect the geographic location of the haze. Variation of temperature with altitude affects the stability of the atmosphere. See page 13 for more information regarding temperature inversions and the accumulation of pollutants at the earth's surface, causing reduced visibility due to urban haze. Particulate matter may contain chemical constituents that are hygroscopic and absorb water when humidity is elevated, causing an increase in light extinction.

References: Tucson Urban Haze Study Plan, Prepared for ADEQ, ENSR Consulting and Engineering, 1992

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 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 28 and 29, (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. The highest 8-hour average for ozone and CO, and the highest 24-hour average for PM_{10} and $PM_{2.5}$ are reported twice daily at 9 AM and at 3 PM, Monday through Friday. The report is provided by fax or Email to the local media and updated on the web site, www.deq.pima.gov.

Figure 10, shows the 2004 AQI percentage of Good, Moderate and Unhealthy for Sensitive Group (FSG) for each pollutant.

Figure 10

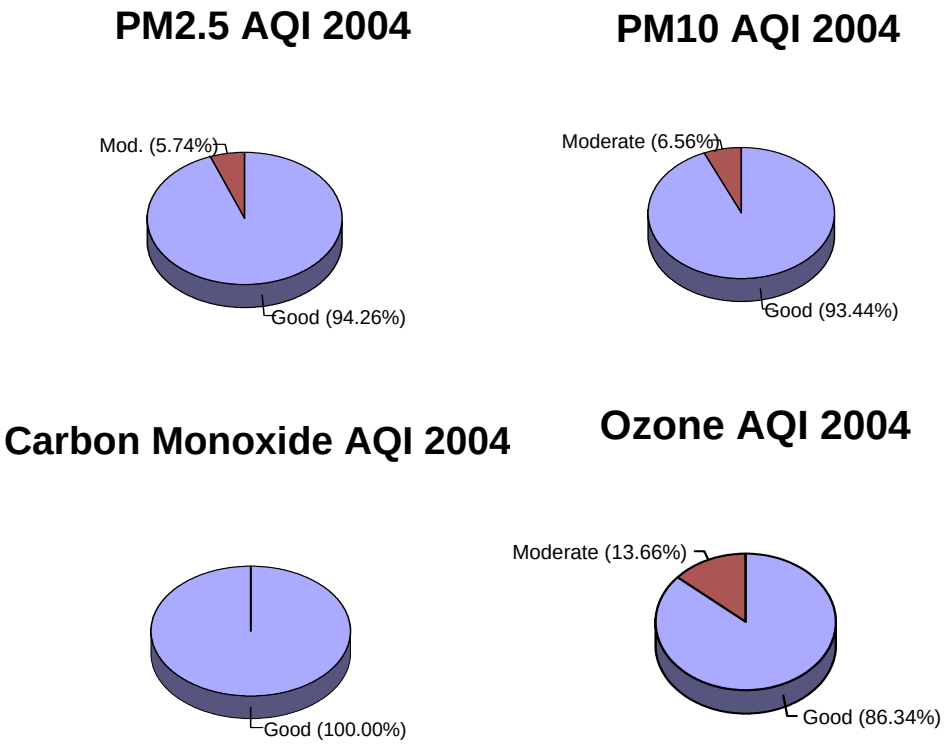


Table 12
AQI Reporting Table

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	0.00-0.064 ppm			0.0-4.4 ppm		
Moderate 51-100	0.065-0.084 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	0.085-0.104 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	0.105-0.124 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	0.125-0.374 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 13
AQI Reporting Table

AQI Category	Particulate Matter (24-hour)					
	$PM_{2.5}$			PM_{10}		
	Concen-tration	Health Effects Statement	Cautionary Statement	Concen-tration	Health Effects Statement	Cautionary Statement
Good 0-50	0.0-15.4 $\mu g/m^3$			0-54 $\mu g/m^3$		
Moderate 51-100	15.5-40.4 $\mu g/m^3$			55-154 $\mu g/m^3$		
Unhealthy for Sensitive Groups 101-150	40.5-65.4 $\mu g/m^3$	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	65.5-150.4 $\mu g/m^3$	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.