Appendices – Volume II
Event Specific Material

For May 21, 2008

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Appendix I
Event Air Quality Advisories

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.epa.gov/airnow/aqibroch

NEW!!! CLICK HERE FOR UPDATED 2008 OZONE SEASON STATS NEW!!!

AIR QUALITY FORECAST FOR WEDNESDAY, MAY 21, 2008

This report is updated by 1:00 p.m. Sunday thru Friday and is valid
for areas within and bordering Maricopa County in Arizona

FORECAST DATE	YESTERDAY MON 05/19/2008	TODAY TUE 05/20/2008	TOMORROW WED 05/21/2008	EXTENDED THU 05/22/2008
NOTICES (*SEE BELOW FOR DETAILS)	**OZONE HEALTH WATCH** **NWS EXCESSIVE HEAT WARNING**	**OZONE HIGH POLLUTION ADVISORY** **NWS EXCESSIVE HEAT WARNING**	**PM-10 HIGH POLLUTION ADVISORY** **OZONE HEALTH WATCH** **NWS WIND ADVISORY**	**PM-10 HEALTH WATCH POSSIBLE** **DUST**
AIR POLLUTANT	Highest AQI Reading/Site (Preliminary data only)			
O3*	**97** **TONTO NATIONAL MONUMENT**	**124** **UNHEALTHY FOR SENSITIVE GROUPS**	**93** **MODERATE**	**80** **MODERATE**
CO*	**14** **PHOENIX SUPERSITE**	**09** **GOOD**	**06** **GOOD**	**06** **GOOD**
PM-10*	**80** **WEST FORTY THIRD**	**74** **MODERATE**	**140** **UNHEALTHY FOR SENSITIVE GROUPS**	**92** **MODERATE**
PM-2.5*	**44** **DURANGO**	**32** **GOOD**	**53** **MODERATE**	**55** **MODERATE**

* O3 = Ozone CO = Carbon Monoxide PM-10 = Particles 10 microns & smaller PM-2.5 = Particles smaller than 2.5 microns

*"Ozone Health Watch" means that the highest concentration of OZONE may approach the federal health standard.
"PM-10 or PM-2.5 Health Watch" means that the highest concentration of PM-10 or PM-2.5 may approach the federal health standard.
"High Pollution Advisory" means that the highest concentration of OZONE, PM-10, or PM-2.5 may exceed the federal health standard.
"DUST" means that short periods of high PM-10 concentrations caused by outflow from thunderstorms are possible.

Health message for Tuesday, May 20: Active children and adults, and people with lung disease such as asthma, should reduce prolonged or heavy outdoor exertion.
Health message for Wednesday, May 21: Active children and adults, and people with lung disease such as asthma, should reduce prolonged or heavy exertion.

Synopsis and Discussion

AN OZONE HIGH POLLUTION ADVISORY REMAINS IN EFFECT TODAY MAY 20
A PM-10 HIGH POLLUTION ADVISORY AND AN OZONE HEALTH WATCH HAVE BEEN ISSUED FOR WEDNESDAY MAY 21

Local ozone levels approached unhealthy levels at several east Valley locations on Monday, and as of 10:00 a.m. this morning hourly concentrations were running 10-15 parts per billion higher than 24 hours ago at most monitoring sites; therefore, today's High Pollution Advisory will continue thru the early evening hours. All eyes now turn to the significant wind/blowing dust/unhealthy PM-10 (coarse particle) event that is looking inevitable for Wednesday. A transition from record heat to below average temperatures will begin on Wednesday as a surface cold front moves over the state ahead of an intense upper level trough. A sharp temperature contrast will be reflected in tight pressure and contour gradients that will be capable of producing sustained winds over 30 mph and wind gusts in excess of 40 mph over a wide area, much of it open desert. The likelihood that widespread blowing dust will be generated by afternoon has prompted the issuance of a PM-10 High Pollution Advisory. Under sunny skies and with continuing additional ozone transport from California, local ozone levels could also be a concern. -Reith

MONITORING SITE MAPS: STATIC MAP - http://www.azdeq.gov/environ/air/monitoring/images/map.jpg
INTERACTIVE MAPS - http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx
http://www.airnow.gov/

POLLUTION MONITOR READINGS FOR MONDAY, MAY 19, 2008

O3 (OZONE)

For facts on new 8-hr ozone standard go to: http://www.epa.gov/air/ozonepollution/pdfs/2008_03_aqi_changes.pdf
For maps go to: http://www.airnow.gov/index.cfm?action=airnow.currentconditions

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Alamo Lake (La Paz County)	NOT AVBL	NOT AVBL	NOT AVBL
Apache Junction (Pinal County)	68	77	
Blue Point	66	71	
Buckeye	54	46	
Casa Grande (Pinal County)	64	64	
Cave Creek	66	71	
Central Phoenix	62	58	
Combs School (Pinal County)	57	48	
Dysart	54	46	
Falcon Field	67	74	
Fountain Hills	67	74	
Glendale	54	46	
Humboldt Mountain	64	64	
Maricopa (Pinal County)	55	47	
North Phoenix	61	54	
Phoenix Supersite	63	61	
Pinal Air Park (Pinal County)	60	51	
Pinnacle Peak	63	61	
Queen Valley (Pinal County)	72	90	
Rio Verde	70	84	
South Phoenix	66	71	
South Scottsdale	62	58	
Tempe	64	64	
Tonto Nat'l Mon. (Gila County)	74	97	
West Chandler	61	54	
West Phoenix	64	64	
Yuma (Yuma County)	57	48	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.9	10	
Greenwood	1.1	13	
Phoenix Supersite	1.2	14	
West Indian School	1.0	11	
West Phoenix	0.6	07	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Buckeye	47	44	
Central Phoenix	41	38	
Combs School(Pinal County)	59	53	
Coyote Lakes	37	34	
Durango	54	50	
Greenwood	47	44	
Higley	46	43	
Maricopa (Pinal County)	74	60	
Phoenix Supersite	33	31	
South Phoenix	50	46	
West Forty Third	113	80	
West Phoenix	42	39	

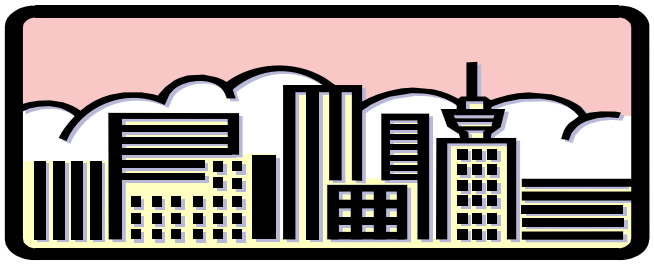
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

For maps go to: http://www.airnow.gov/

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Durango	13.6	44	
Dysart	4.3	14	
Estrella Mountain Park	6.4	21	
Phoenix Supersite	13.0	42	
Vehicle Emissions Lab	6.2	20	
West Phoenix	10.7	35	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

Description – This is a secondary pollutant that is formed by the reaction of other primary pollutants (precursors) such as VOCs (volatile organic compounds) and NOx (Nitrogen Oxides) in the presence of heat and sunlight.

Sources – VOCs are emitted from motor vehicles, chemical plants, refineries, factories, and other industrial sources. NOx is emitted from motor vehicles, power plants, and other sources of combustion.

Potential health impacts – Exposure to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other effects include decrease in lung function, chest pain, and cough.

Unit of measurement – Parts per billion (ppb).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight).

Reduction tips – Curtail daytime driving, refuel cars and use gasoline-powered equipment as late in the day as possible.

CO (CARBON MONOXIDE):

Description – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely.

Sources – In cities, as much as 95 percent of all CO emissions emanate from automobile exhaust. Other sources include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak concentrations occur in colder winter months.

Potential health impacts – Reduces oxygen delivery to the body's organs and tissues. The health threat is most serious for those who suffer from cardiovascular disease.

Unit of measurement – Parts per million (ppm).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight)

Reduction tips – Keep motor vehicle tuned properly and minimize nighttime driving.

PM-10 & PM-2.5 (PARTICLES):

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations such as the "Valley Brown Cloud" (see http://www.phoenixvis.net/). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.
Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.
Units of measurement – Micrograms per cubic meter (ug/m3)
Averaging interval – 24 hours (midnight to midnight).
Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 08/14/2007**}

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

MARICOPA COUNTY
DUST CONTROL ACTION FORECAST
ISSUED TUESDAY, MAY 20, 2008
Three-day weather outlook:

In the wake of the heat wave on Monday and Tuesday the approach of an intense late-season trough in the mid-latitude storm track will make for very windy conditions region-wide beginning on Wednesday. On that day a surface cold front will move over Arizona ahead of the trough; both the duration and speed of the winds have the potential to produce widespread blowing dust over the desert areas with a HIGH risk of unhealthy PM-10 levels in the Phoenix area; High Pollution Advisory will be issued as a result. On Thursday and Friday somewhat less gradient wind may be enhanced by thunderstorm downdrafts so the risk level will remain elevated both days.

R I S K F A C T O R S

	WINDS		STAGNATION		RISK LEVEL
Day #1: Wed 05/21/2008	Southwest to westerly 15-30 mph with gusts near 40 mph possible.	+	Rather stagnant during the morning hours with improvement by afternoon.	=	**HIGH**
Day #2: Thu 05/22/2008	Southwest to westerly 15-25 mph with stronger gusts near thunderstorms.	+	Little if any stagnation expected.	=	**MODERATE**
Day #3: Fri 05/23/2008	Southerly 15-25 mph by afternoon with higher gusts near thunderstorms.	+	Little if any stagnation expected.	=	**MODERATE**

The Maricopa County Dust Control Action Forecast is issued to assist in the planning of work activities to help reduce dust pollution. To review the complete air quality forecast for the Phoenix metropolitan area and the health effects of air pollution, please see ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf, or call 602-771-2367 for recorded forecast information.

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

YUMA AND VICINITY
DUST CONTROL ACTION FORECAST
ISSUED TUESDAY, MAY 20, 2008

Three-day weather outlook:

In the wake of the heat wave on Monday and Tuesday the approach of an intense late-season trough in the mid-latitude storm track will make for very windy conditions region-wide beginning on Wednesday. On that day a surface cold front will move over Arizona ahead of the trough; both the duration and speed of the winds have the potential to produce widespread blowing dust over the desert areas with a HIGH risk of unhealthy PM-10 levels in the Yuma area. Equally strong down-river winds are possible on Thursday, enhanced by the possibility of thunderstorm downdrafts.

	WINDS	WIND-BLOWN DUST RISK
Day #1: Wed 05/21/2008	West to northwesterly 20-30 mph with gusts over 40 mph possible by afternoon.	**HIGH**
Day #2: Thu 05/22/2008	Northwest to northerly 20-30 mph with gusts approaching 40 mph.	**HIGH**
Day #3: Fri 05/23/2008	Southerly 15-25 mph with gusts to 30 mph except stronger near thunderstorms.	**MODERATE**

PM-10 & PM-2.5 (PARTICLES)

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations (brown cloud). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.

Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.

Units of measurement – Micrograms per cubic meter (ug/m3)

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, minimize travel on dirt roads, utilize tarps on haul trucks, limit use of leaf-blowers, and on high-wind days reduce outdoor activities.

CKR 05/09/2005

Appendix J
Event National Weather Service Advisories & Events

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 12:38:00 PM PST**
Begin Location: **Not Known**
End Date: **21 May 2008, 17:38:00 PM PST**
End Location: **Not Known**
Magnitude: **53**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Antelope Valley**

Description:
EVENT NARRATIVE: The Poppy Park RAWS sensor reported westerly wind gusts between 58 and 61 mph. EPISODE NARRATIVE: A cold and unseasonable upper level low pressure system brought strong winds, strong thunderstorms and flash flooding to Southern California. The upper level low first brought strong and gusty northerly winds to the mountains of Ventura and Los Angeles counties as well as the Antelope Valley. Northerly wind gusts between 58 and 85 mph were reported by various automated sensors. As the upper low moved directly over Southern California, the winds diminished, but moisture and instability increased. Over east-central Los Angeles county, strong thunderstorms developed, producing damaging winds and heavy rain. In Azusa, severe thunderstorm winds knocked power poles and lines. In Baldwin Park, over one inch of small hail accumulated. The strong thunderstorms also brought heavy rain and flash flooding to the area. Significant flooding and lane closures were reported along Interstate 10 and Interstate 605.

This page dynamically generated 12 Aug 2010 from:
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms
Please send questions or comments about this system to Stuart.Hinson@noaa.gov
Please see the NCDC Contact Page if you have questions or comments.

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 00:00:00 AM PST**
Begin Location: **Not Known**
End Date: **21 May 2008, 00:00:00 AM PST**
End Location: **Not Known**
Magnitude: **51**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Owens Valley**

Description:
EVENT NARRATIVE: This gust occurred 3 miles SW of Independence, CA. EPISODE NARRATIVE: An unseasonably strong Pacific low pressure system and associated cold front brought locally high winds to portions of southeast California and southern Nevada.

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 02:51:00 AM PST**
Begin Location: **Not Known**
End Date: **21 May 2008, 02:51:00 AM PST**
End Location: **Not Known**
Magnitude: **58**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Western Mojave Desert**

Description:
EVENT NARRATIVE: This gust occurred 30 miles SSW of Searles Valley, CA. EPISODE NARRATIVE: An unseasonably strong Pacific low pressure system and associated cold front brought locally high winds to portions of southeast California and southern Nevada.

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 03:00:00 AM PST**
Begin Location: **Not Known**
End Date: **21 May 2008, 03:00:00 AM PST**
End Location: **Not Known**
Magnitude: **52**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Morongo Basin**

Description:
EVENT NARRATIVE: This gust occurred in Yucca Valley, CA. EPISODE NARRATIVE: An unseasonably strong Pacific low pressure system and associated cold front brought locally high winds to portions of southeast California and southern Nevada.

Event Record Details

Event: **High Wind**
Begin Date: **21 May 2008, 13:50:00 PM MST**
Begin Location: **Not Known**
End Date: **21 May 2008, 17:00:00 PM MST**
End Location: **Not Known**
Magnitude: **50**
Fatalities: **0**
Injuries: **1**
Property Damage: **$ 15.0K**
Crop Damage: **$ 0.0K**

State: **Arizona**
Map of Counties

Zones affected: **Cochise County**

Description:
EVENT NARRATIVE: A tin roof was reported blown off of a red brick house in Elfrida due to strong winds. A man was also blown off the roof of a home in Hereford. In addition, the automated surface observing station in Douglas recorded wind gusts to 58 mph. EPISODE NARRATIVE: An unusually strong late winter storm moved into Southeast Arizona with a very strong surface pressure gradient causing high winds across the area.

WWUS75 KPSR 202312
NPWPSR

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
412 PM MST TUE MAY 20 2008

CAZ032-033-211115-
/O.NEW.KPSR.WI.Y.0023.080521T1500Z-080522T0300Z/
/O.CON.KPSR.EH.W.0003.000000T0000Z-080521T0300Z/
RIVERSIDE COUNTY/EASTERN DESERTS-IMPERIAL COUNTY-
INCLUDING THE CITIES OF...CHIRIACO SUMMIT...DESERT CENTER...
EAGLE MTN...MIDLAND...BRAWLEY...CALEXICO...EL CENTRO...GLAMIS...
IMPERIAL...AND THE SALTON SEA
412 PM PDT TUE MAY 20 2008

...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM PDT THIS EVENING...

...WIND ADVISORY IN EFFECT FROM 8 AM TO 8 PM PDT WEDNESDAY FOR THE SOUTHEAST CALIFORNIA DESERTS FOR STRONG GUSTY WEST WINDS...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM 8 AM TO 8 PM PDT WEDNESDAY FOR THE SOUTHEAST CALIFORNIA DESERTS. AN EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM PDT THIS EVENING.

A STRONG LOW PRESSURE SYSTEM WILL MOVE INTO THE SOUTHWEST UNITED STATES STARTING WEDNESDAY. STRONG AND GUSTY WEST WINDS WILL DEVELOP ACROSS THE SOUTHEAST CALIFORNIA DESERTS DURING THE MORNING HOURS...LASTING THROUGHOUT MUCH OF THE DAY. AS A RESULT...A WIND ADVISORY IS IN EFFECT FROM 8 AM PDT TO 8 PM PDT WEDNESDAY.

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN 30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND 58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA CAUTION.

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AZZ020>023-025>028-CAZ031-211115-
/O.NEW.KPSR.WI.Y.0023.080521T1800Z-080522T0600Z/
/O.CON.KPSR.EH.W.0003.000000T0000Z-080521T0300Z/
LOWER COLORADO RIVER VALLEY AZ-WEST CENTRAL DESERTS-
NORTHWEST MARICOPA COUNTY-GREATER PHOENIX AREA-
YUMA/MARTINEZ LAKE AND VICINITY-SOUTHWEST DESERTS-
SOUTHWEST MARICOPA COUNTY-
NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
LOWER COLORADO RIVER VALLEY CA-
INCLUDING THE CITIES OF...EHRENBERG...PARKER...BOUSE...
QUARTZSITE...SALOME...LAKE PLEASANT...MORRISTOWN...NEW RIVER...
TONOPAH...BUCKEYE...WICKENBURG...CAREFREE...CAVE CREEK...
CHANDLER...FOUNTAIN HILLS...GILBERT...GLENDALE...MESA...PEORIA...
PHOENIX...SCOTTSDALE...SUN CITY...TEMPE...SAN LUIS...SOMERTON...
YUMA...FORTUNA FOOTHILLS...DATELAND...TACNA...WELLTON...
GILA BEND...APACHE JUNCTION...CASA GRANDE...COOLIDGE...FLORENCE...
BLYTHE
412 PM MST TUE MAY 20 2008 /412 PM PDT TUE MAY 20 2008/

...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM MST /8 PM PDT/ THIS EVENING...

...WIND ADVISORY IN EFFECT FROM 11 AM MST /11 AM PDT/ TO 11 PM MST /11 PM PDT/ WEDNESDAY FOR THE LOWER COLORADO RIVER VALLEY...THE SOUTHWEST AND SOUTH-CENTRAL ARIZONA DESERTS FOR STRONG AND GUSTY WEST WINDS...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM 11 AM MST /11 AM PDT/ TO 11 PM MST /11 PM PDT/ WEDNESDAY FROM THE LOWER COLORADO RIVER VALLEY EAST TO THE SOUTHWEST AND SOUTH-CENTRAL ARIZONA DESERTS. AN EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM MST /8 PM PDT/ THIS EVENING.

A STRONG LOW PRESSURE SYSTEM WILL MOVE INTO THE SOUTHWEST UNITED STATES STARTING WEDNESDAY. STRONG AND GUSTY WEST WINDS WILL DEVELOP ALONG THE COLORADO RIVER VALLEY MID MORNING...AND SPREAD ACROSS THE SOUTHWEST AND SOUTH-CENTRAL ARIZONA DESERTS THROUGHOUT THE DAY. AS A RESULT...A WIND ADVISORY HAS BEEN ISSUED FOR THE LOWER COLORADO RIVER VALLEY... AND THE SOUTHWEST AND SOUTH-CENTRAL ARIZONA DESERTS...IN EFFECT FROM 11 AM MST/PDT TO 11 PM MST/PDT WEDNESDAY.

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN 30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND

58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA CAUTION.

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CAZ030-211115-
/O.NEW.KPSR.WI.Y.0023.080521T1500Z-080522T0300Z/
JOSHUA TREE NATIONAL PARK-
INCLUDING THE CITIES OF...COTTONWOOD VISITOR CENTER...
LOST HORSE-KEYS VIEW JTNP
412 PM PDT TUE MAY 20 2008

...WIND ADVISORY IN EFFECT FROM 8 AM TO 8 PM PDT WEDNESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM 8 AM TO 8 PM PDT WEDNESDAY FOR JOSHUA TREE NATIONAL PARK.

A STRONG LOW PRESSURE SYSTEM WILL MOVE INTO THE SOUTHWEST UNITED STATES STARTING WEDNESDAY. STRONG AND GUSTY WEST WINDS WILL DEVELOP ACROSS JOSHUA TREE NATIONAL PARK IN THE MORNING HOURS AND CONTINUE THROUGHOUT THE DAY. A WIND ADVISORY HAS BEEN ISSUED FOR JOSHUA TREE NATIONAL PARK...IN EFFECT FROM 8 AM PDT TO 8 PM PDT WEDNESDAY.

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN 30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND 58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA CAUTION.

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AZZ024-211115-
/O.NEW.KPSR.WI.Y.0023.080521T1800Z-080522T0600Z/
SOUTHERN GILA COUNTY/TONTO NATIONAL FOREST FOOTHILLS-
INCLUDING THE CITIES OF...GLOBE...MIAMI...SAN CARLOS...SUPERIOR...
ALSO INCLUDING APACHE...BARTLETT...CANYON...HORSESHOE...
ROOSEVELT...AND SAGUARO LAKES

412 PM MST TUE MAY 20 2008

...WIND ADVISORY IN EFFECT FROM 11 AM TO 11 PM MST WEDNESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT FROM 11 AM TO 11 PM MST WEDNESDAY FOR THE TONTO NATIONAL FOREST FOOTHILLS AND SOUTHERN GILA COUNTY.

A STRONG LOW PRESSURE SYSTEM WILL MOVE INTO THE SOUTHWEST UNITED STATES STARTING WEDNESDAY. STRONG AND GUSTY WEST WINDS WILL DEVELOP ACROSS THE TONTO NATIONAL FOREST FOOTHILLS AND SOUTHERN GILA MID MORNING AND LAST INTO THE EVENING HOURS. AS A RESULT...A WIND ADVISORY HAS BEEN ISSUED AND IS IN EFFECT FROM 11 AM MST TO 11 PM MST WEDNESDAY.

A WIND ADVISORY MEANS THAT SUSTAINED WIND SPEEDS OF BETWEEN 30 AND 40 MPH ARE EXPECTED...OR WIND GUSTS OF BETWEEN 40 AND 58 MPH. WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. IN ADDITION...STRONG WINDS OVER DESERT AREAS COULD RESULT IN BRIEFLY LOWERED VISIBILITIES TO WELL UNDER A MILE AT TIMES IN BLOWING DUST OR BLOWING SAND. USE EXTRA CAUTION.

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WANEK

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Appendix K
Event Related News Stories

APPENDIX K

EVENT RELATED NEWS STORIES

Normally, Appendix K would contain information on Event Related News Stories for the day being evaluated as an Exceptional Event. However, since there are no archived Event Related News Stories reported for May 21, 2008, this Appendix does not contain this information.

Appendix L
Event Air Quality Data

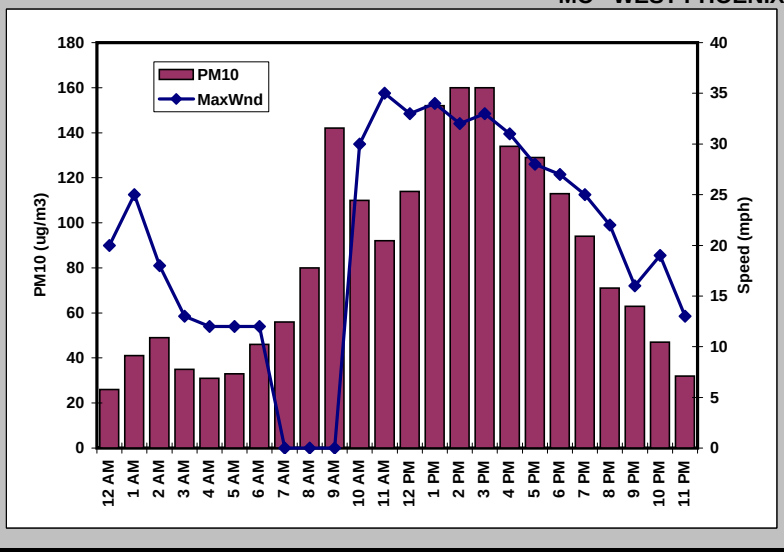
For May 21, 2008

Appendix L: EVENT AIR QUALITY DATA

16477 (112.14Wx33.48N)

MC - WEST PHOENIX

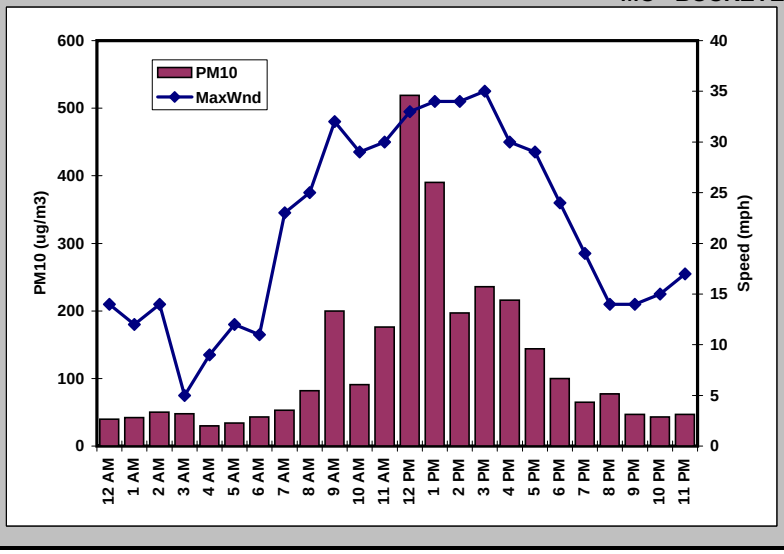
05/21/08	PM10	WndDir	MaxWnd
12 AM	26	237	20
1 AM	41	241	25
2 AM	49	238	18
3 AM	35	224	13
4 AM	31	226	12
5 AM	33	208	12
6 AM	46	216	12
7 AM	56	250	
8 AM	80	140	
9 AM	142	247	
10 AM	110	242	30
11 AM	92	257	35
12 PM	114	260	33
1 PM	152	265	34
2 PM	160	268	32
3 PM	160	274	33
4 PM	134	276	31
5 PM	129	276	28
6 PM	113	270	27
7 PM	94	256	25
8 PM	71	252	22
9 PM	63	249	16
10 PM	47	285	19
11 PM	32	265	13



21525 (112.62Wx33.37N)

MC - BUCKEYE

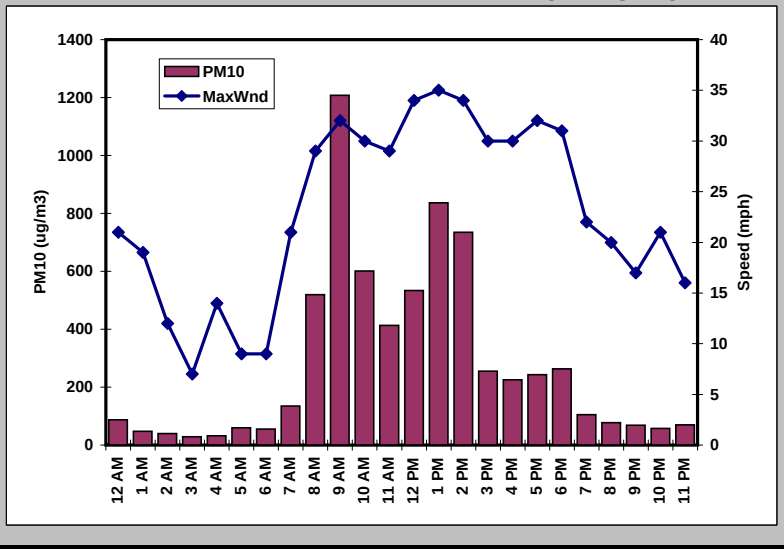
05/21/08	PM10	WndDir	MaxWnd
12 AM	40	239	14
1 AM	42	208	12
2 AM	50	270	14
3 AM	48	98	5
4 AM	30	222	9
5 AM	34	222	12
6 AM	43	235	11
7 AM	53	256	23
8 AM	82	229	25
9 AM	200	234	32
10 AM	91	234	29
11 AM	176	252	30
12 PM	519	290	33
1 PM	390	282	34
2 PM	197	281	34
3 PM	236	290	35
4 PM	216	291	30
5 PM	144	282	29
6 PM	100	271	24
7 PM	65	272	19
8 PM	77	267	14
9 PM	47	269	14
10 PM	43	288	15
11 PM	47	280	17



16659 (112.14Wx33.41N)

MC - WEST FORTY THIR

05/21/08	PM10	WndDir	MaxWnd
12 AM	87	231	21
1 AM	47	234	19
2 AM	40	234	12
3 AM	29	273	7
4 AM	32	188	14
5 AM	60	175	9
6 AM	55	158	9
7 AM	135	231	21
8 AM	519	231	29
9 AM	1208	242	32
10 AM	601	254	30
11 AM	413	252	29
12 PM	534	243	34
1 PM	836	270	35
2 PM	735	276	34
3 PM	255	275	30
4 PM	225	272	30
5 PM	243	274	32
6 PM	263	269	31
7 PM	105	257	22
8 PM	77	260	20
9 PM	69	254	17
10 PM	58	259	21
11 PM	70	235	16

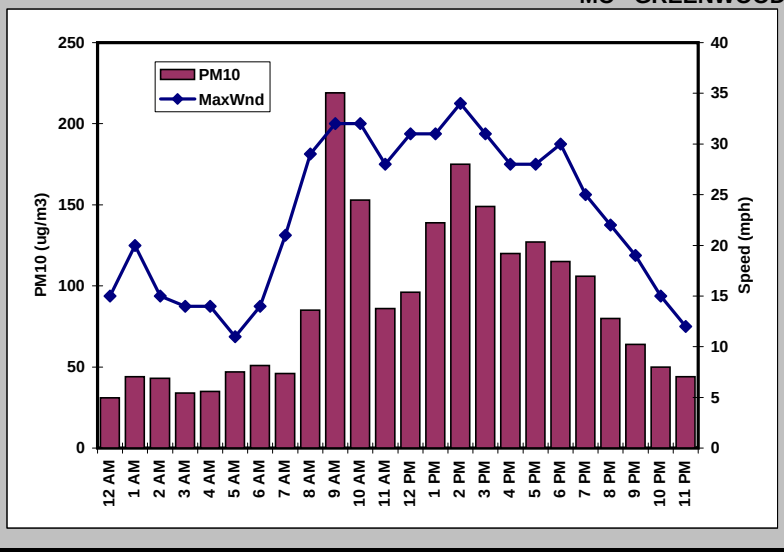


Appendix L: EVENT AIR QUALITY DATA

16372 (112.12Wx33.46N)

MC - GREENWOOD

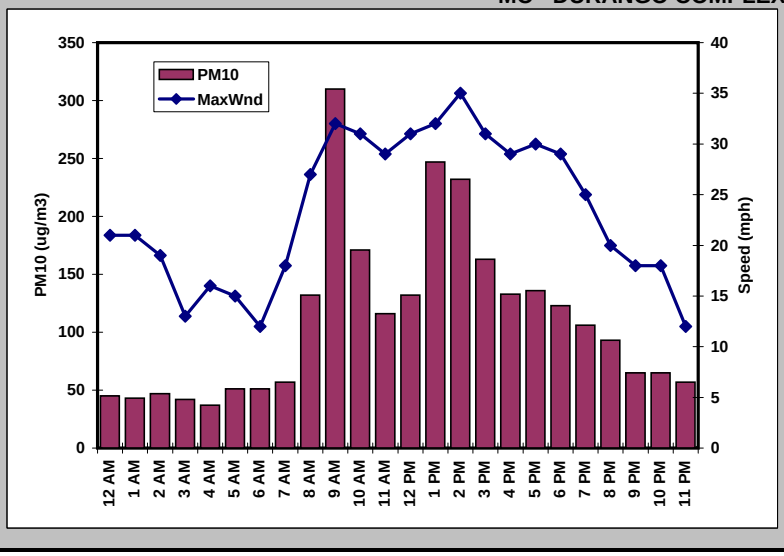
05/21/08	PM10	WndDir	MaxWnd
12 AM	31	238	15
1 AM	44	242	20
2 AM	43	243	15
3 AM	34	235	14
4 AM	35	234	14
5 AM	47	202	11
6 AM	51	213	14
7 AM	46	231	21
8 AM	85	245	29
9 AM	219	244	32
10 AM	153	245	32
11 AM	86	244	28
12 PM	96	253	31
1 PM	139	261	31
2 PM	175	262	34
3 PM	149	271	31
4 PM	120	276	28
5 PM	127	269	28
6 PM	115	267	30
7 PM	106	256	25
8 PM	80	257	22
9 PM	64	253	19
10 PM	50	265	15
11 PM	44	249	12



16375 (112.12Wx33.43N)

MC - DURANGO COMPLEX

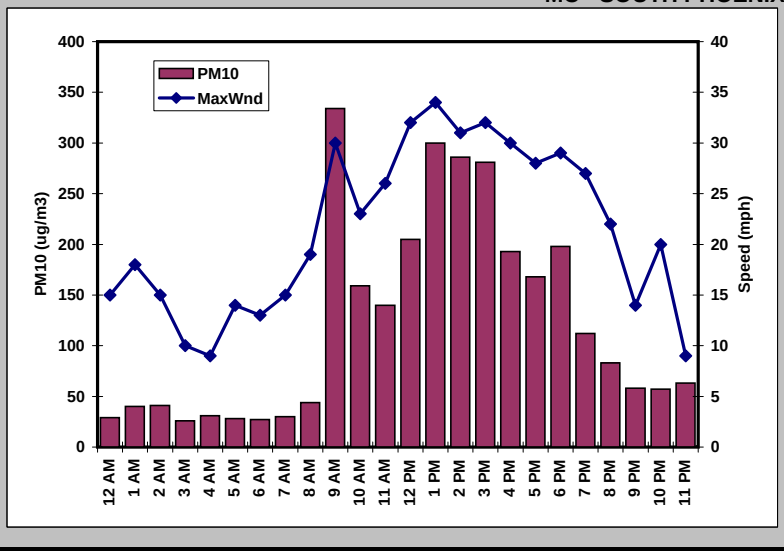
01/00/00	PM10	WndDir	MaxWnd
12 AM	45	241	21
1 AM	43	253	21
2 AM	47	253	19
3 AM	42	243	13
4 AM	37	230	16
5 AM	51	200	15
6 AM	51	173	12
7 AM	57	237	18
8 AM	132	245	27
9 AM	310	254	32
10 AM	171	260	31
11 AM	116	257	29
12 PM	132	251	31
1 PM	247	275	32
2 PM	232	280	35
3 PM	163	283	31
4 PM	133	278	29
5 PM	136	285	30
6 PM	123	277	29
7 PM	106	267	25
8 PM	93	271	20
9 PM	65	265	18
10 PM	65	269	18
11 PM	57	263	12



16377 (112.08Wx33.40N)

MC - SOUTH PHOENIX

01/00/00	PM10	WndDir	MaxWnd
12 AM	29	249	15
1 AM	40	262	18
2 AM	41	251	15
3 AM	26	239	10
4 AM	31	231	9
5 AM	28	184	14
6 AM	27	196	13
7 AM	30	224	15
8 AM	44	204	19
9 AM	334	261	30
10 AM	159	252	23
11 AM	140	268	26
12 PM	205	261	32
1 PM	300	277	34
2 PM	286	283	31
3 PM	281	288	32
4 PM	193	282	30
5 PM	168	283	28
6 PM	198	278	29
7 PM	112	271	27
8 PM	83	270	22
9 PM	58	261	14
10 PM	57	269	20
11 PM	63	257	9

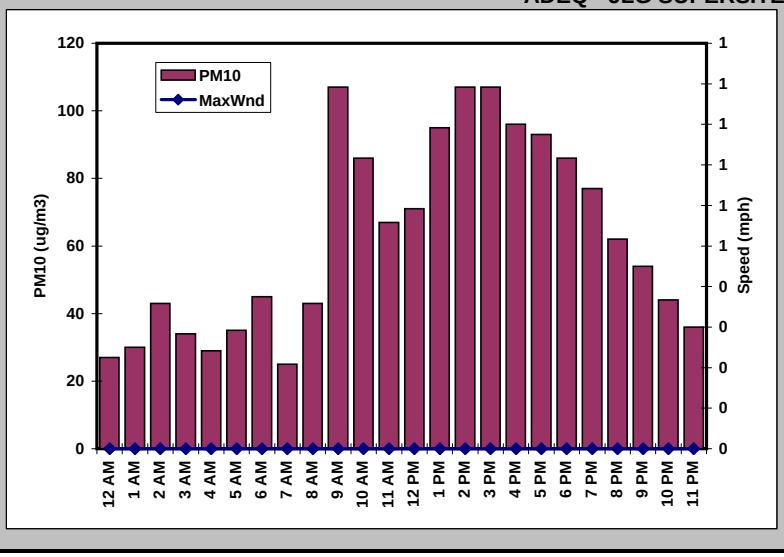


Appendix L: EVENT AIR QUALITY DATA

16328 (112.10Wx33.50N)

ADEQ - JLG SUPERSITE

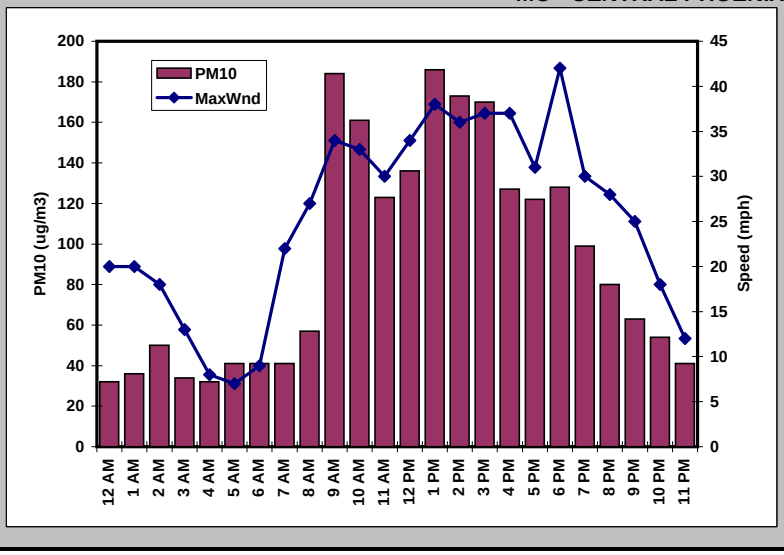
05/21/08	PM10	WndDir	MaxWnd
12 AM	27	238	
1 AM	30	238	
2 AM	43	253	
3 AM	34	242	
4 AM	29	192	
5 AM	35	170	
6 AM	45	14	
7 AM	25	256	
8 AM	43	243	
9 AM	107	241	
10 AM	86	244	
11 AM	67	254	
12 PM	71	257	
1 PM	95	257	
2 PM	107	265	
3 PM	107	274	
4 PM	96	277	
5 PM	93	276	
6 PM	86	264	
7 PM	77	255	
8 PM	62	256	
9 PM	54	251	
10 PM	44	285	
11 PM	36	287	



16329 (112.05Wx33.46N)

MC - CENTRAL PHOENIX

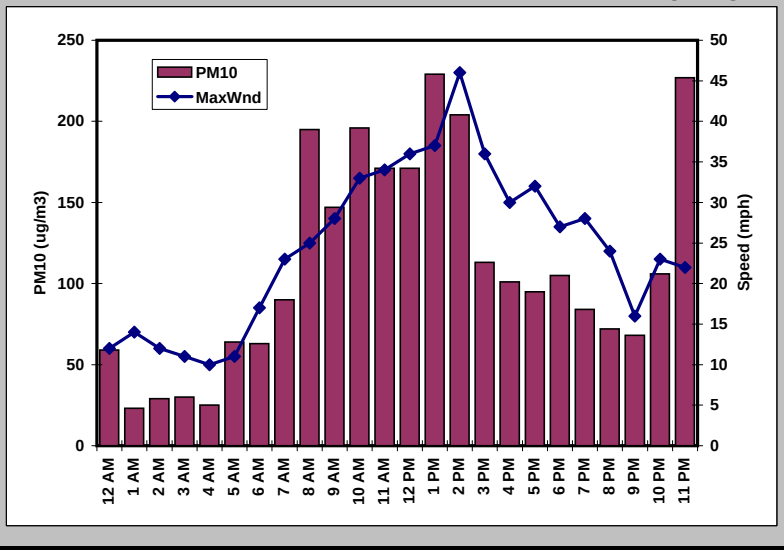
05/21/08	PM10	WndDir	MaxWnd
12 AM	32	259	20
1 AM	36	261	20
2 AM	50	225	18
3 AM	34	182	13
4 AM	32	142	8
5 AM	41	101	7
6 AM	41	152	9
7 AM	41	246	22
8 AM	57	252	27
9 AM	184	257	34
10 AM	161	267	33
11 AM	123	267	30
12 PM	136	264	34
1 PM	186	274	38
2 PM	173	275	36
3 PM	170	282	37
4 PM	127	284	37
5 PM	122	280	31
6 PM	128	276	42
7 PM	99	268	30
8 PM	80	270	28
9 PM	63	265	25
10 PM	54	270	18
11 PM	41	278	12



16505 (111.72Wx33.31N)

MC - HIGLEY

05/21/08	PM10	WndDir	MaxWnd
12 AM	59	200	12
1 AM	23	194	14
2 AM	29	203	12
3 AM	30	184	11
4 AM	25	190	10
5 AM	64	170	11
6 AM	63	182	17
7 AM	90	193	23
8 AM	195	196	25
9 AM	147	199	28
10 AM	196	235	33
11 AM	171	230	34
12 PM	171	241	36
1 PM	229	237	37
2 PM	204	245	46
3 PM	113	244	36
4 PM	101	237	30
5 PM	95	241	32
6 PM	105	269	27
7 PM	84	275	28
8 PM	72	262	24
9 PM	68	252	16
10 PM	106	231	23
11 PM	227	239	22

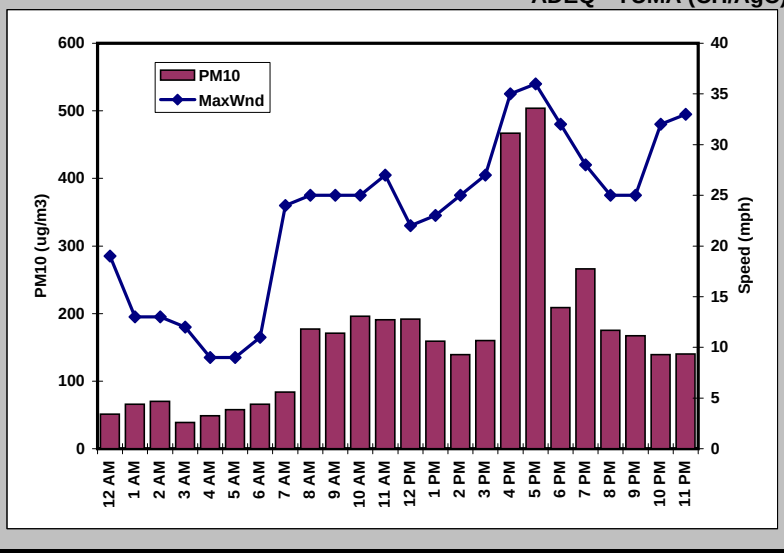


Appendix L: EVENT AIR QUALITY DATA

17027 (114.65Wx32.68N)

ADEQ - YUMA (CH/AgC)

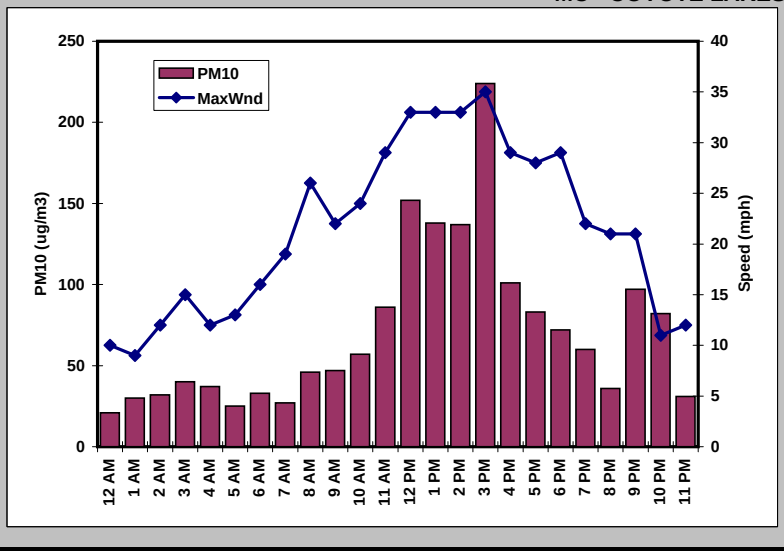
01/00/00	PM10	WndDir	MaxWnd
12 AM	51	281	19
1 AM	66	179	13
2 AM	70	197	13
3 AM	39	243	12
4 AM	49	208	9
5 AM	58	257	9
6 AM	66	233	11
7 AM	84	292	24
8 AM	177	296	25
9 AM	171	294	25
10 AM	196	288	25
11 AM	191	283	27
12 PM	192	288	22
1 PM	159	285	23
2 PM	139	293	25
3 PM	160	281	27
4 PM	467	275	35
5 PM	504	271	36
6 PM	209	273	32
7 PM	266	283	28
8 PM	175	276	25
9 PM	167	284	25
10 PM	139	294	32
11 PM	140	299	33



127530 (112.31Wx33.67N)

MC - COYOTE LAKES

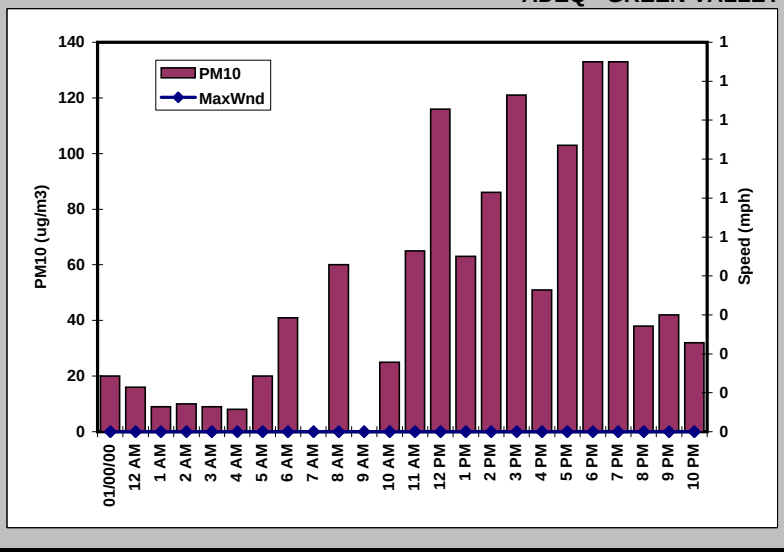
01/00/00	PM10	WndDir	MaxWnd
12 AM	21	175	10
1 AM	30	162	9
2 AM	32	191	12
3 AM	40	212	15
4 AM	37	203	12
5 AM	25	207	13
6 AM	33	206	16
7 AM	27	206	19
8 AM	46	223	26
9 AM	47	220	22
10 AM	57	238	24
11 AM	86	233	29
12 PM	152	252	33
1 PM	138	255	33
2 PM	137	245	33
3 PM	224	240	35
4 PM	101	242	29
5 PM	83	239	28
6 PM	72	235	29
7 PM	60	250	22
8 PM	36	261	21
9 PM	97	283	21
10 PM	82	290	11
11 PM	31	272	12



128562 (111.01Wx31.83N)

ADEQ - GREEN VALLEY

01/00/00	PM10	WndDir	MaxWnd
12 AM	20	233	
1 AM	16	254	
2 AM	9	249	
3 AM	10	245	
4 AM	9	245	
5 AM	8	242	
6 AM	20	231	
7 AM	41	214	
8 AM		205	
9 AM	60	212	
10 AM		216	
11 AM	25	213	
12 PM	65	210	
1 PM	116	210	
2 PM	63	209	
3 PM	86	218	
4 PM	121	220	
5 PM	51	231	
6 PM	103	231	
7 PM	133	229	
8 PM	133	223	
9 PM	38	223	
10 PM	42	214	
11 PM	32	236	



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Appendix M
Event Meteorological / Air Quality Tables

For May 21, 2008

Note: The enclosed tables summarize the meteorological and air quality data for the May 21, 2008, high wind event. Highlighting is applied to the data in the tables. When the reported wind gust or maximum wind speed is greater than 15 miles per hour, the hourly data record is highlighted yellow. If the wind gust or maximum wind speed exceeds 25 mph, the hourly data record is highlighted orange. Stations prefixed with a 2 digit number are AzMet stations. All AzMet wind speed data were adjusted from 3-meters to 10-meters by applying a correction factor for height as discussed in the AzMet network description contained in Appendix B of this document.

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

23179 (114.62Wx34.77N) 05/21/08

NWS-NEEDLES

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-NEEDLES	12	86	10		17	33	W
	1	85	10		7		SW
	2	82	10		5		S
	3	82	10		25		W
	4	79	10		24	33	W
	5	79	10		18	30	NW
	6	81	10		17		NW
	7	86	10		23	32	N
	8	88	10		28	36	N
	9	88	10		24	36	N
	10	90	10		26	38	N
	11	90	10		23	36	N
	12	92	10		23	30	N
	1	90	10		20	26	N
	2	91	10		23	34	NW
	3	90	10		21	36	N
	4	86	10		20	32	N
	5	83	10		26	32	N
	6	81	10		14	23	N
	7	78	10		13	22	N
	8	77	10		8		NW
	9	77	10		14	24	N
	10	75	10		13		N
	11	73	10		21		N

93167 (113.94Wx35.26N) 05/21/08

NWS-KINGMAN

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-KINGMAN	12	76	10		22		SW
	1	75	10		31	40	SW
	2	74	10		32	40	SW
	3	71	10		18	30	SW
	4	71	10		20	32	SW
	5	68	10		21		SW
	6	69	10		18		SW
	7	71	10		17	25	W
	8	72	10		15	28	NW
	9	74	10		22	29	NW
	10	75	10		18	28	W
	11	77	10		22	30	W
	12	77	10		18	28	W
	1	78	10		21	28	NW
	2	79	10		18	33	NW
	3	75	10		21	33	N
	4	74	10		23	32	N
	5	71	10		22	30	N
	6	69	10		18		N
	7	67	10		20		N
	8	67	10		14		N
	9	66	10		25	34	NW
	10	63	10		21	26	NW
	11	60	10		17		NW

20 (114.61Wx34.97N) 05/21/08

20-MOHAVE

	Hr	T(F)	RH	Rn	Spd	Max	Dir
20-MOHAVE	12	88	13	0	7	18	S
	1	85	16	0	7	16	S
	2	82	20	0	7	17	S
	3	82	18	0	12	23	SW
	4	80	19	0	10	21	SW
	5	78	21	0	17	29	W
	6	77	24	0	10	27	W
	7	81	18	0	13	25	NW
	8	84	12	0	19	32	NW
	9	86	9	0	24	31	NW
	10	88	8	0	25	37	NW
	11	88	6	0	28	40	NW
	12	89	6	0	26	37	NW
	1	90	7	0	23	39	NW
	2	90	8	0	22	31	NW
	3	90	9	0	22	32	NW
	4	89	10	0	22	35	NW
	5	87	12	0	22	32	N
	6	84	12	0	25	36	N
	7	80	13	0	22	34	N
	8	78	14	0	17	28	N
	9	75	16	0	10	23	N
	10	77	12	0	20	29	N
	11	75	12	0	22	32	N

23158 (114.72Wx33.62N) 05/21/08

NWS-BLYTHE

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-BLYTHE	12	81	10		0		-
	1	79	10		7		NW
	2	72	10		6		NW
	3	74	10		5		NW
	4	70	10		5		NW
	5	76	10		5		NW
	6	83	10		9	23	NW
	7	85	9		17	30	NW
	8	87	10		18	29	NW
	9	89	10		22	28	NW
	10	91	10		23	28	NW
	11	91	10		21	28	N
	12	93	10		16	26	NW
	1	92	10		23	36	NW
	2	91	10		17	28	N
	3	91	10		24	31	NW
	4	90	10		20	29	NW
	5	88	10		13	28	NW
	6	85	10		18	29	W
	7	83	9		21	29	NW
	8	81	9		14		NW
	9	80	9		15	24	NW
	10	78	9		17		W
	11	78	10		18	26	W

08 (114.45Wx33.88N) 05/21/08

08-PARKER

	Hr	T(F)	RH	Rn	Spd	Max	Dir
08-PARKER	12	79	27	0	14	20	S
	1	75	30	0	13	18	S
	2	74	31	0	7	13	S
	3	74	32	0	9	17	S
	4	73	33	0	8	13	S
	5	76	27	0	10	21	SW
	6	78	25	0	19	35	W
	7	78	22	0	22	38	W
	8	80	19	0	27	39	W
	9	81	16	0	26	37	W
	10	84	15	0	25	33	NW
	11	85	15	0	22	31	W
	12	86	14	0	22	30	W
	1	88	13	0	21	30	W
	2	89	12	0	19	31	W
	3	89	12	0	19	31	W
	4	87	12	0	16	25	W
	5	87	12	0	16	25	W
	6	86	13	0	13	23	NW
	7	83	13	0	18	30	NW
	8	81	14	0	19	32	NW
	9	78	15	0	17	27	NW
	10	77	16	0	18	28	NW
	11	75	16	0	15	22	NW

28 (114.56Wx34.93N) 05/21/08

28-MOHAVE-2

	Hr	T(F)	RH	Rn	Spd	Max	Dir
28-MOHAVE-2	12	88	16	0	10	23	SW
	1	86	17	0	13	27	SW
	2	86	17	0	13	29	SW
	3	84	16	0	13	25	SW
	4	79	20	0	9	26	W
	5	80	18	0	16	33	W
	6	79	21	0	13	28	W
	7	80	21	0	10	18	NW
	8	84	15	0	13	25	NW
	9	86	11	0	20	29	NW
	10	87	11	0	19	44	NW
	11	88	8	0	24	38	NW
	12	89	8	0	24	36	NW
	1	89	9	0	20	41	NW
	2	89	10	0	19	29	NW
	3	89	10	0	21	32	NW
	4	88	12	0	21	31	NW
	5	86	13	0	21	33	NW
	6	84	13	0	21	33	NW
	7	81	14	0	21	33	N
	8	80	14	0	18	28	N
	9	78	15	0	14	22	N
	10	76	14	0	14	26	N
	11	76	13	0	16	26	N

23199 (115.67Wx32.82N) 05/21/08

NWS-EL CENTRO

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-EL CENTRO	12	81	10		24	33	W
	1	80	10		25		W
	2	78	10		25	32	W
	3	76	10		23	32	W
	4	74	10		30	38	W
	5	72	10		29	37	W
	6	75	8		30	36	W
	7	78	10		28	37	W
	8	80	10		29	38	W
	9	83	7		30	38	W
	10	86	10		23	33	W
	11	87	10		26	36	W
	12	89	10		21	31	W
	1	88	10		30	37	W
	2	85	10		31	38	W
	3	84	10		23	31	W
	4	82	10		31	40	W
	5	78	10		29	37	W
	6	73	10		22	28	W
	7	71	10		22	28	W
	8	70	10		22		SW
	9	70	10		16	24	W
	10	67	10		8		W
	11	70	10		11		W

03144 (115.58Wx32.83N) 05/21/08

NWS-IMPERIAL CO

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-IMPERIAL CO	12	80	10		18	26	W
	1	80	10		18	26	SW
	2	77	10		23	30	W
	3	76	10		18	23	W
	4	73	10		21	26	W
	5	72	10		21	28	W
	6	74	10		18	25	W
	7	77	10		22	34	W
	8	79	10		24	32	W
	9	81	10		24	33	W
	10	84	10		21	32	W
	11	86	10		21	31	W
	12	87	10		20	29	W
	1	87	9		25	36	W
	2	84	10		26	36	W
	3	83	10		25	38	W
	4	81	10		29	40	W
	5	78	10		25	38	W
	6	73	8		25	33	W
	7	71	10		23	34	W
	8	69	10		18	28	W
	9	71	10		13	24	W
	10	69	10		11		NW
	11	64	10		8		W

17027 (114.65Wx32.68N) 05/21/08

ADEQ - YUMA (CH/AgC)

	Hr	T(F)	RH	PM	Spd	Max	Dir
ADEQ - YUMA (CH/AgC)	12	81	16	51	9	19	W
	1	74	25	66	4	13	S
	2	71	28	70	5	13	S
	3	72	28	39	7	12	SW
	4	65	43	49	4	9	SW
	5	69	37	58	6	9	W
	6	69	38	66	5	11	SW
	7	77	31	84	13	24	W
	8	78	32	177	15	25	NW
	9	79	31	171	15	25	NW
	10	81	30	196	16	25	W
	11	83	26	191	16	27	W
	12	85	22	192	14	22	W
	1	87	19	159	13	23	W
	2	88	16	139	14	25	NW
	3	89	15	160	15	27	W
	4	86	20	467	20	35	W
	5	83	23	504	20	36	W
	6	81	25	209	17	32	W
	7	78	28	266	20	28	W
	8	75	32	175	14	25	W
	9	73	33	167	16	25	W
	10	73	31	139	21	32	NW
	11	72	30	140	20	33	NW

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

24 (113.96Wx32.74N) 05/21/08

24-ROLL

	Hr	T(F)	RH	Rn	Spd	Max	Dir
24-ROLL	12	72	35	0	4	9	SW
	1	71	32	0	5	10	W
	2	67	49	0	3	6	SE
	3	66	44	0	3	6	W
	4	64	54	0	5	9	SW
	5	64	49	0	3	6	SW
	6	65	61	0	3	7	S
	7	74	44	0	5	14	W
	8	77	46	0	10	16	SW
	9	82	38	0	13	21	W
	10	82	40	0	16	24	SW
	11	85	33	0	13	22	SW
	12	86	32	0	12	20	SW
	1	85	35	0	13	22	SW
	2	86	32	0	13	23	SW
	3	84	31	0	16	24	SW
	4	84	28	0	17	28	SW
	5	82	27	0	18	31	SW
	6	81	26	0	17	26	W
	7	77	32	0	17	26	W
	8	74	36	0	12	20	W
	9	73	37	0	11	17	W
	10	73	36	0	8	19	W
	11	66	53	0	4	11	SW

07 (113.19Wx33.95N) 05/21/08

07-AGUILA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
07-AGUILA	12	80	14	0	4	10	W
	1	72	19	0	3	6	NW
	2	71	17	0	5	9	E
	3	67	20	0	2	6	NE
	4	65	22	0	4	11	SE
	5	63	23	0	3	8	NE
	6	68	22	0	4	9	NE
	7	78	20	0	17	30	W
	8	78	15	0	23	38	W
	9	78	14	0	21	32	W
	10	80	16	0	16	24	W
	11	82	14	0	18	28	W
	12	84	12	0	18	29	NW
	1	85	9	0	19	38	NW
	2	85	9	0	19	32	NW
	3	85	8	0	22	35	NW
	4	83	9	0	18	31	NW
	5	82	9	0	18	26	NW
	6	79	10	0	17	29	NW
	7	77	12	0	21	48	NW
	8	74	14	0	19	28	NW
	9	69	19	0	8	15	NW
	10	66	23	0	9	11	NW
	11	65	23	0	9	12	NW

23 (113.12Wx33.48N) 05/21/08

23-HARQUAHALA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
23-HARQUAHALA	12	74	29	0	5	8	S
	1	70	31	0	6	11	S
	2	70	26	0	11	15	S
	3	70	24	0	10	14	S
	4	66	30	0	6	10	S
	5	66	30	0	5	12	S
	6	69	28	0	7	12	S
	7	75	26	0	10	19	SW
	8	79	26	0	12	19	SW
	9	82	25	0	13	20	SW
	10	83	17	0	24	32	NW
	11	83	17	0	21	32	W
	12	85	17	0	18	27	W
	1	85	16	0	18	27	W
	2	86	14	0	17	30	W
	3	86	12	0	19	29	W
	4	86	11	0	18	31	W
	5	83	13	0	16	28	W
	6	83	11	0	19	28	W
	7	78	13	0	13	22	W
	8	74	17	0	10	16	W
	9	74	14	0	10	17	NW
	10	71	17	0	10	16	W
	11	72	17	0	11	17	W

02 (114.75Wx32.71N) 05/21/08

02-YUMA VALLEY

	Hr	T(F)	RH	Rn	Spd	Max	Dir
02-YUMA VALLEY	12	78	19	0	8	22	W
	1	73	28	0	5	16	SW
	2	68	34	0	4	10	SW
	3	68	37	0	6	10	SW
	4	62	54	0	3	7	SW
	5	64	53	0	5	7	SW
	6	67	47	0	5	16	SW
	7	77	32	0	14	26	NW
	8	78	32	0	16	25	NW
	9	80	31	0	16	25	NW
	10	82	30	0	18	28	NW
	11	84	27	0	19	29	W
	12	86	23	0	16	28	W
	1	87	20	0	14	24	W
	2	89	17	0	16	27	W
	3	89	16	0	17	26	W
	4	86	21	0	24	37	W
	5	82	24	0	24	38	W
	6	81	26	0	20	28	W
	7	77	30	0	19	32	W
	8	74	34	0	16	26	W
	9	72	34	0	17	26	W
	10	72	32	0	18	30	NW
	11	72	31	0	20	30	NW

14 (114.53Wx32.74N) 05/21/08

14-YUMA NORTH GILA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
14-YUMA NORTH GILA	12	71	36	0	3	6	S
	1	68	43	0	4	9	SW
	2	64	49	0	5	8	SW
	3	64	48	0	6	9	SW
	4	66	42	0	4	9	SW
	5	66	44	0	4	9	S
	6	66	51	0	4	7	S
	7	74	41	0	8	19	SW
	8	79	32	0	14	23	W
	9	80	31	0	16	25	W
	10	81	31	0	15	22	W
	11	83	28	0	16	26	W
	12	85	24	0	14	24	W
	1	86	21	0	14	22	W
	2	88	18	0	14	24	W
	3	88	16	0	16	24	W
	4	87	17	0	17	31	W
	5	84	23	0	20	28	W
	6	81	25	0	17	25	W
	7	78	28	0	14	23	W
	8	76	30	0	16	26	W
	9	73	32	0	15	24	W
	10	72	33	0	11	19	W
	11	71	34	0	7	16	NW

19040 (114.63Wx32.61N) 05/21/08

ADEQ - YUMA MESA

	Hr	T(F)	RH		Spd	Max	Dir
ADEQ - YUMA MESA	12	71	35		2	5	SE
	1	68	41		1	4	W
	2	64	52		2	7	SE
	3	63	51		3	6	S
	4	65	47		0	4	W
	5	65	43		3	9	SW
	6	68	40		3	9	S
	7	76	34		6	15	W
	8	79	31		7	17	W
	9	80	30		8	20	W
	10	82	28		8	23	W
	11	84	26		11	26	W
	12	85	24		10	25	W
	1	87	21		10	24	W
	2	89	16		9	22	W
	3	89	16		12	31	W
	4	87	20		17	33	W
	5	83	23		13	29	W
	6	80	26		18	31	W
	7	76	30		15	27	W
	8	73	34		13	24	W
	9	71	36		11	24	W
	10	69	36		12	21	W
	11	68	37		9	19	W

03145 (114.62Wx32.65N) 05/21/08

NWS-YUMA MCAS

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-YUMA MCAS	12	82	10		0		-
	1	81	10		7		W
	2	77	10		6		S
	3	77	10		3		SW
	4	74	10		5		SW
	5	75	10		9		W
	6	76	10		5		W
	7	81	10		13		W
	8	83	10		14	23	NW
	9	85	10		16	24	NW
	10	87	10		16		NW
	11	89	9		18	26	W
	12	92	9		14	25	NW
	1	93	10		16	25	W
	2	95	10		17	24	NW
	3	95	10		20	30	W
	4	91	4	BLDU	29	37	W
	5	87	4	BLDU	26	33	W
	6	83	9		21	29	W
	7	80	9		21	28	W
	8	77	10		18	28	W
	9	76	10		18	26	W
	10	75	10		16	28	W
	11	74	10		15		W

19 (112.90Wx32.93N) 05/21/08

19-PALOMA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
19-PALOMA	12	72	49	0	7	10	SW
	1	71	50	0	7	10	SW
	2	70	43	0	7	10	SW
	3	69	38	0	7	10	S
	4	73	27	0	12	17	S
	5	71	31	0	10	16	S
	6	74	29	0	13	20	S
	7	77	27	0	14	19	SW
	8	80	30	0	18	26	SW
	9	82	29	0	24	40	SW
	10	85	27	0	26	39	SW
	11	86	23	0	27	37	SW
	12	87	18	0	26	40	W
	1	88	15	0	26	38	W
	2	87	17	0	24	36	SW
	3	88	18	0	23	34	SW
	4	87	16	0	21	32	SW
	5	86	17	0	20	32	W
	6	84	14	0	16	26	W
	7	79	18	0	15	24	W
	8	76	28	0	18	25	SW
	9	74	31	0	19	26	SW
	10	71	39	0	14	19	SW
	11	70	40	0	16	23	SW

03148 (112.72Wx32.89N) 05/21/08

NWS-GILA BEND

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-GILA BEND	12						
	1						
	2						
	3						
	4						
	5						
	6	77	20		2		SE
	7	86	20		14		SW
	8	88	20		17		SW
	9	90	20		24	30	W
	10	90	20	BLDU	25	32	W
	11	91	15	BLDU	21	32	W
	12	91	15	BLDU	24	36	W
	1	93	15	BLDU	25	31	W
	2	97	15	BLDU	15	32	W
	3	91	15	BLDU	25	34	W
	4	91	15	BLDU	22	32	W
	5	90	15	BLDU	20	23	W
	6	88	20		16		W
	7	84	20		16		W
	8	81	10	BLDU	20		W
	9	77	15	BLDU	17		W
	10	75	15	BLDU	17		W
	11						

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

10 (112.46Wx33.62N) 05/21/08

10-WADDELL

	Hr	T(F)	RH	Rn	Spd	Max	Dir
10-WADDELL	12	88	14	0	6	14	SW
	1	84	14	0	2	8	S
	2	82	14	0	5	13	S
	3	80	13	0	5	10	SW
	4	77	15	0	4	10	SW
	5	74	19	0	4	9	SW
	6	77	22	0	4	14	S
	7	**81**	**14**	**0**	**10**	**18**	**SW**
	8	**82**	**16**	**0**	**9**	**17**	**S**
	9	**84**	**17**	**0**	**9**	**18**	**SW**
	10	**86**	**15**	**0**	**10**	**22**	**SW**
	11	**88**	**14**	**0**	**10**	**24**	**SW**
	12	**89**	**11**	**0**	**10**	**19**	**W**
	1	**89**	**11**	**0**	**11**	**21**	**W**
	2	**90**	**10**	**0**	**12**	**24**	**SW**
	3	**89**	**9**	**0**	**13**	**24**	**W**
	4	**88**	**8**	**0**	**10**	**21**	**W**
	5	**87**	**8**	**0**	**11**	**22**	**SW**
	6	**85**	**8**	**0**	**12**	**20**	**SW**
	7	**83**	**9**	**0**	**7**	**16**	**W**
	8	**81**	**9**	**0**	**7**	**16**	**W**
	9	80	11	0	6	13	W
	10	78	12	0	6	13	W
	11	78	12	0	7	14	W

127530 (112.31Wx33.67N) 05/21/08

MC - COYOTE LAKES

	Hr	T(F)		PM	Spd	Max	Dir
MC - COYOTE LAKES	12	85		21	3	10	S
	1	82		30	2	9	S
	2	80		32	3	12	S
	3	**80**		**40**	**7**	**15**	**SW**
	4	78		37	5	12	SW
	5	76		25	5	13	SW
	6	**79**		**33**	**2**	**16**	**SW**
	7	**83**		**27**	**6**	**19**	**SW**
	8	**86**		**46**	**10**	**26**	**SW**
	9	**87**		**47**	**10**	**22**	**SW**
	10	**90**		**57**	**10**	**24**	**SW**
	11	**91**		**86**	**12**	**29**	**SW**
	12	**92**		**152**	**14**	**33**	**W**
	1	**92**		**138**	**15**	**33**	**W**
	2	**93**		**137**	**14**	**33**	**SW**
	3	**93**		**224**	**15**	**35**	**SW**
	4	**92**		**101**	**14**	**29**	**SW**
	5	**91**		**83**	**13**	**28**	**SW**
	6	**87**		**72**	**12**	**29**	**SW**
	7	**84**		**60**	**11**	**22**	**W**
	8	**82**		**36**	**9**	**21**	**W**
	9	**80**		**97**	**6**	**21**	**W**
	10	76		82	3	11	W
	11	75		31	4	12	W

16378 (112.19Wx33.57N) 05/21/08

MC - GLENDALE

	Hr	T(F)	RH		Spd	Max	Dir
MC - GLENDALE	12	87	17		6	12	SW
	1	84	19		6	11	SW
	2	**84**	**17**		**8**	**16**	**SW**
	3	81	19		4	13	SW
	4	78	22		2	9	S
	5	78	23		3	8	SW
	6	76	25		3	6	W
	7	**80**	**20**		**8**	**20**	**SW**
	8	**82**	**17**		**15**	**30**	**SW**
	9	**83**	**19**		**15**	**31**	**SW**
	10	**84**	**19**		**17**	**30**	**SW**
	11	**86**	**17**		**14**	**29**	**SW**
	12	**87**	**16**		**16**	**33**	**SW**
	1	**88**	**12**		**16**	**30**	**W**
	2	**89**	**10**		**18**	**34**	**W**
	3	**88**	**10**		**17**	**38**	**W**
	4	**88**	**10**		**17**	**33**	**W**
	5	**87**	**9**		**16**	**32**	**W**
	6	**86**	**9**		**14**	**26**	**W**
	7	**83**	**10**		**14**	**30**	**SW**
	8	**82**	**11**		**10**	**22**	**W**
	9	**80**	**12**		**7**	**18**	**W**
	10	**80**	**13**		**8**	**23**	**W**
	11	77	15		3	10	NW

26 (112.68Wx33.40N) 05/21/08

26-BUCKEYE

	Hr	T(F)	RH	Rn	Spd	Max	Dir
26-BUCKEYE	**12**	**83**	**18**	**0**	**10**	**17**	**SW**
	1	79	20	0	6	12	SW
	2	71	26	0	4	8	SW
	3	73	23	0	4	8	SW
	4	73	26	0	4	11	S
	5	71	31	0	5	12	SW
	6	71	33	0	4	12	SW
	7	**80**	**20**	**0**	**10**	**17**	**SW**
	8	**83**	**20**	**0**	**14**	**24**	**SW**
	9	**84**	**19**	**0**	**18**	**28**	**SW**
	10	**87**	**17**	**0**	**15**	**25**	**SW**
	11	**90**	**15**	**0**	**15**	**26**	**W**
	12	**90**	**11**	**0**	**22**	**32**	**NW**
	1	**90**	**10**	**0**	**20**	**30**	**NW**
	2	**91**	**9**	**0**	**18**	**28**	**W**
	3	**90**	**9**	**0**	**20**	**32**	**NW**
	4	**89**	**9**	**0**	**18**	**29**	**NW**
	5	**87**	**9**	**0**	**18**	**27**	**W**
	6	**84**	**9**	**0**	**14**	**23**	**W**
	7	**81**	**10**	**0**	**12**	**20**	**W**
	8	78	12	0	9	14	W
	9	76	13	0	9	14	W
	10	69	20	0	6	10	W
	11	**72**	**16**	**0**	**9**	**17**	**W**

21525 (112.62Wx33.37N) 05/21/08

MC - BUCKEYE

	Hr	T(F)	RH	PM	Spd	Max	Dir
MC - BUCKEYE	12	82	25	40	9	14	SW
	1	81	25	42	4	12	SW
	2	75	32	50	5	14	W
	3	72	36	48	1	5	E
	4	74	33	30	4	9	SW
	5	73	36	34	7	12	SW
	6	73	38	43	5	11	SW
	7	**80**	**31**	**53**	**10**	**23**	**W**
	8	**83**	**25**	**82**	**16**	**25**	**SW**
	9	**85**	**26**	**200**	**20**	**32**	**SW**
	10	**88**	**24**	**91**	**18**	**29**	**SW**
	11	**91**	**20**	**176**	**17**	**30**	**W**
	12	**91**	**15**	**519**	**19**	**33**	**W**
	1	**92**	**14**	**390**	**20**	**34**	**W**
	2	**92**	**13**	**197**	**18**	**34**	**W**
	3	**91**	**13**	**236**	**17**	**35**	**W**
	4	**90**	**13**	**216**	**16**	**30**	**W**
	5	**88**	**13**	**144**	**17**	**29**	**W**
	6	**85**	**15**	**100**	**14**	**24**	**W**
	7	**81**	**16**	**65**	**12**	**19**	**W**
	8	77	20	77	9	14	W
	9	74	23	47	9	14	W
	10	**73**	**22**	**43**	**8**	**15**	**W**
	11	**73**	**21**	**47**	**10**	**17**	**W**

16477 (112.14Wx33.48N) 05/21/08

MC - WEST PHOENIX

	Hr	T(F)		PM	Spd	Max	Dir
MC - WEST PHOENIX	**12**	**89**		**26**	**8**	**20**	**SW**
	1	**87**		**41**	**10**	**25**	**SW**
	2	**85**		**49**	**7**	**18**	**SW**
	3	83		35	4	13	SW
	4	80		31	4	12	SW
	5	81		33	4	12	SW
	6	82		46	5	12	SW
	7			56			-
	8			80			-
	9			142			-
	10	**86**		**110**	**14**	**30**	**SW**
	11	**88**		**92**	**14**	**35**	**W**
	12	**90**		**114**	**13**	**33**	**W**
	1	**91**		**152**	**15**	**34**	**W**
	2	**91**		**160**	**14**	**32**	**W**
	3	**90**		**160**	**14**	**33**	**W**
	4	**90**		**134**	**14**	**31**	**W**
	5	**88**		**129**	**12**	**28**	**W**
	6	**87**		**113**	**13**	**27**	**W**
	7	**84**		**94**	**11**	**25**	**W**
	8	**82**		**71**	**10**	**22**	**W**
	9	**80**		**63**	**7**	**16**	**W**
	10	**80**		**47**	**8**	**19**	**W**
	11	78		32	5	13	W

23111 (112.38Wx33.54N) 05/21/08

NWS-LUKE AFB

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-LUKE AFB	12	84	10		14		SW
	1	80	10		13		SW
	2	79	10		15		SW
	3	79	10		14		S
	4	75	10		7		SW
	5	75	10		10		S
	6	77	10		11		SW
	7	81	10		17		SW
	8	85	10		20		SW
	9	86	10		23		SW
	10	**87**	**10**		**21**	**30**	**SW**
	11	**89**	**10**		**21**	**28**	**SW**
	12	**91**	**10**		**9**	**34**	**SW**
	1	**91**	**10**		**26**	**37**	**W**
	2	**91**	**10**		**20**	**31**	**W**
	3	**91**	**10**		**22**	**29**	**W**
	4	**89**	**10**		**17**	**33**	**W**
	5	**88**	**10**		**20**	**25**	**W**
	6	**85**	**10**		**21**	**26**	**SW**
	7	83	10		16		W
	8	82	10		16		W
	9	81	10		18		NW
	10	78	10		9		W
	11	78	10		13		W

03186 (112.38Wx33.42N) 05/21/08

NWS-GOODYEAR

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-GOODYEAR	12						
	1						
	2						
	3						
	4						
	5	75	20		8		W
	6	79	20		8		W
	7	82	20		11		SW
	8	**86**	**20**		**22**	**28**	**SW**
	9	**88**	**10**		**20**	**30**	**SW**
	10	**90**	**7**		**17**	**29**	**W**
	11						
	12	**97**	**10**		**23**	**31**	**W**
	1	**93**	**10**		**17**	**28**	**W**
	2	**99**	**10**		**17**	**25**	**W**
	3	**95**	**10**		**17**	**25**	**W**
	4	**90**	**7**		**17**	**25**	**W**
	5	**91**	**7**		**17**	**25**	**W**
	6	**88**	**10**		**16**	**23**	**W**
	7	82	10		11		W
	8	79	20		11		SW
	9						
	10						
	11						

16659 (112.14Wx33.41N) 05/21/08

MC - WEST FORTY THIR

	Hr	T(F)		PM	Spd	Max	Dir
MC - WEST FORTY THIR	**12**	**89**		**87**	**9**	**21**	**SW**
	1	**87**		**47**	**10**	**19**	**SW**
	2	85		40	5	12	SW
	3	81		29	2	7	W
	4	82		32	5	14	S
	5	82		60	4	9	S
	6	83		55	3	9	S
	7	**86**		**135**	**10**	**21**	**SW**
	8	**88**		**519**	**16**	**29**	**SW**
	9	**89**		**1208**	**19**	**32**	**SW**
	10	**90**		**601**	**17**	**30**	**W**
	11	**92**		**413**	**15**	**29**	**W**
	12	**94**		**534**	**16**	**34**	**SW**
	1	**94**		**836**	**18**	**35**	**W**
	2	**94**		**735**	**19**	**34**	**W**
	3	**94**		**255**	**16**	**30**	**W**
	4	**92**		**225**	**16**	**30**	**W**
	5	**90**		**243**	**16**	**32**	**W**
	6	**87**		**263**	**16**	**31**	**W**
	7	**84**		**105**	**13**	**22**	**W**
	8	**82**		**77**	**12**	**20**	**W**
	9	**80**		**69**	**8**	**17**	**W**
	10	**78**		**58**	**10**	**21**	**W**
	11	**77**		**70**	**8**	**16**	**SW**

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

16372 (112.12Wx33.46N) 05/21/08

MC - GREENWOOD

MC - GREENWOOD

Hr	T(F)		PM	Spd	Max	Dir
12	88		31	7	15	SW
1	86		44	8	20	SW
2	84		43	8	15	SW
3	82		34	6	14	SW
4	80		35	5	14	SW
5	80		47	3	11	S
6	84		51	6	14	SW
7	85		46	8	21	SW
8	87		85	12	29	SW
9	86		219	15	32	SW
10	86		153	15	32	SW
11	88		86	13	28	SW
12	90		96	12	31	W
1	91		139	13	31	W
2	91		175	14	34	W
3	91		149	14	31	W
4	90		120	13	28	W
5	89		127	12	28	W
6	86		115	13	30	W
7	83		106	10	25	W
8	81		80	10	22	W
9	79		64	8	19	W
10	79		50	7	15	W
11	76		44	5	12	W

03184 (112.08Wx33.69N) 05/21/08

NWS-DEER VALLEY

NWS-DEER VALLEY

Hr	T(F)	VR	Dust	Spd	Max	Dir
12	85	10		9		SW
1	83	10		8		SW
2	81	10		11		SW
3	78	10		6		SW
4	78	10		10	20	S
5	74	8		3		N
6	78	10		7		SW
7	82	10		21		SW
8	83	10		22	29	SW
9	84	10		23	30	SW
10	86	10		18	28	SW
11	88	10		18	28	SW
12	90	10		20	36	W
1	90	10		24	37	W
2	90	10		23	34	W
3	90	10		21	32	SW
4	88	10		22	32	W
5	86	10		18		SW
6	84	10		20	29	W
7	82	10		16	26	SW
8	80	10		14		W
9	78	10		15		NW
10	75	10		6		W
11	73	10		3		NW

16390 (112.07Wx33.56N) 05/21/08

MC - NORTH PHOENIX

MC - NORTH PHOENIX

Hr	T(F)			Spd	Max	Dir
12	87			6	13	SW
1	84			4	12	SW
2	83			4	15	W
3	79			2	6	S
4	77			2	6	S
5	74			1	7	W
6	77			2	6	NW
7	80			4	16	W
8	84			8	20	SW
9	84			12	31	SW
10	86			11	26	SW
11	88			11	25	SW
12	89			11	26	W
1	89			11	29	W
2	90			12	31	W
3	89			10	27	W
4	88			10	26	W
5	87			10	23	W
6	85			10	23	W
7	83			8	21	W
8	81			8	19	W
9	80			5	16	W
10	79			4	12	NW
11	76			2	8	NW

16375 (112.12Wx33.43N) 05/21/08

MC - DURANGO COMPLEX

MC - DURANGO COMPLEX

Hr	T(F)		PM	Spd	Max	Dir
12	88		45	8	21	SW
1	86		43	10	21	W
2	85		47	9	19	W
3	81		42	6	13	SW
4	80		37	7	16	SW
5	80		51	6	15	S
6	81		51	4	12	S
7	85		57	8	18	SW
8	89		132	12	27	SW
9	88		310	17	32	W
10	88		171	17	31	W
11	91		116	15	29	W
12	92		132	15	31	W
1	92		247	17	32	W
2	93		232	18	35	W
3	92		163	17	31	W
4	91		133	15	29	W
5	89		136	16	30	W
6	87		123	16	29	W
7	83		106	13	25	W
8	81		93	12	20	W
9	80		65	9	18	W
10	78		65	9	18	W
11	76		57	5	12	W

16328 (112.10Wx33.50N) 05/21/08

ADEQ - JLG SUPERSITE

ADEQ - JLG SUPERSITE

Hr			PM	Spd		Dir
12			27	5		SW
1			30	6		SW
2			43	6		W
3			34	4		SW
4			29	2		S
5			35	2		S
6			45	2		N
7			25	5		W
8			43	7		SW
9			107	11		SW
10			86	9		SW
11			67	9		W
12			71	8		W
1			95	9		W
2			107	9		W
3			107	9		W
4			96	9		W
5			93	8		W
6			86	7		W
7			77	6		W
8			62	5		W
9			54	4		W
10			44	5		W
11			36	3		W

16329 (112.05Wx33.46N) 05/21/08

MC - CENTRAL PHOENIX

MC - CENTRAL PHOENIX

Hr	T(F)		PM	Spd	Max	Dir
12	89		32	10	20	W
1	86		36	10	20	W
2	84		50	6	18	SW
3	82		34	4	13	S
4	80		32	2	8	SE
5	79		41	2	7	E
6	84		41	2	9	SE
7	87		41	9	22	SW
8	89		57	14	27	W
9	89		184	17	34	W
10	89		161	17	33	W
11	90		123	16	30	W
12	91		136	17	34	W
1	92		186	18	38	W
2	92		173	18	36	W
3	92		170	17	37	W
4	91		127	17	37	W
5	89		122	16	31	W
6	87		128	18	42	W
7	83		99	15	30	W
8	81		80	15	28	W
9	80		63	14	25	W
10	79		54	9	18	W
11	77		41	6	12	W

16377 (112.08Wx33.40N) 05/21/08

MC - SOUTH PHOENIX

MC - SOUTH PHOENIX

Hr	T(F)		PM	Spd	Max	Dir
12	91		29	4	15	W
1	88		40	6	18	W
2	87		41	4	15	W
3	85		26	3	10	SW
4	83		31	3	9	SW
5	84		28	3	14	S
6	86		27	5	13	S
7	88		30	5	15	SW
8	90		44	7	19	SW
9	89		334	11	30	W
10	90		159	9	23	W
11	91		140	12	26	W
12	93		205	12	32	W
1	93		300	15	34	W
2	93		286	16	31	W
3	93		281	16	32	W
4	92		193	14	30	W
5	91		168	14	28	W
6	89		198	15	29	W
7	86		112	10	27	W
8	84		83	8	22	W
9	82		58	5	14	W
10	81		57	7	20	W
11	79		63	3	9	W

15 (112.10Wx33.48N) 05/21/08

15-PHOENIX ENCANTO

15-PHOENIX ENCANTO

Hr	T(F)	RH	Rn	Spd	Max	Dir
12	88	15	0	6	12	SW
1	85	17	0	5	14	SW
2	84	18	0	8	16	W
3	81	21	0	5	11	SW
4	78	23	0	3	10	W
5	71	36	0	1	5	N
6	77	29	0	2	9	NE
7	84	15	0	9	19	SW
8	85	15	0	11	20	SW
9	85	17	0	15	26	SW
10	85	19	0	15	25	SW
11	86	19	0	13	24	SW
12	88	16	0	13	25	W
1	89	13	0	15	28	W
2	89	11	0	14	30	W
3	89	10	0	13	29	W
4	88	10	0	12	22	W
5	87	10	0	11	23	W
6	86	9	0	12	21	W
7	83	10	0	11	19	W
8	81	11	0	10	17	W
9	79	12	0	8	13	W
10	79	13	0	6	13	W
11	77	15	0	4	12	W

23183 (111.99Wx33.44N) 05/21/08

NWS-PHX SKY HARBOR

NWS-PHX SKY HARBOR

Hr	T(F)	VR	Dust	Spd	Max	Dir
12	90	10		15		W
1	87	10		8		W
2	87	10		7		W
3	86	10		5		S
4	83	10		7		S
5	79	10		13		SE
6	79	10		11		E
7	86	10		15		SW
8	87	10		10		S
9	89	10		22	33	W
10	89	10		22	28	SW
11	92	10		17	28	SW
12	92	10		22	31	W
1	93	10		18	38	SW
2	93	10		20	30	W
3	91	10		21	34	W
4	90	10		18	28	W
5	89	10		20	26	W
6	87	10		24	32	W
7	84	10		16	25	W
8	83	10		18	23	W
9	81	10		11		SW
10	80	10		13		W
11	78	10		9		W

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

12 (112.11Wx33.62N) 05/21/08

12-PHOENIX GREENWAY

	Hr	T(F)	RH	Rn	Spd	Max	Dir
12-PHOENIX GREENWAY	12	86	16	0	6	13	S
	1	83	20	0	6	12	S
	2	81	20	0	6	12	SW
	3	79	22	0	4	11	S
	4	77	24	0	4	11	S
	5	73	29	0	1	4	S
	6	76	26	0	2	8	SW
	7	**79**	**20**	**0**	**7**	**16**	**SW**
	8	**81**	**17**	**0**	**11**	**23**	**SW**
	9	**82**	**18**	**0**	**14**	**28**	**SW**
	10	**84**	**19**	**0**	**13**	**25**	**SW**
	11	**86**	**16**	**0**	**13**	**22**	**SW**
	12	**87**	**16**	**0**	**14**	**25**	**SW**
	1	**88**	**12**	**0**	**14**	**27**	**SW**
	2	**88**	**9**	**0**	**16**	**31**	**SW**
	3	**88**	**9**	**0**	**15**	**26**	**SW**
	4	**88**	**9**	**0**	**14**	**30**	**SW**
	5	**86**	**8**	**0**	**13**	**22**	**SW**
	6	**85**	**9**	**0**	**12**	**23**	**SW**
	7	**82**	**9**	**0**	**10**	**19**	**SW**
	8	**81**	**10**	**0**	**9**	**18**	**SW**
	9	**79**	**11**	**0**	**7**	**17**	**W**
	10	78	14	0	6	14	NW
	11	75	19	0	2	6	W

16368 (112.02Wx33.82N) 05/21/08

MC - CAVE CREEK

	Hr	T(F)	RH		Spd	Max	Dir
MC - CAVE CREEK	12	84	26		6	14	SW
	1	81	26		3	9	S
	2	77	28		2	6	SE
	3	76	29		3	10	SE
	4	**74**	**29**		**3**	**16**	**SE**
	5	72	31		2	5	E
	6	75	31		2	9	S
	7	**79**	**27**		**9**	**23**	**S**
	8	**80**	**23**		**15**	**29**	**SW**
	9	**83**	**24**		**13**	**26**	**SW**
	10	**84**	**24**		**14**	**29**	**SW**
	11	**86**	**23**		**13**	**27**	**SW**
	12	**88**	**20**		**14**	**33**	**SW**
	1	**89**	**15**		**18**	**43**	**SW**
	2	**88**	**16**		**15**	**34**	**SW**
	3	**87**	**17**		**15**	**34**	**SW**
	4	**87**	**15**		**15**	**30**	**SW**
	5	**84**	**16**		**15**	**29**	**SW**
	6	**83**	**16**		**13**	**29**	**SW**
	7	**81**	**15**		**9**	**28**	**W**
	8	**78**	**16**		**8**	**20**	**W**
	9	**76**	**20**		**11**	**27**	**NW**
	10	**75**	**23**		**9**	**23**	**NW**
	11	**73**	**24**		**5**	**16**	**N**

27 (111.97Wx33.73N) 05/21/08

27-DESERT RIDGE

	Hr	T(F)	RH	Rn	Spd	Max	Dir
27-DESERT RIDGE	**12**	**85**	**17**	**0**	**7**	**15**	**W**
	1	**83**	**18**	**0**	**10**	**17**	**W**
	2	**80**	**21**	**0**	**10**	**16**	**W**
	3	79	21	0	7	14	SW
	4	77	22	0	9	14	SW
	5	74	27	0	3	9	SW
	6	72	36	0	2	12	S
	7	77	25	0	5	11	SW
	8	**80**	**19**	**0**	**16**	**24**	**SW**
	9	**81**	**19**	**0**	**18**	**30**	**W**
	10	**81**	**22**	**0**	**18**	**27**	**W**
	11	**83**	**20**	**0**	**17**	**30**	**W**
	12	**84**	**20**	**0**	**18**	**32**	**SW**
	1	**86**	**15**	**0**	**18**	**37**	**W**
	2	**86**	**12**	**0**	**19**	**34**	**W**
	3	**86**	**11**	**0**	**20**	**37**	**W**
	4	**85**	**10**	**0**	**18**	**30**	**W**
	5	**84**	**10**	**0**	**17**	**31**	**W**
	6	**82**	**10**	**0**	**14**	**24**	**W**
	7	**80**	**10**	**0**	**13**	**23**	**W**
	8	**79**	**11**	**0**	**12**	**22**	**W**
	9	**78**	**11**	**0**	**9**	**21**	**NW**
	10	**74**	**17**	**0**	**7**	**16**	**N**
	11	72	20	0	2	8	N

16393 (112.13Wx33.49N) 05/21/08

MC - WEST INDIAN SCH

	Hr				Spd	Max	Dir
MC - WEST INDIAN SCH	**12**				**11**	**21**	**SW**
	1				**12**	**25**	**SW**
	2				**8**	**20**	**SW**
	3				6	13	SW
	4				5	11	SW
	5				1	11	SW
	6				3	10	SW
	7				**8**	**22**	**SW**
	8				**14**	**32**	**SW**
	9				**17**	**36**	**SW**
	10				**16**	**32**	**SW**
	11				**13**	**28**	**W**
	12				**13**	**32**	**W**
	1				**14**	**31**	**W**
	2				**14**	**31**	**W**
	3				**12**	**28**	**W**
	4				**13**	**33**	**W**
	5				**11**	**30**	**W**
	6				**13**	**29**	**W**
	7				**11**	**22**	**W**
	8				**10**	**22**	**W**
	9				**7**	**16**	**W**
	10				**7**	**20**	**W**
	11				**4**	**15**	**W**

15 (112.10Wx33.48N) 05/21/08

15-PHOENIX ENCANTO

	Hr	T(F)	RH	Rn	Spd	Max	Dir
15-PHOENIX ENCANTO	12	88	15	0	6	12	SW
	1	85	17	0	5	14	SW
	2	**84**	**18**	**0**	**8**	**16**	**W**
	3	81	21	0	5	11	SW
	4	78	23	0	3	10	W
	5	71	36	0	1	5	N
	6	77	29	0	2	9	NE
	7	**84**	**15**	**0**	**9**	**19**	**SW**
	8	**85**	**15**	**0**	**11**	**20**	**SW**
	9	**85**	**17**	**0**	**15**	**26**	**SW**
	10	**85**	**19**	**0**	**15**	**25**	**SW**
	11	**86**	**19**	**0**	**13**	**24**	**SW**
	12	**88**	**16**	**0**	**13**	**25**	**W**
	1	**89**	**13**	**0**	**15**	**28**	**W**
	2	**89**	**11**	**0**	**14**	**30**	**W**
	3	**89**	**10**	**0**	**13**	**29**	**W**
	4	**88**	**10**	**0**	**12**	**22**	**W**
	5	**87**	**10**	**0**	**11**	**23**	**W**
	6	**86**	**9**	**0**	**12**	**21**	**W**
	7	**83**	**10**	**0**	**11**	**19**	**W**
	8	**81**	**11**	**0**	**10**	**17**	**W**
	9	79	12	0	8	13	W
	10	79	13	0	6	13	W
	11	77	15	0	4	12	W

16398 (111.92Wx33.48N) 05/21/08

MC - SOUTH SCOTTSDAL

	Hr	T(F)	RH		Spd	Max	Dir
MC - SOUTH SCOTTSDAL	**12**	**89**	**18**		**9**	**18**	**SW**
	1	**86**	**20**		**6**	**17**	**W**
	2	83	20		2	9	SW
	3	78	23		1	7	S
	4	74	27		2	8	NE
	5	74	29		5	11	SE
	6	**79**	**24**		**6**	**18**	**S**
	7	**83**	**21**		**8**	**19**	**SW**
	8	**87**	**19**		**9**	**18**	**S**
	9	**90**	**18**		**11**	**29**	**SW**
	10	**90**	**19**		**14**	**28**	**W**
	11	**92**	**19**		**14**	**32**	**W**
	12	**93**	**18**		**13**	**34**	**W**
	1	**94**	**16**		**14**	**32**	**W**
	2	**94**	**14**		**14**	**31**	**W**
	3	**93**	**13**		**14**	**31**	**W**
	4	**92**	**13**		**13**	**28**	**W**
	5	**90**	**13**		**12**	**27**	**W**
	6	**87**	**13**		**12**	**29**	**W**
	7	**84**	**12**		**13**	**30**	**W**
	8	**82**	**14**		**11**	**22**	**W**
	9	**80**	**15**		**11**	**21**	**W**
	10	**79**	**16**		**6**	**17**	**W**
	11	76	17		4	8	W

03192 (111.91Wx33.62N) 05/21/08

NWS-SCOTTSDALE

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-SCOTTSDALE	**12**	**89**	**10**		**11**	**20**	**SW**
	1	86	10		11		SW
	2	83	10		7		SW
	3	80	10		0		-
	4	79	10		3		S
	5	74	10		5		SE
	6	77	10		5		*VR
	7	80	10		5		S
	8	85	10		11		SW
	9	**86**	**10**		**17**	**25**	**W**
	10	**86**	**10**		**14**	**24**	**W**
	11	**87**	**10**		**16**	**29**	**SW**
	12	**90**	**10**		**15**	**26**	**W**
	1	**90**	**10**		**20**	**32**	**W**
	2	**90**	**10**		**20**	**28**	**SW**
	3	**89**	**10**		**14**	**26**	**W**
	4	**88**	**10**		**15**	**25**	**W**
	5	**87**	**10**		**18**	**26**	**W**
	6	**85**	**10**		**17**	**25**	**W**
	7	**83**	**10**		**15**	**21**	**SW**
	8	**82**	**10**		**14**	**24**	**W**
	9	**80**	**10**		**11**	**16**	**W**
	10	77	10		3		W
	11	76	10		3		W

53128 (111.80Wx33.27N) 05/21/08

NWS-CHANDLER

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-CHANDLER	12						
	1						
	2						
	3						
	4						
	5						
	6	**77**	**30**		**11**	**20**	**S**
	7	82	40		21		S
	8	**84**	**30**		**23**	**29**	**S**
	9	88	30		20		SW
	10	**90**	**15**		**23**	**34**	**SW**
	11	**90**	**20**		**23**	**40**	**SW**
	12	**91**	**15**		**34**	**48**	**SW**
	1	**90**	**10**	BLDU	**40**	**54**	**W**
	2	**90**	**7**		**36**	**47**	**S**
	3	**91**	**10**		**29**	**34**	**SW**
	4	**90**	**10**		**23**	**31**	**SW**
	5						
	6	84	15		17		W
	7	**82**	**15**		**23**	**33**	**W**
	8	81	15		17		W
	9						
	10						
	11						

23104 (111.65Wx33.31N) 05/21/08

NWS-WILLIAMS FLD

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-WILLIAMS FLD	12	79	10		8		SW
	1	82	10		8		S
	2	75	10		7		E
	3	72	10		7		SE
	4	68	10		7		E
	5	68	30		6		SE
	6	73	30		9		SE
	7	**84**	**30**		**15**	**26**	**S**
	8	**86**	**30**		**17**	**26**	**S**
	9	**88**	**20**		**16**	**28**	**SW**
	10	**90**	**15**		**20**	**31**	**W**
	11						
	12	**91**	**15**		**25**	**33**	**SW**
	1	**95**	**10**		**28**	**39**	**W**
	2	**93**	**10**		**21**	**28**	**W**
	3	**91**	**10**		**23**	**33**	**W**
	4	**90**	**10**		**20**	**30**	**SW**
	5	**86**	**10**		**21**	**30**	**W**
	6	**86**	**10**		**15**	**25**	**W**
	7	**84**	**10**		**18**	**26**	**W**
	8	**81**	**10**		**13**	**28**	**W**
	9	79	10		10		W
	10	**77**	**7**		**15**	**21**	**SW**
	11	**73**	**7**		**13**	**25**	**SW**

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

16406 (111.85Wx33.71N) 05/21/08

MC - PINNACLE PEAK

	Hr				Spd	Max	Dir
MC - PINNACLE PEAK	12				2	9	SW
	1				3	10	SW
	2				6	15	SW
	3				5	13	SW
	4				4	15	SW
	5				7	16	SW
	6				12	27	SW
	7				11	27	SW
	8				10	28	W
	9				14	29	W
	10				14	30	W
	11				13	30	W
	12				14	33	W
	1				14	35	W
	2				16	36	W
	3				15	34	W
	4				15	32	W
	5				14	28	W
	6				11	24	NW
	7				9	23	W
	8				9	19	W
	9				4	15	NW
	10				6	13	N
	11				4	10	NE

16376 (111.73Wx33.61N) 05/21/08

MC - FOUNTAIN HILLS

	Hr	T(F)	RH		Spd	Max	Dir
MC - FOUNTAIN HILLS	12	90	15		6	13	SW
	1	88	17		7	18	SW
	2	86	19		7	14	SW
	3	82	22		6	9	SW
	4	80	23		4	9	SW
	5	78	24		4	11	SW
	6	79	21		8	18	S
	7	82	18		11	19	S
	8	86	15		11	22	SW
	9	88	14		12	25	SW
	10	88	18		13	31	W
	11	88	18		12	28	W
	12	90	16		12	34	SW
	1	91	15		11	37	SW
	2	91	13		12	32	W
	3	90	12		12	29	W
	4	90	11		11	29	W
	5	88	11		10	30	W
	6	87	11		10	28	SW
	7	85	11		9	23	W
	8	83	11		9	25	W
	9	82	12		9	28	W
	10	80	13		6	17	W
	11	78	16		5	13	NW

16417 (111.61Wx33.55N) 05/21/08

MC - BLUE POINT

	Hr	T(F)			Spd	Max	Dir
MC - BLUE POINT	12	87			5	15	SW
	1	84			3	7	SW
	2	81			2	10	S
	3	77			2	6	S
	4	77			2	16	S
	5	80			10	20	S
	6	80			13	26	S
	7	83			15	28	S
	8	85			16	28	S
	9	86			17	30	S
	10	88			15	38	SW
	11	89			16	32	W
	12	90			16	32	W
	1	90			17	34	SW
	2	91			17	40	W
	3	90			15	34	W
	4	90			15	35	W
	5	88			15	31	W
	6	86			13	27	W
	7	83			13	25	W
	8	81			10	20	W
	9	79			11	19	W
	10	78			9	19	W
	11	76			4	13	W

16405 (111.93Wx33.41N) 05/21/08

MC - TEMPE

	Hr	T(F)			Spd	Max	Dir
MC - TEMPE	12	88			3	13	SW
	1	84			1	8	SW
	2	78			0	5	SE
	3	78			1	11	SE
	4	80			4	11	S
	5	78			5	14	SE
	6	78			5	15	SE
	7	81			3	9	E
	8	86			7	20	S
	9	88			8	23	S
	10	88			8	29	SW
	11	89			6	21	SW
	12	90			6	26	SW
	1	91			7	27	SW
	2	90			6	25	W
	3	89			7	28	W
	4	89			7	30	W
	5	87			6	26	W
	6	86			5	25	W
	7	83			4	20	SW
	8	82			4	16	SW
	9	80			4	14	SW
	10	79			4	19	SW
	11	77			2	12	W

03185 (111.73Wx33.46N) 05/21/08

NWS-MESA FF

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-MESA FF	12						
	1						
	2						
	3						
	4						
	5						
	6						
	7	81	40		14	21	S
	8	84	40		14	20	SW
	9	84	40		21	26	SW
	10	86	40		21	34	SW
	11	90	40		21	32	W
	12						
	1						
	2	90	30		21	34	W
	3						
	4						
	5	88	20		23	34	W
	6						
	7						
	8						
	9						
	10						
	11						

16381 (111.73Wx33.45N) 05/21/08

MC - FALCON FIELD

	Hr	T(F)	RH		Spd	Max	Dir
MC - FALCON FIELD	12	85	15		4	10	S
	1	83	19		5	10	S
	2	80	20		5	9	SE
	3	79	20		9	16	SE
	4	77	21		9	15	SE
	5	76	22		9	15	SE
	6	76	20		9	20	SE
	7	80	14		11	20	S
	8	84	12		11	23	S
	9	85	12		15	29	S
	10	87	13		14	29	SW
	11	88	14		11	27	SW
	12	89	13		11	28	SW
	1	90	11		15	34	SW
	2	89	10		13	36	W
	3	89	9		13	29	W
	4	88	9		13	34	W
	5	87	9		13	27	W
	6	85	9		13	30	W
	7	83	8		13	30	W
	8	82	9		10	23	SW
	9	80	10		10	22	W
	10	79	11		9	21	W
	11	76	13		5	15	W

16478 (111.88Wx33.30N) 05/21/08

MC - WEST CHANDLER

	Hr	T(F)	RH		Spd	Max	Dir
MC - WEST CHANDLER	12	83	18		6	13	S
	1	81	19		7	18	SW
	2	85	15		8	15	SW
	3	82	17		5	10	SW
	4	81	19		6	12	S
	5	77	21		6	14	S
	6	76	19		6	14	S
	7	81	15		11	25	S
	8	84	13		12	25	S
	9	87	12		12	36	SW
	10	88	13		15	31	SW
	11	89	14		14	29	SW
	12	90	13		16	36	SW
	1	90	10		19	40	SW
	2	90	8		20	42	SW
	3	90	8		16	36	SW
	4	89	9		15	29	SW
	5	88	10		15	32	SW
	6	86	9		13	30	W
	7	85	8		14	32	W
	8						-
	9	81	9		9	16	W
	10	80	10		10	22	SW
	11	76	18		8	17	SW

16380 (111.87Wx33.41N) 05/21/08

MC - MESA

	Hr	T(F)	RH		Spd	Max	Dir
MC - MESA	12	87	15		5	11	SW
	1	84	18		3	6	SW
	2	83	19		4	8	S
	3	83	18		5	9	S
	4	81	20		6	11	S
	5	78	21		7	17	S
	6	79	18		10	19	S
	7	82	16		8	19	SW
	8	85	14		10	23	S
	9	88	13		14	31	SW
	10	89	14		18	34	W
	11	90	14		16	30	W
	12	90	14		15	33	W
	1	92	12		17	38	W
	2	90	11		17	34	W
	3	90	10		18	34	W
	4	89	10		17	34	W
	5	88	10		17	30	W
	6	86	10		17	30	W
	7	84	10		15	32	W
	8	82	10		13	23	W
	9	81	11		13	25	W
	10	80	12		12	24	W
	11	78	13		7	13	W

16505 (111.72Wx33.31N) 05/21/08

MC - HIGLEY

	Hr	T(F)		PM	Spd	Max	Dir
MC - HIGLEY	12			59	6	12	S
	1			23	7	14	S
	2			29	6	12	SW
	3			30	6	11	S
	4			25	5	10	S
	5			64	6	11	S
	6			63	6	17	S
	7			90	13	23	S
	8			195	14	25	S
	9			147	13	28	S
	10			196	17	33	SW
	11			171	17	34	SW
	12			171	15	36	SW
	1			229	18	37	SW
	2			204	18	46	SW
	3			113	16	36	SW
	4			101	14	30	SW
	5			95	13	32	SW
	6			105	13	27	W
	7			84	13	28	W
	8			72	10	24	W
	9			68	7	16	W
	10			106	9	23	SW
	11			227	10	22	SW

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

30 (111.58Wx35.21N) 05/21/08

30-FLAGSTAFF

	Hr	T(F)	RH	Rn	Spd	Max	Dir
30-FLAGSTAFF	12	63	23	0	10	23	W
	1	62	23	0	8	16	SW
	2	59	26	0	5	11	SW
	3	57	29	0	4	13	SW
	4	57	32	0	7	19	SW
	5	57	30	0	9	18	SW
	6	58	29	0	11	23	SW
	7	59	28	0	14	30	SW
	8	59	28	0	16	28	S
	9	60	29	0	16	32	S
	10	60	27	0	17	32	S
	11	62	21	0	17	32	SW
	12	59	27	0	16	37	SW
	1	58	28	0	14	33	SW
	2	60	18	0	16	30	SW
	3	62	14	0	23	39	W
	4	60	16	0	21	34	W
	5	56	29	0	22	33	NW
	6	52	31	0	19	34	W
	7	50	32	0	14	29	W
	8	48	34	0	8	17	W
	9	44	46	0	4	10	SE
	10	42	54	0	6	11	SE
	11	40	54	0	3	8	S

31 (112.42Wx34.59N) 05/21/08

31-PRESCOTT

	Hr	T(F)	RH	Rn	Spd	Max	Dir
31-PRESCOTT	12	66	23	0	7	12	SW
	1	66	24	0	7	13	SW
	2	66	23	0	4	9	S
	3	65	21	0	7	16	SW
	4	64	19	0	9	21	SW
	5	62	26	0	7	14	SW
	6	63	27	0	10	18	SW
	7	64	28	0	13	23	SW
	8	65	25	0	19	33	SW
	9	66	25	0	17	29	SW
	10	66	23	0	19	30	SW
	11	67	25	0	18	27	W
	12	68	25	0	17	32	W
	1	68	23	0	17	27	SW
	2	68	19	0	20	33	W
	3	68	16	0	17	34	W
	4	68	12	0	17	31	W
	5	66	14	0	14	27	W
	6	64	16	0	9	29	W
	7	61	20	0	10	30	W
	8	59	24	0	5	13	W
	9	57	27	0	5	12	NW
	10	55	28	0	5	11	N
	11	52	36	0	3	13	N

32 (111.34Wx34.23N) 05/21/08

32-PAYSON

	Hr	T(F)	RH	Rn	Spd	Max	Dir
32-PAYSON	12	74	22	0	12	24	SW
	1	71	27	0	10	18	SW
	2	69	27	0	8	14	SW
	3	69	25	0	7	16	S
	4	67	27	0	10	18	S
	5	66	26	0	10	15	S
	6	68	25	0	12	20	S
	7	68	24	0	13	23	S
	8	69	20	0	14	31	S
	9	69	21	0	14	27	SW
	10	68	25	0	16	31	SW
	11	69	26	0	16	30	SW
	12	70	24	0	18	33	SW
	1	70	22	0	21	40	SW
	2	70	17	0	22	40	SW
	3	70	17	0	16	29	SW
	4	68	19	0	14	26	SW
	5	68	15	0	15	25	SW
	6	68	13	0	15	31	W
	7	66	12	0	10	20	W
	8	64	13	0	8	20	W
	9	61	22	0	6	13	NW
	10	58	29	0	4	11	NW
	11	56	33	0	1	4	NE

29 (111.87Wx33.39N) 05/21/08

29-MESA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
29-MESA	12	86	15	0	4	6	S
	1	83	18	0	4	8	S
	2	82	19	0	2	6	SE
	3	82	19	0	4	8	SE
	4	79	21	0	4	9	SE
	5	78	20	0	7	12	SE
	6	78	18	0	8	13	S
	7	82	15	0	6	15	S
	8	86	13	0	10	21	S
	9	88	12	0	13	22	SW
	10	89	13	0	16	27	SW
	11	91	13	0	12	23	SW
	12	91	13	0	13	24	SW
	1	92	11	0	15	26	W
	2	91	10	0	12	22	W
	3	91	9	0	13	22	W
	4	90	9	0	12	22	W
	5	88	9	0	12	21	W
	6	86	9	0	12	24	W
	7	84	9	0	11	24	W
	8	83	9	0	9	17	W
	9	81	10	0	9	18	W
	10	81	10	0	10	18	W
	11	78	14	0	8	18	SW

22 (111.64Wx33.26N) 05/21/08

22-QUEEN CREEK

	Hr	T(F)	RH	Rn	Spd	Max	Dir
22-QUEEN CREEK	12	79	24	0	5	9	S
	1	70	39	0	4	8	E
	2	71	33	0	5	6	E
	3	66	48	0	4	7	SE
	4	65	44	0	6	9	SE
	5	63	47	0	5	8	SE
	6	69	35	0	6	10	SE
	7	76	27	0	10	22	S
	8	82	18	0	14	24	S
	9	85	13	0	16	29	S
	10	86	15	0	15	31	SW
	11	87	16	0	17	32	SW
	12	86	19	0	18	32	W
	1	86	18	0	19	36	W
	2	85	18	0	19	33	W
	3	86	16	0	19	34	W
	4	85	14	0	20	32	W
	5	84	12	0	20	32	W
	6	82	13	0	15	25	W
	7	80	14	0	15	29	W
	8	78	12	0	11	20	W
	9	77	12	0	10	18	W
	10	75	14	0	13	20	SW
	11	74	21	0	15	24	SW

16317 (111.33Wx34.23N) 05/21/08

ADEQ - PAYSON WELL S

	Hr	T(F)	RH		Spd		Dir
ADEQ - PAYSON WELL S	12	74	19		11		SW
	1	72	23		11		SW
	2	70	23		9		SW
	3	68	23		6		SW
	4	66	26		6		SW
	5	65	26		7		S
	6	66	24		9		S
	7	67	23		11		S
	8	70	17		12		S
	9	71	16		13		S
	10	72	19		13		SW
	11	73	18		13		SW
	12	74	17		15		SW
	1	74	16		17		SW
	2	74	11		19		SW
	3	72	12		16		SW
	4	70	14		12		SW
	5	70	12		13		SW
	6	69	10		13		W
	7	66	10		10		W
	8	64	11		8		W
	9	61	18		6		NW
	10	59	23		4		NW
	11	56	29		3		N

06 (111.97Wx33.07N) 05/21/08

06-MARICOPA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
06-MARICOPA	12	75	29	0	5	8	SE
	1	73	30	0	4	8	SE
	2	72	29	0	4	8	SE
	3	70	30	0	5	11	SE
	4	69	29	0	5	9	SE
	5	68	29	0	7	13	SE
	6	73	25	0	10	18	S
	7	79	19	0	16	26	S
	8	83	17	0	17	26	S
	9	88	13	0	17	27	SW
	10	90	12	0	20	33	SW
	11	90	14	0	20	32	W
	12	90	12	0	22	41	W
	1	90	12	0	22	33	W
	2	90	11	0	22	35	W
	3	90	10	0	21	35	W
	4	89	10	0	20	37	W
	5	88	10	0	17	27	W
	6	85	11	0	17	26	W
	7	83	10	0	13	22	W
	8	80	10	0	8	15	W
	9	77	12	0	9	16	W
	10	76	18	0	9	16	SW
	11	74	25	0	12	20	W

05 (111.60Wx32.98N) 05/21/08

05-COOLIDGE

	Hr	T(F)	RH	Rn	Spd	Max	Dir
05-COOLIDGE	12	73	33	0	5	8	S
	1	66	50	0	5	9	SE
	2	66	44	0	5	8	S
	3	65	46	0	6	8	S
	4	64	46	0	5	7	SW
	5	64	41	0	4	8	SW
	6	66	43	0	4	7	S
	7	75	34	0	8	18	S
	8	82	17	0	15	26	S
	9	86	15	0	16	26	SW
	10	88	14	0	17	26	SW
	11	90	14	0	18	28	SW
	12	91	12	0	19	33	SW
	1	91	12	0	20	31	W
	2	90	13	0	18	31	W
	3	89	13	0	19	30	W
	4	88	11	0	21	32	W
	5	86	12	0	19	30	W
	6	84	12	0	18	28	W
	7	82	13	0	16	26	W
	8	80	12	0	13	22	W
	9	79	11	0	13	26	W
	10	74	27	0	14	24	SW
	11	71	38	0	16	24	SW

04 (109.68Wx32.81N) 05/21/08

04-SAFFORD

	Hr	T(F)	RH	Rn	Spd	Max	Dir
04-SAFFORD	12	82	15	0	10	21	NW
	1	81	16	0	14	21	NW
	2	79	18	0	11	21	NW
	3	76	19	0	5	10	W
	4	67	27	0	4	9	S
	5	64	28	0	6	13	SE
	6	69	25	0	5	12	E
	7	78	18	0	5	9	N
	8	85	12	0	6	16	N
	9	88	10	0	7	16	N
	10	90	8	0	7	17	W
	11	93	6	0	15	28	SW
	12	90	7	0	9	26	SW
	1	93	6	0	15	26	SW
	2	93	6	0	16	30	SW
	3	92	7	0	18	31	W
	4	91	8	0	19	45	W
	5	88	9	0	21	33	W
	6	83	10	0	22	36	W
	7	79	11	0	28	39	NW
	8	76	12	0	25	36	NW
	9	75	15	0	23	34	NW
	10	70	21	0	11	26	NW
	11	68	27	0	18	30	NW

Appendix M: EVENT METEOROLOGICAL / AIR QUALITY TABLES

13 (111.23Wx32.46N) 05/21/08

13-MARANA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
13-MARANA	12	79	19	0	1	4	N
	1	71	26	0	3	6	E
	2	69	29	0	3	7	E
	3	68	31	0	3	8	E
	4	67	28	0	2	5	E
	5	68	26	0	1	5	E
	6	72	24	0	4	10	E
	7	82	14	0	12	24	S
	8	85	11	0	17	25	S
	9	88	10	0	16	29	S
	10	91	9	0	17	26	SW
	11	93	8	0	19	30	SW
	12	94	8	0	22	35	W
	1	94	8	0	23	36	SW
	2	93	9	0	25	37	SW
	3	92	9	0	24	35	SW
	4	89	10	0	24	37	W
	5	86	10	0	21	30	W
	6	83	11	0	20	29	W
	7	80	13	0	18	27	W
	8	77	16	0	14	23	SW
	9	74	22	0	14	21	SW
	10	72	23	0	13	21	SW
	11	71	26	0	10	16	SW

01 (110.95Wx32.28N) 05/21/08

01-TUCSON

	Hr	T(F)	RH	Rn	Spd	Max	Dir
01-TUCSON	12	76	24	0	1	6	E
	1	73	26	0	3	5	E
	2	70	30	0	2	5	E
	3	69	31	0	4	5	E
	4	68	32	0	4	8	E
	5	66	33	0	5	10	E
	6	70	29	0	4	10	E
	7	81	15	0	7	19	SE
	8	84	11	0	10	21	S
	9	87	10	0	10	20	S
	10	88	9	0	13	22	SW
	11	89	10	0	12	21	SW
	12	90	8	0	14	30	SW
	1	91	8	0	15	30	SW
	2	91	9	0	15	26	SW
	3	90	9	0	18	34	SW
	4	88	10	0	19	33	W
	5	87	9	0	17	28	W
	6	84	9	0	14	26	W
	7	80	12	0	16	29	W
	8	77	14	0	16	30	W
	9	75	19	0	11	22	SW
	10	72	23	0	10	21	SW
	11	70	26	0	8	16	SW

09 (109.93Wx32.46N) 05/21/08

09-BONITA

	Hr	T(F)	RH	Rn	Spd	Max	Dir
09-BONITA	12	67	31	0	7	10	NW
	1	68	31	0	5	12	NW
	2	63	35	0	5	8	N
	3	61	34	0	5	10	NE
	4	56	43	0	4	8	NE
	5	56	44	0	3	7	NE
	6	64	34	0	5	10	SE
	7	71	24	0	2	6	S
	8	78	13	0	15	31	SW
	9	82	10	0	18	27	SW
	10	84	8	0	19	38	SW
	11	84	8	0	23	38	SW
	12	85	8	0	17	35	SW
	1	86	8	0	17	36	SW
	2	86	8	0	22	43	SW
	3	85	9	0	32	50	W
	4	83	11	0	29	41	W
	5	80	12	0	26	43	W
	6	76	14	0	24	34	W
	7	73	13	0	21	32	W
	8	69	16	0	17	30	W
	9	68	19	0	19	30	W
	10	65	23	0	19	30	W
	11	63	23	0	15	30	SW

23160 (110.96Wx32.13N) 05/21/08

NWS-TUCSON INTL

	Hr	T(F)	VR	Dust	Spd	Max	Dir
NWS-TUCSON INTL	12	82	10		9	20	S
	1	79	10		8		S
	2	79	10		8		S
	3	76	10		7		SE
	4	73	10		3		E
	5	70	10		5		E
	6	80	10		9		SW
	7	82	10		23	29	SW
	8	85	10		23	37	SW
	9	87	10		26	34	S
	10	91	10		20	29	SW
	11	91	10		20	31	SW
	12	92	10		25	33	SW
	1	92	10		26	37	SW
	2	92	10		26	45	SW
	3	90	10		25	37	SW
	4	88	10		30	38	W
	5	86	10		20	37	SW
	6	83	10		21	30	W
	7	79	10		16	23	W
	8	75	10		15	22	SW
	9	72	10		16	24	SW
	10	70	10		14	25	SW
	11	69	10		15	30	S

34 (109.73Wx32.05N) 05/21/08

34-KANSAS SETTLEMENT

	Hr	T(F)	RH	Rn	Spd	Max	Dir
34-KANSAS SETTLEMENT	12	64	37	0	6	14	SE
	1	64	37	0	3	6	S
	2	60	45	0	5	9	SE
	3	56	49	0	5	9	SE
	4	57	42	0	8	12	SE
	5	56	48	0	8	14	SE
	6	60	45	0	12	18	SE
	7	69	32	0	15	21	SE
	8	75	25	0	16	25	S
	9	79	21	0	14	29	SW
	10	80	18	0	20	36	SW
	11	81	15	0	26	37	SW
	12	82	14	0	30	43	SW
	1	82	15	0	30	44	SW
	2	82	15	0	28	43	SW
	3	81	17	0	33	53	SW
	4	80	18	0	38	53	SW
	5	77	18	0	37	49	SW
	6	74	20	0	29	42	SW
	7	72	23	0	27	37	SW
	8	70	24	0	25	37	SW
	9	68	26	0	22	34	SW
	10	65	27	0	18	34	SW
	11	60	30	0	12	20	SW

33 (109.48Wx32.33N) 05/21/08

33-BOWIE

	Hr	T(F)	RH	Rn	Spd	Max	Dir
33-BOWIE	12	73	23	0	2	8	NW
	1	71	24	0	3	9	W
	2	72	23	0	4	9	W
	3	70	24	0	6	9	W
	4	66	28	0	4	8	W
	5	64	29	0	4	8	W
	6	67	31	0	3	8	W
	7	79	17	0	6	22	S
	8	84	12	0	12	22	SW
	9	85	11	0	15	26	SW
	10	86	10	0	17	31	SW
	11	87	8	0	22	41	SW
	12	88	8	0	19	35	SW
	1	89	8	0	26	44	SW
	2	88	9	0	23	41	SW
	3	86	11	0	22	37	SW
	4	85	13	0	21	38	SW
	5	83	13	0	22	36	SW
	6	81	14	0	20	36	SW
	7	79	15	0	22	38	SW
	8	76	18	0	18	33	SW
	9	74	18	0	15	27	SW
	10	70	20	0	11	21	W
	11	68	21	0	12	22	SW

128562 (111.01Wx31.83N) 05/21/08

ADEQ - GREEN VALLEY

	Hr			PM	Spd		Dir
ADEQ - GREEN VALLEY	12			20	9		SW
	1			16	9		W
	2			9	9		W
	3			10	9		SW
	4			9	10		SW
	5			8	11		SW
	6			20	11		SW
	7			41	17		SW
	8				21		SW
	9			60	22		SW
	10				21		SW
	11			25	20		SW
	12			65	24		SW
	1			116	26		SW
	2			63	25		SW
	3			86	27		SW
	4			121	26		SW
	5			51	22		SW
	6			103	22		SW
	7			133	19		SW
	8			133	15		SW
	9			38	15		SW
	10			42	8		SW
	11			32	9		SW

16511 (110.94Wx31.34N) 05/21/08

ADEQ - NOGALES POST

	Hr			PM	Spd		Dir
ADEQ - NOGALES POST	12			46	4		SE
	1			37	3		S
	2			51	3		SW
	3			50	4		S
	4			32	4		S
	5			37	4		S
	6			57	5		S
	7			112	7		S
	8			139	9		S
	9			178	13		SW
	10			142	14		SW
	11			109	13		S
	12			156	13		S
	1			192	14		S
	2				14		S
	3			203	13		S
	4			125	14		SW
	5			169	15		SW
	6			89	12		SW
	7			97	11		SW
	8			126	9		SW
	9			49	7		SW
	10			41	6		S
	11			31	5		S

16361 (109.55Wx31.33N) 05/21/08

ADEQ - AGUA PRIETA F

	Hr	T(F)	RH		Spd		Dir
ADEQ - AGUA PRIETA F	12	77	17		4		NW
	1	76	17		2		NW
	2	75	17		2		W
	3	71	21		2		E
	4	69	21		2		SE
	5	69	21		6		S
	6	70	24		7		S
	7	76	18		10		S
	8	79	18		11		S
	9	82	13		16		S
	10	82	13		19		S
	11	85	11		17		SW
	12	85	10		18		S
	1	87	9		20		SW
	2	86	10		19		S
	3	85	11		19		S
	4	84	11		20		SW
	5	82	9		20		S
	6	79	12		18		S
	7	76	14		15		S
	8	74	14		14		S
	9	71	14		13		S
	10	69	20		9		S
	11	68	26		11		S

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Appendix N

Event Visibility Camera Images

For May 21, 2008

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Phoenix Visibility Network Cameras

The visibility cameras aimed at South Mountain, the Estrella Mountains, and Camelback Mountain capture images every 15 minutes. Both the South Mountain and Estrella Mountains cameras are oriented looking south, while the Camelback Mountain camera is oriented looking northeast. The Estrella Mountains camera shows the southwestern portions of the Valley, looking toward the Salt River channel upwind of the West 43rd Ave. monitor. The South Mountain Camera shows downtown Phoenix with South Mountain in the background as well as a portion of the Estrella Mountains in the extreme upper right hand corner of the camera view. On May 21, 2008, all three cameras' images showed reductions in visibility beginning in the late morning and continuing throughout the afternoon. Because winds were out of a westerly/southwesterly direction, the dust causing the reduction in visibility captured by the South Mountain and Estrella Mountains cameras comes in from the right hand side of the images, and the dust seen in the Camelback Mountain images is coming from behind and slightly left of the camera's view.

The upper right hand portion of the South Mountain images depicts the area of near West 43rd Ave. and provides an opportunity to see any windblown dust propagating down the Salt River channel in front of the Estrella Mountains and South Mountain. Due to the importance of that portion of the images, and in order to better see the area, images were zoomed in to allow for a closer, more detailed look (pages 4-5). In examining these images, it is apparent that there was a large amount of dust moving down the Salt River channel (from right to left in the images) beginning in the morning and continuing throughout the afternoon hours of May 21, 2008. Not only are the Estrella Mountains in the background almost completely obscured, but much of the foreground is obscured as well.

The full South Mountain images (pages 6-7) first clearly show increases in windblown dust during the 8:00 a.m. and 9:00 a.m. hours when windblown dust can be seen moving into the images from right to left (west to east). This timing is consistent with the onset of strong winds gusting over 30 mph and with elevated PM_{10} levels at the West 43rd Ave. monitor. The images show continued deceases in visibility through the morning and into the afternoon with the South Mountain and the Estrella Mountains becoming fully obscured by about 1:15 p.m. Visibility does not greatly improve through nightfall, and this is consistent with the elevated PM_{10} values that were recorded through about 7:00 p.m. at the West 43rd Ave. monitor. The extremely poor visibility is also consistent with the strong winds which reached gusts of at least 30 mph each hour of the afternoon through about 7:00 p.m.

The Estrella Mountains images (pages 10-11) begin to show an obvious reduction in visibility during the 9:00 a.m. hour as windblown dust moves into the images from the west. Visibility continues to worsen through the morning and into the afternoon. In particular, the 12:30 p.m. and 1:30 p.m. images show significant increases in dust, almost completely obscuring the Estrella Mountains lasting for the duration of the afternoon. During the period from 9:00 a.m. through about 7:00 p.m., wind gusts were consistently greater than 25 mph throughout the Phoenix area and were frequently gusting well above 30 mph at numerous monitoring sites. The timing of reduced visibility in these images is consistent with the onset and continuation of elevated PM_{10} levels and elevated winds recorded at the West 43rd Ave. monitor site on May 21, 2008.

The Camelback Mountain images (pages 8-9) were included to show the continued propagation of dust from west to east across the Valley. Visibility there also decreases in the morning and then again throughout the afternoon.

Appendix N - South Mountain Camera – (Zoomed View)
May 21, 2008 - 8:00 a.m. to 12:00 p.m.

View of pristine conditions in the frame of South Mountain and Estrella Mountain from the South Mountain Camera located on North Mountain looking south. Peak in the far ground, visible in the photograph, is in the Estrella range. The south end of the Estrella range is 26.1 miles from the camera and is not visible on the map. South Mountain is at a range of 17 to 20 miles.		

8:00 a.m.	8:15 a.m.	8:30 a.m.	8:45a.m.
			
9:00 a.m.	9:15 a.m.	9:30 a.m.	9:45 a.m.
			
10:00 a.m.	10:15 a.m.	10:30 a.m.	10:45 a.m.
		Image unavailable	
11:00 a.m.	11:15 a.m.	11:30 a.m.	11:45 p.m.
			

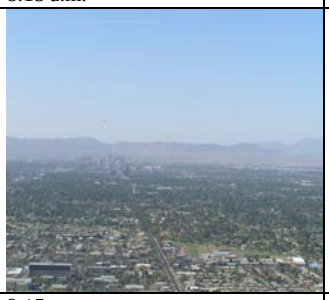
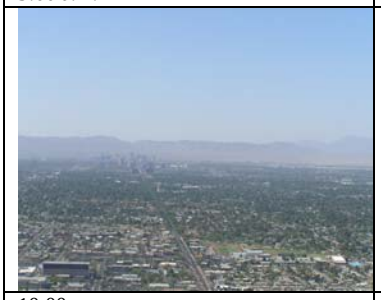
Appendix N - South Mountain Camera – (Zoomed View)
May 21, 2008 - 12:00 p.m. to 4:00 p.m.

View of pristine conditions in the frame of South Mountain and Estrella Mountain from the South Mountain Camera located on North Mountain looking south. Peak in the far ground, visible in the photograph, is in the Estrella range. The south end of the Estrella range is 26.1 miles from the camera and is not visible on the map. South Mountain is at a range of 17 to 20 miles.		

12:00 p.m.	12:15 p.m.	12:30 p.m.	12:45 p.m.
			
1:00 p.m.	1:15 p.m.	1:30 p.m.	1:45 p.m.
			
2:00 p.m.	2:15 p.m.	2:30 p.m.	2:45 p.m.
			
3:00 p.m.	3:15 p.m.	3:30 p.m.	3:45 p.m.
			

Appendix N - South Mountain Camera – May 21, 2008 – 8:00 a.m. to 12:00 p.m.

View of Pristine Conditions from the South Mountain Camera located on North Mountain looking toward the downtown Phoenix area with South Mountain visible in the background. Peak in the far ground, visible in the photograph, is in the Estrella range. The south end of the Estrella range is 26.1 miles from the camera and is not visible on the map. South Mountain is at a range of 17 to 20 miles.		

8:00 a.m.	8:15 a.m.	8:30 a.m.	8:45 a.m.
			
9:00 a.m.	9:15 a.m.	9:30 a.m.	9:45 a.m.
			
10:00 a.m.	10:15 a.m.	10:30 a.m.	10:45 a.m.
		Image unavailable	
11:00 a.m.	11:15 a.m.	11:30 a.m.	11:45 a.m.
			

Appendix N - South Mountain Camera – May 21, 2008 – 12:00 p.m. to 4:00 p.m.

View of Pristine Conditions from the South Mountain Camera located on North Mountain looking toward the downtown Phoenix area with South Mountain visible in the background. Peak in the far ground, visible in the photograph, is in the Estrella range. The south end of the Estrella range is 26.1 miles from the camera and is not visible on the map. South Mountain is at a range of 17 to 20 miles.		

12:00 p.m.	12:15 p.m.	12:30 p.m.	12:45 p.m.
			
1:00 p.m.	1:15 p.m.	1:30 p.m.	1:45 p.m.
			
2:00 p.m.	2:15 p.m.	2:30 p.m.	2:45 p.m.
			
3:00 p.m.	3:15 p.m.	3:30 p.m.	3:45 p.m.
			

Appendix N – Camelback Mtn Camera – May 21, 2008 - 8:00 a.m. to 12:00 p.m.

View of Pristine Conditions from the Camelback Mtn Camera on the ADEQ building in Central Phoenix looking northeast at Camelback Mountain.		

8:00 a.m.	8:15 a.m.	8:30 a.m.	8:45 a.m.
		Image unavailable	
9:00 a.m.	9:15 a.m.	9:30 a.m.	9:45 a.m.
			
10:00 a.m.	10:15 a.m.	10:30 a.m.	10:45 a.m.
			
11:00 a.m.	11:15 a.m.	11:30 a.m.	11:45 p.m.
			

Appendix N – Camelback Mtn Camera – May 21, 2008 - 12:00 p.m. to 4:00 p.m.

View of Pristine Conditions from the Camelback Mtn Camera on the ADEQ building in Central Phoenix looking northeast at Camelback Mountain.		

12:00 p.m.	12:15 p.m.	12:30 p.m.	12:45 p.m.
			
1:00 p.m.	1:15 p.m.	1:30 p.m.	1:45 p.m.
			
2:00 p.m.	2:15 p.m.	2:30 p.m.	2:45 p.m.
			
3:00 p.m.	3:15 p.m.	3:30 p.m.	3:45 p.m.
			

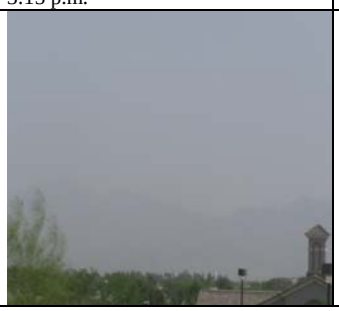
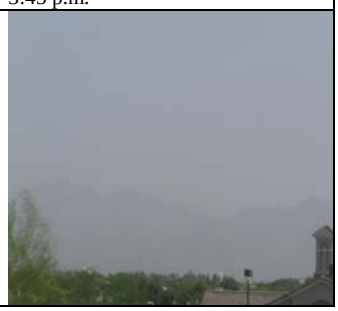
Appendix N – Estrella Camera – May 21, 2008 - 8:00 a.m. to 12:00 p.m.

View of Pristine Conditions from the Estrella Camera in the West Valley looking south at the Sierra Estrella.		

8:00 a.m.	8:15 a.m.	8:30 a.m.	8:45 a.m.
			
9:00 a.m.	9:15 a.m.	9:30 a.m.	9:45 a.m.
			
10:00 a.m.	10:15 a.m.	10:30 a.m.	10:45 a.m.
			
11:00 a.m.	11:15 a.m.	11:30 a.m.	11:45 a.m.
			

Appendix N – Estrella Camera – May 21, 2008 - 12:00 p.m. to 4:00 p.m.

View of Pristine Conditions from the Estrella Camera in the West Valley looking south at the Sierra Estrella.		

12:00 p.m.	12:15 p.m.	12:30 p.m.	12:45 p.m.
			
1:00 p.m.	1:15 p.m.	1:30 p.m.	1:45 p.m.
			
2:00 p.m.	2:15 p.m.	2:30 p.m.	2:45 p.m.
			
3:00 p.m.	3:15 p.m.	3:30 p.m.	3:45 p.m.
			

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Appendix O
Event Source Contribution Assessment

APPENDIX O

EVENT SOURCE CONTRIBUTION ASSESSMENT

Windblown Emission Analyses
West 43rd Avenue Monitor
May 21, 2008

Introduction

The recording of several exceedances of the federal 24-hour PM_{10} ambient air quality standard at the West 43rd Avenue monitoring station in Phoenix in 2008 has focused new attention on the question of contributing sources in the Salt River area. All of the exceedances in question occurred during high wind events, with peak hourly PM_{10} concentrations correlating with highest wind velocity hours. This correlation strongly implicates windblown dust as a primary contributor to measured PM_{10} concentrations. Previous analyses of the wind trajectories leading to the monitoring site immediately prior to peak hourly PM_{10} levels on each of four exceedance days reveal that lands likely to generate the monitored dust lie to the west-southwest of the monitoring site. To evaluate the categories and emission significance of lands contributing to windblown dust loads, a sequence of analyses was conducted by the Maricopa Association of Governments (MAG) and Sierra Research.

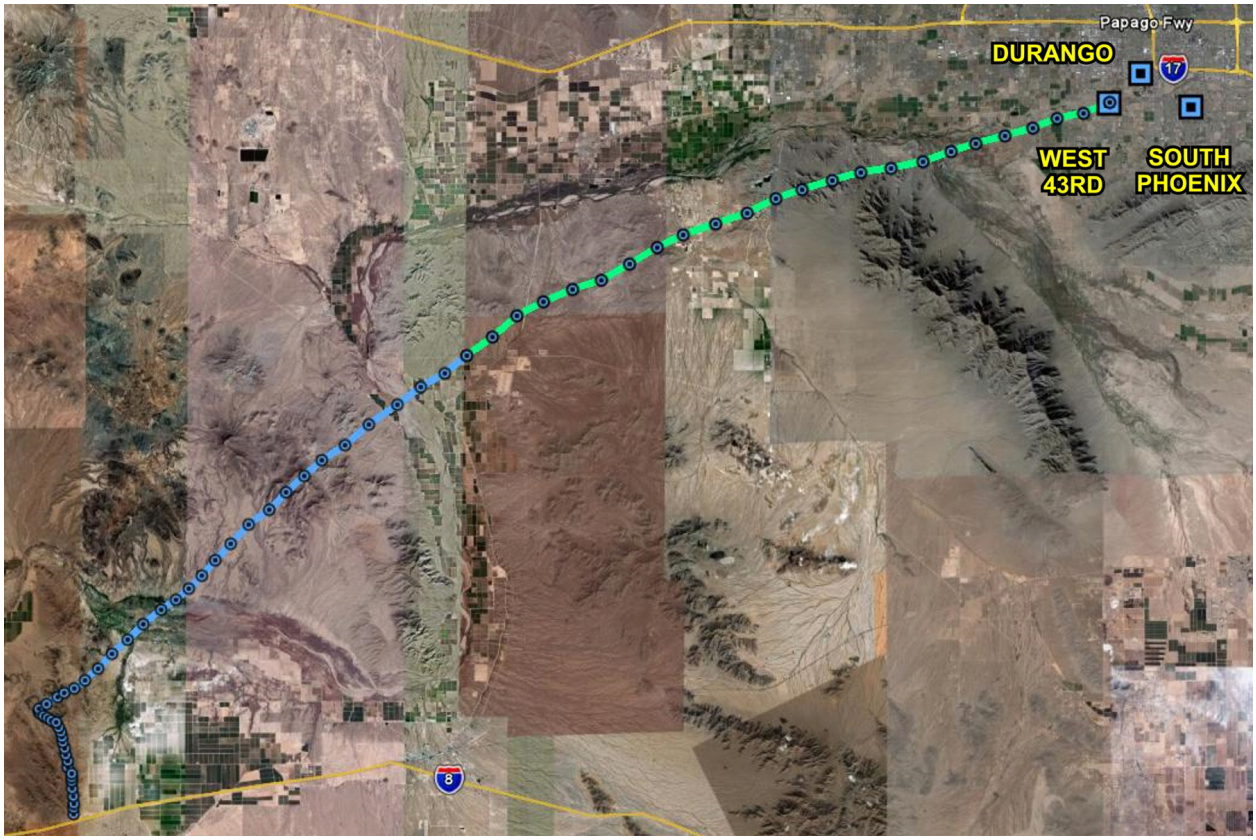
Contributing Land Uses

A MAG analysis of land uses began with work done by Sierra Research to study circumstances causing PM_{10} exceedances at a critical Salt River area air quality monitoring site operated by the Maricopa County Air Quality Department (MCAQD). Sierra Research plotted wind parcel back-trajectories from the West 43rd Avenue monitoring station starting from the peak PM_{10} hour on each of four exceedances days in 2008. These days are March 14, April 30, May 21, and June 4, 2008. The back-trajectories were plotted in 5-minute links based on 5-minute average wind speed and wind direction data recorded at the West 43rd Avenue station by MCAQD. The back-trajectory plot for May 21, as an example, is shown in Figure 1. These back-trajectories revealed that winds accompanying peak PM_{10} concentrations typically blew from the west-southwest to the West 43rd Avenue station, crossing a mosaic of agricultural, residential, industrial, and riverbed lands.

MAG staff used land use GIS files to determine the zoned uses of all lands within ½ mile of each back-trajectory track over which wind parcels travelled during the two hours prior to delivering the peak PM_{10} concentration to the West 43rd Avenue monitor. Lands under active construction on each exceedance day were identified from MCAQD earthmoving permit records. Parcel areas were aggregated within seven general categories for which limited emission factor data were available: vacant, agriculture, construction, open/restricted access, riverbed, sand and gravel/landfill, and other lands. The uses of these land categories are generally defined as follows:

- Vacant – represents undeveloped land to which public access is not restricted;
- Agriculture – represents lands under agricultural cultivation;
- Construction – represents lands being developed for long term use that will include ground coverage elements such as pavement, structures, or landscaping that will prevent the generation of windblown dust;
- Passive/restricted open space – represents undeveloped or partially developed lands to which public vehicular access is restricted (these lands include public parks, national forests, military posts, and Indian reservations);
- Riverbed – represents riverbed channels of the Salt and Gila River branches;
- Landfill/sand and gravel – represents lands being used for mineral extraction or waste deposit;
- Other – represents developed lands that are protected from windblown dust generation by elements such as paving, structures, and landscaping.

Figure 1
May 21, 2008, Back-Trajectory



These categories correspond to those used in the windblown dust emission inventory published in the MCAQD's 2008 Periodic PM_{10} Emission Inventory[1] with the exception of the riverbed category, which was split out from the passive/restricted open space category and reported separately. The separate reporting and analysis of windblown emissions from riverbed lands was deemed necessary because of the finer soil texture and higher emission rate in comparison to other restricted open space lands, and because of the high prevalence of riverbed lands in the zones along the mapped back-trajectories.

The total acreages reported within each of these seven categories within ½ mile of the wind back-trajectory for the two hours preceding the peak PM_{10} concentrations recorded at the West 43rd Avenue monitoring station on each of the exceedance days are shown in Table 1.

Table 1
Total Acreage Within ½ Mile of May 21, 2008, Back-Trajectory by Land Use Category

Category	1st Hour	2nd Hour
Vacant	1,372	8,480
Agriculture	794	242
Construction	117	144
Passive/Restricted	4	128
Riverbed	3,039	75
Sand & Gravel	624	5
Other	4,933	1,582
Total	10,883	10,657

Windblown dust emissions on these lands are controlled by MCAQD Rules 310, 310.01, and 316. Under these rules, disturbed soil surfaces are to be stabilized to reduce windblown emissions. When wind speeds are high, however, even stabilized soil surfaces will produce windblown emissions, but at lower rates than non-stabilized soils. Periodically, MCAQD conducts compliance surveys of lands regulated by these rules. The most recent compliance analysis is published in the Department's 2008 PM_{10} Periodic Emission Inventory.[2] The compliance analysis reports rule effectiveness rates for each of the three rules and compliance rates with agricultural best management practices on agricultural lands. These rule effectiveness rates were used in this analysis, as was done in the windblown dust portion of the 2008 PM_{10} Periodic Emission Inventory (2008 PEI), to represent the fractions of stabilized and non-stabilized lands in each land use category. A listing of the 2008 rule effectiveness rates by rule and affected land use category are shown in Table 2.

[1] 2008 PM10 Periodic Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area, Appendix 4, Windblown Dust Emission Estimates Methodology, Final Draft, Maricopa County Air Quality Department, June 2010.
[2] 2008 PM10 Periodic Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area, Appendix 3, Final Draft, Maricopa County Air Quality Department, June 2010

Table 2 Rule Effectiveness Rates from 2008 PM_{10} Periodic Emission Inventory			
Rule Number	Affected Land Use Categories	Stabilized Fraction	Non-Stabilized Fraction
310	Construction	82.99%	17.01%
310.01	Vacant, Open/Restricted,	80.76%	19.24%
316	Sand and Gravel/ Landfill	49.62%	50.38%
Best Management Practices	Agricultural	55.33%	44.67%

The stabilized and non-stabilized fractions reported in the 2008 PEI were used to split appropriate land use acreages along each back-trajectory into stabilized and non-stabilized subtotals. However, further evaluation of the agricultural data revealed that compliance fractions related to controls applied to lands that were exposed with wind erosion and not covered with protective crops or crop residues. As a result, MAG staff conducted an independent analysis of the months during which protective crops were being grown on lands within ½ mile of each back-trajectory. This analysis shows much of the land in each back-trajectory zone was being used to cultivate alfalfa during the exceedance days, which fully protected these lands from wind erosion and greatly reduced emissions from agricultural lands in the aggregate. For other crops, the analysis quantified the acreage within each back-trajectory zone devoted to each of 8 other crop types, and determined the monthly activity calendar for each crop showing the months during which tilling, planting, irrigating, crop growth, and harvesting activities occurred. These data were used to refine the estimates of stabilized and non-stabilized land fractions for agricultural lands on each exceedance day. For purposes of calculating the stabilized and non-stabilized fractions of agricultural lands as a whole, we assumed that:

- lands being tilled, planted, or harvested were disturbed;
- lands with emergent growth of alfalfa, corn, grain, hay, or sorghum were undisturbed (by virtue of the continuous soil coverage provided by these crop);
- lands being cultivated for cotton, orchards, or vegetables were disturbed through the cultivation cycle (by virtue of the lack of soil coverage afforded by these crops);
- fallow lands were disturbed; and
- all disturbed agricultural lands were subject to partial control through application of the compliance fractions reported in the 2008 PEI.

Table 3 shows these data for the May 21, 2008, back-trajectory zone. Because the database used for this analysis (Arizona Cotton Research and Protection Council GIS Data) was different from that used in the original quantification of back-trajectory land use acreages, the totals of agricultural lands within the back-trajectory zones are somewhat different. Because of the high threshold friction velocities needed to generate emissions from both undisturbed and disturbed agricultural lands, these differences do not affect the resulting land category contributions to windblown PM_{10}. The full results of the MAG analysis are presented in Attachment 1.

Table 3 Crop Type Status and Acreage in May 21, 2008, Back-Trajectory Zone					
Crop	Cultivation Status	Total Acres		Disturbed Acres	
		1st Hour	2nd Hour	1st Hour	2nd Hour
Cotton	Irrigating	0	0	0	0
Alfalfa	Crop in Field	623	0		
Corn	Crop in Field	0	0		
Fallow	No Activity	34	0	34	0
Grain	Crop in Field	132	0		
Hay	Crop in Field	0	0		
Orchard	Crop in Field	0	0	0	0
Sorghum	No Activity	0	0	0	0
Vegetable	Crop in Field	0	0	0	0
Total		789	0	34	0
Non-Compliance Fraction				44.67%	44.67%
Net Disturbed Acres				15	0
Net Disturbed Faction				1.92%	0.00%

When the refined agricultural disturbed land fractions are combined with the rule effectiveness rates from the 2008 PEI, the resulting acreages of undisturbed and disturbed lands with each land use category were calculated and are shown in Table 4 for the May 21, 2008, back-trajectory.

Table 4 Acreage by Land Use Category and Stability Status Within ½ Mile of May 21, 2008, Back-Trajectory			
Land Use Category/ Stability Status	Fraction of Land Use Category Total Acreage	May 21, 2008	
		1st Hour, Acres	2nd Hour, Acres
Vacant/Undisturbed	80.76%	1,110	6,858
Vacant/Disturbed	19.24%	263	1,622
Agriculture/Undisturbed	98.08%/100.00% (1st/2nd hr)	778	242
Agriculture/Disturbed	1.92%/0.00% (1st/2nd hr)	15	0
Construction/Undisturbed	82.99%	97	120
Construction/Disturbed	17.01%	20	25
Passive-Restricted/ Undisturbed	80.76%	3	104
Passive-Restricted/Disturbed	19.24%	1	25
Riverbed/Undisturbed	80.76%	2,458	61
Riverbed/Disturbed	19.24%	581	14
Sand & Gravel/Undisturbed	49.62%	505	4
Sand & Gravel/Disturbed	50.38%	119	1
Other	100.00%	4,933	1,582
Subtotal/Undisturbed		9,884	8,970
Subtotal/Disturbed		999	1,687
Total		10,883	10,657

Windblown PM_{10} Emission Equations by Land Use

The windblown PM_{10} emissions of each land use category during each high wind transport hour were computed as a product of two factors: (1) a PM_{10} emission factor, in units of pounds of emission per hour per acre, specific to the land use category and 5-minute average wind velocities within each back-trajectory hour; and (2) the acreage by land use category within ½ mile on either side of the back-trajectory wind path for each hour studied. The windblown PM_{10} emission factor by land use category was derived from data published in a paper by W.A. Nickling and J.A. Gillies that described the 1985 wind tunnel emission testing conducted on exposed soils in desert portions of Arizona.[3] Nickling and Gillies fitted their research data to the classical Prandtl equation for near-surface wind velocity profiles.[4] This equation relates wind speed at any height above ground to the friction velocity and roughness height specific to the soil surface. The friction velocity is the coefficient of a logarithmic equation relating wind velocity to height above the ground. The friction velocity, or slope of the wind velocity curve, is itself a function of the wind velocity. The soil roughness height is the maximum height above the soil surface at which the wind velocity remains zero due to the sheltering effects of surface roughness. Research by Bagnold and others has found that wind erosion of surface soil particles commences at a minimum threshold wind velocity, and below this velocity wind erosion emissions are effectively zero.[5] Nickling and Gillies measured threshold velocities at each of 13 test sites and converted these values to equivalent threshold wind speeds measured at a 10-meter height (the typical height above ground for wind velocity sensors) using the Prandtl equation. Based on these data, Nickling and Gillies formulated emission factor equations for each of five land use categories: desert lands, riverbed (fluvial) lands, construction sites, mine tailing lands, and agricultural lands. The emission factors were developed by regression analysis as power equations using the computed friction velocity as an independent variable. These equations are presented in Table 5.

Table 5
Nickling and Gillies Windblown PM_{10} Emission Factor Equations by Land Use Category

Land Use Category	PM_{10} Emission Factor Equation, gm/cm^2-sec
Natural and disturbed desert	$F = 7.99 \times 10^{-13} u_*^{2.99}$
Fluvial sites	$F = 1.59 \times 10^{-13} u_*^{3.32}$
Construction sites	$F = 5.82 \times 10^{-15} u_*^{4.24}$
Mine tailings	$F = 1.59 \times 10^{-12} u_*^{2.93}$
Agricultural lands	$F = 1.445 \times 10^{-18} u_*^{6.026}$

[3] Evaluation of Aerosol Production Potential of Type Surfaces in Arizona, prepared for Engineering-Science by W.G. Nickling and J.A. Gillies, for EPA Contract No. 68-02-380, September 1986

[4] Meteorologische Anwendung der Stromungslehre, Beitr. Phys. D. Freien Atm., vol. XIX, pp. 188-202, L. Prandtl, 1932

[5] The Physics of Blown Sand and Desert Dunes, R.A. Bagnold, Morrow Press, New York, 1941

The friction velocity is calculated through the Prandtl equation as a function of the roughness height and the wind velocity measured at a 10-meter height. The modified Prandtl equation used in this analysis is:

$$u_* = (u_z * k)/\ln(z/z_0)$$

where:

u_* = friction velocity, cm/sec
u_z = measured wind velocity at z height = 10-meter height, cm/sec
k = von Karman coefficient, ~= 0.4
z = height of wind measurement = 10 meters
z_0 = roughness height, cm

The roughness heights and threshold friction velocities reported by Nickling and Gillies for each of the 13 sites tested are shown in Table 6. This table also reports the threshold friction velocities in units of miles per hour measured at a 10-meter height for comparison with wind velocities reported at the West 43rd Avenue monitoring station.

Table 6
Nickling and Gillies Windblown PM_{10} Emission Factor Constants

Location	Land Use Category	Roughness Height Z_0, cm	Threshold Friction Velocity @Z_0, m/s	Threshold Friction Velocity @10 m., m/s	Threshold Friction Velocity @10 m., mph
Yuma, AZ	Scrub Desert	0.0163	0.386	11.33	25.3
Yuma, AZ	Disturbed Scrub Desert	0.0731	0.320	8.11	18.1
Algodones, CA	Dune Flats	0.0166	0.625	18.31	41.0
Mesa, AZ	Agricultural	0.0331	0.569	15.63	35.0
Yuma, AZ	Agricultural	0.0224	0.582	16.59	37.1
Maricopa, AZ	Agricultural	0.1255	0.578	13.82	30.9
Casa Grande, AZ	Abandoned Agricultural	0.0067	0.246	7.80	17.4
Tucson, AZ	Santa Cruz River Terrace	0.0204	0.180	5.18	11.6
Mesa, AZ	Salt River Channel	0.0100	0.218	6.68	14.9
Ajo, AZ	Mine Tailings	0.0176	0.228	6.65	14.9
Hayden, AZ	Mine Tailings	0.0141	0.172	5.11	11.4
Glendale, AZ	Construction Site	0.0301	0.530	14.69	32.9
Tucson, AZ	Construction Site	0.0181	0.251	7.26	16.2

The Nickling and Gillies study contains substantial information about each site tested. A discussion of how this information was used to select roughness heights and threshold friction velocities for undisturbed and disturbed lands within each land use category found in the exceedance day back-trajectory zones is presented in Attachment 2. The emission factor equations, together with the roughness heights and threshold friction velocities, used to compute emissions for each land use category, are shown in Table 7.

Table 7
PM_{10} Emission Equations and Coefficients Selected to Represent Land Use Categories

Land Use Category	Roughness Height Z_o, (cm)	Threshold Friction Velocity (mph)	PM_{10} Emission Factor Equation
Vacant – Undisturbed	0.0163	25.3	$F = 7.99 \times 10^{-13} u_*^{2.99}$
Vacant – Disturbed	0.0731	18.1	$F = 7.99 \times 10^{-13} u_*^{2.99}$
Agriculture – Undisturbed	0.0067	17.4	$F = 1.445 \times 10^{-18} u_*^{6.026}$
Agriculture – Disturbed	0.0278	41.2	$F = 1.445 \times 10^{-18} u_*^{6.026}$
Construction – Undisturbed	0.0163	25.3	$F = 5.82 \times 10^{-15} u_*^{4.24}$
Construction – Disturbed	0.0241	28.2	$F = 5.82 \times 10^{-15} u_*^{4.24}$
Passive/Restricted - Undisturbed	0.0163	25.3	$F = 7.99 \times 10^{-13} u_*^{2.99}$
Passive/Restricted - Disturbed	0.0731	18.1	$F = 7.99 \times 10^{-13} u_*^{2.99}$
River Terrain - Undisturbed	0.0100	14.9	$F = 1.59 \times 10^{-13} u_*^{3.32}$
River Terrain – Disturbed	0.0204	11.6	$F = 1.59 \times 10^{-13} u_*^{3.32}$
Sand & Gravel – Undisturbed	0.0163	25.3	$F = 1.59 \times 10^{-12} u_*^{2.93}$
Sand & Gravel - Disturbed	0.0731	18.1	$F = 1.59 \times 10^{-12} u_*^{2.93}$

PM_{10} Emissions by Anthropogenic and Nonanthropogenic Sources

PM_{10} emissions were calculated for each back-trajectory hour using emission factors derived from the Nickling and Gillies data, 5-minute wind speed averages recorded at the West 43rd Avenue monitoring station, and the land use acreage along each back-trajectory computed by MAG staff.

The emission factor equations were used to compute PM_{10} emissions for each 5-minute portion of each back-trajectory hour. For each 5-minute period, the measured average wind speed was compared to the threshold friction velocity calculated at a 10-meter height to determine whether the threshold wind speed necessary to the generation of windblown PM_{10} on each land use, undisturbed and disturbed, had been exceeded. If the threshold velocity was exceeded, the appropriate Nickling and Gillies emission factor equation was used to compute PM_{10} emissions in units of gm/cm^2-sec. Emissions for each 5-minute period within each hour and within each land use category were converted to units of lb/acre-hr and then summed to produce hourly average PM_{10} emission rates per land use category. A sample calculation of the hourly average emission rate from vacant-disturbed lands using the 5-minute average wind speeds measured during the first back-trajectory hour on May 21, 2008, is presented in Table 8. The emission rates for the other land use categories and the 2nd hour were calculated using a similar methodology.

The land use category emission rates were then multiplied by the acreages within each appropriate land use category to derive PM_{10} emissions for each back-trajectory hour by land use category. A sample land use category emission calculation for the first back-trajectory of May 21, 2008, is presented in Table 9. The appearance of zeros as PM_{10} emission rates resulted when

none of the 5-minute wind speed averages exceeded the threshold friction velocity for that land use category.

Table 8
Average Hourly PM_{10} Rate for Vacant-Disturbed Land on 1st Hour of May 21, 2008, Back-Trajectory

5-Minute Segment	Average Wind Speed (mph)	PM_{10} Emission Rate (lb/acre-hr)
09:00-09:05	18.4	10.21
09:05-09:10	18.8	10.89
09:10-09:15	17.4	0.00
09:15-09:20	18.4	10.21
09:20-09:25	17.6	0.00
09:25-09:30	18.9	11.07
09:30-09:35	18.7	10.72
09:35-09:40	16.8	0.00
09:40-09:45	19.9	12.91
09:45-09:50	19.4	11.96
09:50-09:55	18.7	10.72
09:55-10:00	16.1	0.00
Average	18.3	7.39

Table 9
Land Use Category PM_{10} Emissions for 1st Back-Trajectory Hour of May 21, 2008

Land Use Category	PM_{10} Emission Factor (lb/ac-hr)	Area Within Back-Trajectory Zone (ac)	PM_{10} Emissions (lb/hr)
Vacant/Undisturbed	0.00	1,109.9	0
Vacant/Disturbed	7.39	262.5	1,941
Agriculture/Undisturbed	0.00	778.5	0
Agriculture/Disturbed	0.00	15.3	0
Construction/Undisturbed	0.00	96.8	0
Construction/Disturbed	3.29	19.8	65
Passive-Restricted/Undisturbed	0.00	3.2	0
Passive-Restricted/Disturbed	7.39	0.8	6
Riverbed/Undisturbed	3.44	2,457.7	8,452
Riverbed/Disturbed	4.25	581.4	2,472
Sand & Gravel/Undisturbed	0.00	504.8	0
Sand & Gravel/Disturbed	7.39	119.4	883
Other	0.00	4,933.3	0
Total		10,883.4	13,818

EPA guidance on exceptional event determinations requires the analysis of emissions from anthropogenic sources.[6] The land use categories shown in Table 9 were grouped within anthropogenic and nonanthropogenic categories, and the hourly PM_{10} emissions within each of these groupings were summed to assess the fractional contribution of anthropogenic and nonanthropogenic sources to peak hourly PM_{10} concentrations measured on exceedance days at the West 43rd Avenue site. The groupings of anthropogenic and nonanthropogenic land use categories are shown in Table 10.

The PM_{10} emissions for each of the two back-trajectory hours on each exceedance day were summed together to calculate total emissions over each exceedance day back-trajectory by land use category. These land use category emissions were then grouped by anthropogenic and nonanthropogenic categories to assess the relative contribution of nonanthropogenic sources to exceedances recorded at the West 43rd Avenue monitoring station during 2008. A summary of the results of these calculations for the May 21, 2008, exceedance day is presented in Table 11.

Table 10
Anthropogenic and Nonanthropogenic Land Use Categories

Land Use Category	Anthropogenic	Nonanthropogenic
Vacant/Undisturbed		X
Vacant/Disturbed	X	
Agriculture/Undisturbed	X	
Agriculture/Disturbed	X	
Construction/Undisturbed	X	
Construction/Disturbed	X	
Passive-Restricted/Undisturbed		X
Passive-Restricted/Disturbed	X	
Riverbed/Undisturbed		X
Riverbed/Disturbed	X	
Sand & Gravel/Undisturbed	X	
Sand & Gravel/Disturbed	X	
Other	X	

[6] Federal Register/ Vol. l72, No. 55, Thursday, March 22,2007/ Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule.

Table 11 Anthropogenic and Nonanthropogenic Windblown PM_{10} Emissions From West 43rd Avenue Monitor Back-Trajectory Lands on May 21, 2008			
	PM_{10} Emissions (lb)		% of
Land Use Category	Anthropogenic	Nonanthropogenic	Anthropogenic
Vacant/Undisturbed	-	0	
Vacant/Disturbed	4,841	-	57.6%
Agriculture/Undisturbed	0	-	0.0%
Agriculture/Disturbed	0	-	0.0%
Construction/Undisturbed	0	-	0.0%
Construction/Disturbed	113	-	1.3%
Passive-Restricted/Undisturbed	-	0	
Passive-Restricted/Disturbed	49	-	0.6%
Riverbed/Undisturbed	-	8,603	
Riverbed/Disturbed	2,519	-	30.0%
Sand & Gravel/Undisturbed	0	-	0.0%
Sand & Gravel/Disturbed	884	-	10.5%
Other		-	
Total	8,407	8,603	
% of Grand Total	49.4%	50.6%	

Attachment 1

Analysis of Agricultural Crop Coverage and Cultivation Calendars in the Salt River Area

Table 1 Disturbed and Undisturbed Agricultural Crop Acreage for One-Mile Swath of Trajectory (1/2 mile each side)

	3/14/2008		4/30/2008		5/21/2008		6/4/2008	
	1st HR	2nd HR	1st HR	2nd HR	1st HR	2nd HR	1st HR	2nd HR
Disturbed Agriculture (Acre)								
COTTON	577	1,090	0	0	0	0	0	0
GRAIN	0	0	0	0	0	0	317	0
Disturbed Total	**577**	**1,090**	**0**	**0**	**0**	**0**	**317**	**0**
Undisturbed Agriculture (Acre)								
ALFALFA	4,377	5,856	499	0	623	0	692	0
CORN	26	108	0	0	0	0	0	0
COTTON	0	0	0	0	0	0		
FALLOW	251	78	0	0	34	0	52	0
GRAIN	668	1,314	0	0	132	0	0	0
HAY	268	0	0	0	0	0	93	0
ORCHARD	38	0	0	0	0	0	0	0
SORGHUM	0	0	0	0	0	0	0	0
VEGETABLE	0	0	0	0	0	0	0	0
Undisturbed Total	**5,628**	**7,356**	**499**	**0**	**789**	**0**	**836**	**0**

Agricultural Area Data Source: Arizona Cotton Research and Protection Council (ACRPC) GIS Data.

DRAFT **Crop Calendar for Maricopa County**												
(Usual Field Activity by Month and Crop)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Alfalfa[1]												
Corn - Silage[1]												
Cotton[1]												
Grain[2]												
Orchard[3]												
Hay[2]												
Sorghum - Grain[3]												
Vegetables[1]												
Days of Interest			**3/14/08**	**4/16/08** **4/30/08**		**6/4/08**						

Field Activities Legend	
• Tilling =	
• Planting =	
• Irrigated =	
• Crop in Field =	
• Harvest =	
• No Activity =	

Notes

1. Salt River PM-10 TSD (2003 meetings with Maricopa County Farm Bureau and U of A Cooperative Extension).

2. "Usual Planting and Harvesting Dates for U.S. Crops", Agricultural Handbook Number 628, USDA, ARS, NASS, December 1997.

3. Communication with Maricopa County Farm Bureau, May 11, 2010. In 2008, sorghum was grown for grain instead of silage. Common practice is to plant sorghum in July in the same field that corn had been harvested from in July, with little tillage.

4. Cotton fields must be plowed down by February 15th and cannot be irrigated until March 15th as required by Pink Bollworm Program.

5. Planting - fields are either irrigated prior to planting or shortly after planting.

Attachment 2

Use of Nickling and Gillies Test Data in Characterizing Emission Potential of Salt River Area Lands

The Nickling and Gillies study of windblown PM_{10} emissions from Arizona lands under different use patterns constitutes the best available information on the emission potential of undeveloped lands upwind of the W. 43rd Avenue monitoring station.[7] The challenge in using the data was to best match the surface soil conditions found at the 13 sampling sites in 1985 with conditions existing at lands upwind of the monitoring station in 2008. This appendix discusses how these matches were developed.

Critical Parameters

As discussed in the report, Nickling and Gillies fit their field data to the classical Prandtl wind velocity equation and a series of power equations relating PM_{10} emissions to wind velocity. The Prandtl equation assumes a logarithmic relationship between wind velocity and the height above ground surface at which the wind velocity is measured. The coefficient linking these two parameters is referred to as the friction velocity (u_*). Nickling and Gillies developed PM_{10} emission factor equations for five different land use categories that use the friction velocity as the sole independent variable. A second Prandtl equation coefficient, that dictates the magnitude of the friction velocity, is the soil roughness height (Zo) at the point of wind velocity measurement. The soil roughness height is calculated from wind velocity profile measurements and represents the height below which the wind velocity is effectively zero due to the sheltering effects of soil surface elements.

The final parameter of significance in computing windblown PM_{10} emission rates is the threshold friction velocity. This is the velocity above which shear forces on the soil surface commence the saltating, or bouncing, movement of sand particles that is the primary mechanism for the dislodgement and entrainment into the air of fine soil particles. At wind speeds below the threshold friction velocity, no windblown PM10 emissions are generated.

Land Use Categories Tested

Nickling and Gillies conducted wind tunnel emission studies on five categories of land use:

- desert lands,
- fluvial, or riverbed, lands,
- construction sites,

[7] Evaluation of Aerosol Production Potential of Type Surfaces in Arizona, prepared for Engineering-Science by W.G. Nickling and J.A. Gillies, for EPA Contract No. 68-02-380, September 1986

- mine tailing piles, and
- agricultural lands.

Of the 13 sites tested among these land use categories, most were fairly disturbed. Only two of the test sites were relatively undisturbed: a scrub desert site near Yuma, AZ, and an abandoned farm near Casa Grande, AZ. The lack of test data from undisturbed sites offered one of the more significant challenges in using Nickling and Gillies test data to represent disturbed and undisturbed portions of lands upwind of the W. 43rd Avenue station.

Desert Lands

One of the more expansive land use categories, in terms of acres of undeveloped land along wind back-trajectories impacting the monitoring station, is vacant lands. This category includes lands that are not in productive use, but which are partially disturbed by human trespass. Much of the land within this category constitutes open desert. As a result, the surface soil characteristics of lands within this category were assumed to be very similar to those in the "desert" category tested by Nickling and Gillies. Nickling and Gillies tested two desert soil sites near Yuma, AZ, one of which had been disturbed by off-road vehicle traffic and one of which was relatively undisturbed by anthropogenic activities.

The undisturbed site was located on federal land under the control of the U.S. Bureau of Land Management. The soil surface was crusted, but the crust was extremely delicate and broke with the slightest pressure. Saltating particles easily broke the crust once the wind tunnel tests were initiated. The soil surface contained widely scattered pebble deposits, and was sparsely vegetated with low grasses. This structure is very representative of undisturbed desert soils in the Salt River area.

The disturbed site was located within the University of Arizona's Agricultural Research Station at Yuma. The surface soil was very loose from vehicle disturbance and also sparsely vegetated with low grasses. Data from these two sites were used to represent undisturbed and disturbed vacant lands in the Salt River area, respectively.

A second related land use category identified in the back-trajectory zones upwind of the W. 43rd Avenue monitoring station was restricted access open areas. Access to these lands is limited by fencing, barriers, active enforcement, or other means. Land that fill within this category include parks, military lands, national forest land, and privately owned fenced lands. Because the surface soils on these lands are essentially desert soils, the soil characteristics of these lands were also represented by the desert soils test data collected by Nickling and Gillies.

Finally, Nickling and Gillies also conducted testing of windblown emissions from sand dunes in the Algodones Dunes area near Brawley, CA. Because there are no sand dunes of significance within the Salt River area, these test data were not used to represent surface soil conditions for any land use category in this analysis.

Fluvial Sites

Fluvial, or riverbed, lands typically contain higher concentrations of fine silts than alluvial desert lands, and are capable of higher PM_{10} emission rates at lower threshold friction velocities as a result. Nickling and Gillies tested two riverbed sites, one on the Salt River channel near Mesa, AZ, and a second on the Santa Cruz River channel near Tucson, AZ.

Both riverbed sites were somewhat disturbed. The Salt River test site was located in the river channel among large silt lenses in an area heavily disturbed by vehicle traffic. The Santa Cruz River site, however, was located on a terrace above the main channel and was moderately disturbed. The soil in this latter site also contained small gravel particles that provided limited wind sheltering to exposed silt.

On the basis of the descriptions in the Nickling and Gillies report, the Salt River test site data was selected to represent disturbed riverbed soils, and the Santa Cruz River data was used to represent undisturbed soils. Because of the higher silt content of the fluvial soils, the characteristics of undisturbed desert soils were not considered to be similar to those of undisturbed riverbed sites.

Construction Sites

Two construction sites were tested by Nickling and Gillies, one in Glendale, AZ, and a second in Tucson, AZ. The Glendale site was being developed the west campus of the Arizona State University, and had been severely disturbed by earthmoving equipment, but had also been heavily watered as part of a dust control operation. During testing, the soil surface was found to have formed a crust from water application that increased the threshold friction velocity and reduced the windblown PM_{10} emission rate. Data from this site was used to represent undisturbed construction sites in the Salt River area.

The Tucson site was located on the south side of I-10, where a major motel complex was being constructed. The site had been leveled by earthmoving equipment and the surface soil was heavily pulverized. The soil surface at this site contained more loose particles than the Glendale site, apparently as a result of less dust control watering and more recent vehicle disturbance. Data collected at this site, as a result, was used to represent disturbed construction lands along the back-trajectories upwind of the W. 43rd Avenue monitor.

Mine Tailings

Two mine tailings piles were tested by Nickling and Gillies. Emissions from these structures were of interest because of the high silt content of the finely ground mill waste, and the lack of any sheltering vegetation or larger particles on the surfaces of these piles. One of the piles tested was on the property of the Phelps-Dodge Company in Ajo, AZ, and the second was located near Hayden, AZ.

The Ajo tailings had very little cohesive structure on the surface, resulting in high PM10 emissions rates at low threshold velocities. The Hayden tailings possessed greater cementation and greater variability in particle size, but also contained a higher silt content than the Ajo tailings. The higher silt content appeared to provide a slight crust when the tailings surfaces were watered and then allowed to dry.

The very fine and uniform particle sizes of soils in these tailing piles are unlike any soils found in the Salt River area. The tailing piles were formed through the pulverization of quarried rock to release precious minerals, especially copper, through chemical extraction. No soils or rock in the Salt River area are processed to this degree, or in any other fashion to produce such fine, noncohesive material. As a result, the test data from these sites were not used to represent any of the undeveloped lands in the Salt River area.

The mining of riverbed material for use as sand and gravel in the construction industry is a significant land use in the Salt River area. In this process however, silt is an undesirable by-product, and material processing operations are designed to produce a minimum of this fine material. Much of the exposed surface at sand and gravel mines capable of generating windblown PM10 is actually desert soil upon which processing operations are located. As a result, the surface soil characteristics of these sites were represented by the disturbed and undisturbed desert land data collected by Nickling and Gillies.

Agricultural Lands

Nickling and Gillies conducted emissions tests on three active and one abandoned farm site in 1985. The active sites were located near Mesa, Yuma, and Maricopa, AZ, and the abandoned farm site was located near Casa Grande, AZ. Soil conditions related to windblown emissions at the farms in the Mesa and Yuma areas were found to be relatively similar. These sites were characterized as having been recently tilled and awaiting planting. No dust control measures had been applied at either site, and the soil surface was somewhat cloddy from the recent plowing. The active farming site at Maricopa was found to have been recently tilled while the soil had been relatively damp, resulting in large, dried clods on the soil surface that were heavily crusted and responsible for a relatively high surface roughness. As a result, the test data from the Maricopa site were substantially different from data collected at the other two active sites. Because of this difference, and the unique conditions found at the Maricopa site, the data from this site were not used to represent soil conditions on agricultural lands in the Salt River area. Instead, the data collected at Mesa and Yuma were averaged together to represent these lands.

The abandoned farm land near Casa Grande, AZ, was also unusual compared to lands found in the Salt River area. The Casa Grande site had not been cultivated for a number of years, and the soil surface showed significance evidence of wind erosion and a return to desert conditions. Additionally, however, lands in this portion of Pinal County are known to have high alkaline contents – hence their abandonment from cultivation – and high windblown dust potential. Because of these unique properties, data collected at this site by Nickling and Gillies were not used to represent any land use category in the Salt River area.

Separate analyses of crop coverages and cultivation calendars in the Salt River area have found that significant fractions of agricultural lands are covered by maturing crops during the high wind season in the spring of each year. As a result, soil surface characteristics for lands with cover crops – such as alfalfa, corn, and grains – were estimated using classical protocols. The roughness height for these lands was calculated to be $1/30^{th}$ of the height of the lowest continuous crop, which is 3 inches for freshly mowed alfalfa, resulting in a roughness height of 0.254 cm. The friction velocity for vegetated fields was assumed to be the same as that measured on disturbed fields by Nickling and Gillies. The resulting calculated threshold friction velocity of 34.1 mph at a 10-meter height for undisturbed fields was found to be less than the value of 41.2 mph measured on disturbed fields, meaning that this approach resulted in a conservatively low calculated value that would not underestimate the emissions from undisturbed fields.

Appendix P
Event Control Measures Report

APPENDIX P

EVENT CONTROL MEASURES REPORT

PM_{10} Control Measures Reporting Form
High Wind Exceptional Event Demonstration

Date of Flagged Event: May 21, 2008

PM_{10} Planning Area: Maricopa County PM_{10} Nonattainment Area

Exceeding Monitor(s): West 43rd Ave.

AQI/High Wind/Dust Forecast (rolling three-day forecast) issued?

Yes	No
X	

Type: PM_{10} Health Watch (issued the day prior)

In the spaces below, please provide information about the 72-hour period preceding the event, the day of the event, and the 72-hour period following the event. For a list of control measures for the planning area, see back of this form. Account for minimum 2-mile area around exceeding monitor(s). Please attach additional information if necessary.

Complaints:
- May 20, 2008: One (1) complaint inspection of dust control permit; no violations of Rule 310 were observed.

Inspections:
- May 19, 2008: Two (2) inspections of dust control permits; no violations of Rule 310 were observed at either location.
- May 20, 2008: Two (2) inspections of dust control permits: one site was inactive but stable; no violations of Rule 310 were observed at other location.
- May 21, 2008: Two (2) inspections of dust control permits; no violations of Rule 310 were observed at either location.
- May 22, 2008: Two (2) inspections of dust control permits; no violations of Rule 310 were observed.
- May 23, 2008: One (1) inspection of a vacant lot; no violations of Rule 310.01 were observed.

Notices or Enforcement Actions:
(None identified within the timeframe and geographic area included in this analysis.)

Regulating Agency: Maricopa County Air Quality Department

Information Supplied By: Jo Crumbaker, Planning & Analysis Division Manager

Date Completed: August 6, 2010

Measures included in the Maricopa County PM_{10} Five Percent Plan:
(committed measure numbers in parentheses)

1. Extensive dust control training program (2).
2. Dust managers/Coordinators at earthmoving sites < than or equal to 5 acres (3,16).
3. Increase proactive Rule 310 and 316 inspections (9, 10, 44).
4. Strengthen Rule 310 to promote continuous compliance (36 thru 38, 28).
5. Conduct nighttime and weekend inspections (8).
6. Ban leaf blowers from blowing debris into streets (21).
7. Prohibit use of leaf blowers on unstabilized surfaces (45).
8. Implement a leaf blower outreach program (22).
9. Ban ATV use on high pollution advisory days (23).
10. Pave or stabilize existing unpaved parking lots (25).
11. Pave or stabilize unpaved road shoulders (28).
12. Strengthen and increase enforcement of Rule 310.01 for vacant lots (31, 32)
13. Recover costs for stabilizing vacant lots (33).
14. Restrict and enforce vehicle use/parking on vacant lots (31, 32).
15. Increase fines for open burning (34).
16. Restrict use of outdoor fireplaces/pits/ambience fireplaces (35).
17. Other wood burning restrictions in SB 1552 (47, 48).
18. Repave or overlay paved roads with rubberized asphalt (53).

Emission Source Categories:
1. Agriculture – Agricultural Best Management Practices (AgBMP) Program.
2. Point sources – Permit Conditions (stack, fugitive, and area source emissions).
3. Construction – Rules 310 and 310.01; sand and gravel – Rule 316.
4. Windblown, area sources – mobile, roadway, vacant lots, fires, et al.

Appendix Q
Event Preliminary Assessment & Notification

Preliminary Notification of Exceptional Event
Submitted April 30, 2008

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Janice K. Brewer
Governor

Benjamin H. Grumbles
Director

June 30, 2009

Electronic Submittal (to be followed by U.S. Mail)

Deborah Jordan, Air Division Director
U.S. Environmental Protection Agency, Region IX
Air-1
75 Hawthorne Street
San Francisco, CA 94105

SUBJECT: Submittal of Preliminary Documenation of Exceptional/Natural Events in Arizona, 2008 and Request for Concurrence

Dear Ms. Jordan:

The purpose of this letter is to notify the Environmental Protection Agency (EPA) of information regarding exceptional events that resulted in exceedances of the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS), or the Limited Maintenance Plan threshold concentration, throughout the State of Arizona during 2008. After preliminary investigations of the unusual nature of the exceedances, the Arizona Department of Environmental Quality (ADEQ) is has determined that the aforementioned sample data are exceptional events in the Air Quality Subsystem (AQS) database. The events that have been flagged in AQS, and for which preliminary documentation is being submitted with this letter, are listed in Table 1 (enclosed).

Attached to this letter are the preliminary assessment reports or documentation for the exceptional events (Enclosure 1 binder). These events qualify for flagging under ADEQ's Air Quality Natural and Exceptional Events Policy - Policy Number 2009.001, Rev 002 (NEEP). This policy was revised on June 22, 2007, after a multiple month stakeholder process and transmitted to you on June 23, 2007. These analyses rely upon the "Technical Criteria Document for Determination of Natural and Exception Event" finalized on December 12, 2005. ADEQ concludes it is important to exclude these readings because of their exceptional causes. ADEQ will be requesting EPA to provide written concurrence with the flagging determinations after the final demonstrations are submitted in the near future. ADEQ is working with your staff to add certain components to our assessment reports to improve clarity of the reports. These should be finalized in the next few months.

Enclosure 2 (CD) is a compact disc containing an electronic copy of the exceptional/natural event analyses in Enclosure 1. Those who are being copied on this letter will only receive Enclosures 2.

All of these events have been made available for informal public review and comment at stakeholder meetings, consistent with the requirement in our NEEP to hold such meetings prior to finalizing the attached assessments. Please note that prior to submittal of the final documentation for these events, the final demonstration reports will be made available for a formal 30-day public review and comment period as required by the Federal Exceptional Events Rule (EER).

If you have any questions related to this request, please do not hesitate to contact me at (602) 771-2308 or Steven Peplau, Air Quality Assessment Manager, at (602) 771-2274.

Sincerely,

Nancy C. Wrona, Director
Air Quality Division

Enclosures (2)

NCW:AJ:mbl

Cc: Colleen McKaughan, USEPA, Region IX (w/Enclosure 2)
John Kelley, USEPA, Region IX (w/Enclosure 2)
Coleman Owen, USEPA, Region IX (w/Enclosure 2)
Lawrence Odle, Director, MCAQD (w/Enclosure 2)
Don Gabrielson, PCAQCD (w/Enclsoure 2)
Mack Luckie, YMPO (w/Enclosure 2)

INDEX OF 2008 EXCEPTIONAL EVENTS
PRELIMINARY DOCUMENTATION

TAB	Agency *	Date	Monitor (Operator/Type)	AQS ID **	24-hr Avg PM_{10} (or $PM_{2.5}$)	Maximum Winds	Nature of Event
1	ADEQ	1/1/2008	Nogales Post Office PM2.5 (ADEQ/BAM)	04-023-0004	52	Calm	Smoke from Mexico
	ADEQ	1/1/2008	Nogales Post Office (PM2.5 FRM primary)	04-023-0004	47	Calm	Smoke from Mexico
	ADEQ	1/1/2008	Nogales Post Office (PM2.5 FRM collocated)	04-023-0004	47	Calm	Smoke from Mexico
2	ADEQ	1/26/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	204	Calm	Dust from Mexico
3	ADEQ	2/27/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	166	Calm	Dust from Mexico
4	MCAQD	3/2/2008	Buckeye (Maricopa Co. [MC]/TEOM)	04-013-4011	160	36 mph	Frontal system passage
	ADEQ	3/2/2008	Yuma Courthouse (ADEQ/TEOM)	04-027-0004	161	46 mph	Frontal system passage
5	MCAQD	3/14/2008	West 43rd Ave (MC/TEOM)	04-013-4009	251	43 mph	Low pressure trough
6	MCAQD	4/16/2008	West 43rd Ave (MC/TEOM)	04-013-4009	155	28 mph	Frontal system passage
7	MCAQD	4/30/2008	West 43rd Ave (MC/TEOM)	04-013-4009	173	41 mph	Frontal system passage
8	ADEQ	5/12/2008	Paul Spur (ADEQ/FRM - Primary)	04-003-0011 (1)	160	34 mph	Frontal system passage
	ADEQ	5/12/2008	Paul Spur (ADEQ/FRM - Collocated)	04-003-0011 (2)	156	34 mph	Frontal system passage
9	ADEQ	5/18/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	169	Calm	Dust from Mexico
10	MCAQD	5/21/2008	West 43rd Ave (MC/TEOM)	04-013-4009	279	37 mph	Frontal system passage
	ADEQ	5/21/2008	Yuma Courthouse (ADEQ/TEOM)	04-027-0004	164	37 mph	Frontal system passage
11	ADEQ	5/22/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	217	49 mph	Frontal system passage
12	MCAQD	6/4/2008	Yuma Courthouse (ADEQ/TEOM)	04-027-0004	386	40 mph	Frontal system passage
	MCAQD	6/4/2008	Buckeye (Maricopa Co. [MC]/TEOM)	04-013-4011	204	40 mph	Frontal system passage
	MCAQD	6/4/2008	West 43rd Ave (MC/TEOM)	04-013-4009	194	40 mph	Frontal system passage
	ADEQ	6/4/2008	Coyote Lakes (MC/TEOM)	04-013-4014	187	40 mph	Frontal system passage
13	MCAQD	7/1/2008	Buckeye (Maricopa Co. [MC]/TEOM)	04-013-4011	172	49 mph	Monsoon Storm
14	MCAQD	7/4/2008	Buckeye (Maricopa Co. [MC]/TEOM)	04-013-4011	223	39 mph	Monsoon Storm
15	MCAQD	10/11/2008	South Phoenix (Maricopa Co. [MC]/TEOM)	04-013-4003	162	34 mph	Frontal system passage
16	MCAQD	10/22/2008	Coyote Lakes (MC/TEOM)	04-013-4014	168	35 mph	Strong pressure gradient
17	ADEQ	10/26/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	157	Calm	International transport
18	PDEQ	10/27/2008	Santa Clara (R&P 2000)	04-019-1026	173	46 mph	Strong pressure gradient
19	ADEQ	10/31/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	159	Calm	International transport
	ADEQ	11/1/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	234	Calm	International transport
20	MCAQD	11/7/2008	Durango (Maricopa Co. [MC]/TEOM)	04-013-9812	249	Calm	Ag-related exceedance (cannot flag)
21	ADEQ	11/8/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	168	Calm	International transport

Public Comment Period
TBA

INDEX OF 2008 EXCEPTIONAL EVENTS
PRELIMINARY DOCUMENTATION

TAB	Agency *	Date	Monitor (Operator/Type)	AQS ID **	24-hr Avg PM_{10} (or $PM_{2.5}$)	Maximum Winds	Nature of Event
21	ADEQ	11/8/2008	Nogales Post Office (PM10 FRM)	04-023-0004	??	Calm	International transport
22	MCAQD	11/9/2008	Durango (Maricopa Co. [MC]/TEOM)	04-013-9812	170	40 mph	High winds
	MCAQD	11/9/2008	South Phoenix (Maricopa Co. [MC]/TEOM)	04-013-4003	230	40 mph	High winds
	MCAQD	11/9/2008	West 43rd Ave (MC/TEOM)	04-013-4009	248	40 mph	High winds
	ADEQ	11/9/2008	Yuma Courthouse (ADEQ/TEOM)	04-027-0004	252	47 mph	High winds
23	ADEQ	11/16/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	171	Calm	International transport
	ADEQ	11/17/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	206	Calm	International transport
24	ADEQ	11/20/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	161	Calm	International transport
25	ADEQ	11/22/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	179	Calm	International transport
26	ADEQ	12/20/2008	Nogales Post Office PM2.5 FRM Primary	04-023-0004	36	Calm	International transport
	ADEQ	12/20/2008	Nogales Post Office PM2.5 FRM Collocated	04-023-0004	37	Calm	International transport
27	ADEQ	12/31/2008	Nogales Post Office (ADEQ/BAM)	04-023-0004	156	Calm	International transport

* Agency: ADEQ – Arizona Department of Environmental Quality
MCAQD – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District

** EPA Air Quality System Identification Number

{LMP Flag} – Value below NAAQS flagged for LMP eligibility

Type Abbreviations: FRM – Federal Reference Method Filter Based Monitor
BAM – Beta-Attenuation Mass Monitor (Continuous monitor)
TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov
Janice K. Brewer
Governor
Benjamin H. Grumbles
Director

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix and Yuma Areas on May 21, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma and Phoenix areas as part of their Natural Events Action Plans. On Tuesday May 20, 2008, in response to an approaching trough of low pressure, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a high risk of wind-blown dust for Wednesday May 21st, in Maricopa County. In anticipation of this potential wind-blown dust event, ADEQ also issued a High Pollution Advisory for Maricopa County for May 21, 2008. The approaching trough was forecast to impact the Yuma area as well, and ADEQ air quality forecasters subsequently called for a high risk of wind-blown dust in their Yuma and Vicinity Dust Control Action Forecast for Wednesday, May 21st. This potential regional high-wind event equated to a significant risk of exceeding the PM_{10} National Ambient Air Quality Standards (NAAQS) in both Yuma and Maricopa County. The forecasts/ advisories satisfy the requirement in 40 CFR 51.930(a)(1).

The forecast for May 21st for both Maricopa County and Yuma called for sustained winds at 20-30 mph with the possibility of gusts greater than 40 mph capable of producing significant wind-blown dust. This potential wind-blown dust event equated to a high risk of exceeding the PM_{10} NAAQS in Maricopa County. Strong winds did occur and were observed in the Phoenix Metro and the Yuma areas on May 21st, 2008. Beginning in the morning and continuing through the evening hours of May 21st, strong southwesterly and westerly winds in Phoenix and strong west-northwesterly winds in Yuma generated areas of blowing dust. All appropriate State Implementation Plan (SIP) control measures were in place during the event, demonstrating per 40 CFR 50.1(j) that the event "is not reasonably controllable or preventable." A discussion of commonly employed Best Available Control Measures (BACM) for dust in Maricopa and Yuma counties can be found in "High Wind Exceptional Events and Control Measures for PM_{10} Areas" (see "References").

The initialization of a wind-blown dust event is evident in the Phoenix visible camera images, as well as the Arizona Meteorological Network (AzMET), Maricopa County (MC), ADEQ, and National Weather Service (NWS) monitors (see Fig. 1). Strong winds gusting over 25 mph and as high as 35 mph at the MC West 43rd monitor location and 37 mph at the NWS Luke Air Force Base were reported. The Yuma Marine Corps Air Stations (MCAS) also measured wind gusts up to 37 mph along with reports of reduced visibility. This significant wind event brought elevated ambient concentrations of PM_{10} to the Phoenix and Yuma areas that exceeded the NAAQS at the West 43rd Ave. and Yuma Courthouse monitors. Due to the spatial variability of PM sources both within and outside of the Phoenix urban core, the PM_{10} NAAQS was only exceeded at the West 43rd monitors operated by Maricopa County, though other Phoenix area monitors did show elevated levels of PM_{10} (see Section 2 for more detail). The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event "affects air quality." The following are the key PM_{10} monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM_{10}	1-hr Max PM_{10}	Max Time	Flag**
YUMA AREA					
Yuma Courthouse (ADEQ/TEOM)	**04-027-0004***	**164**	**504**	**1700**	**RJ**
PHOENIX METRO AREA					
West 43rd Ave (MC/TEOM)	**04-013-4009***	**279**	**1208**	**0900**	**RJ**
Durango Complex (MC/TEOM)	**04-013-9812***	**110**	**310**	**0900**	None
Greenwood (MC/TEOM)	**04-013-3010***	**89**	**219**	**0900**	None
South Phoenix (MC/TEOM)	**04-013-4003***	**122**	**334**	**0900**	None

* EPA Air Quality System Identification Number
** 24-hr PM_{10} concentration influenced by natural or exceptional event to be flagged.
Type Abbreviations: TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

The preliminary findings from this analysis were presented at stakeholders meeting on November 19, 2008, and March 19, 2009, in Phoenix, Arizona. Following the stakeholders meetings, ADEQ supplemented and finalized the analysis and a public comment period was held from October 15, 2009 through November 13, 2009. This finalized document and any comments received are being submitted to EPA to satisfy the requirements in 40 CFR 50.14(c)(3)(i).

NORTH PHOENIX

12-PHX Greenway

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	86	16	-	5	11	SW
2	83	20	-	5	10	SW
3	81	20	-	5	10	SW
4	79	22	-	4	9	SW
5	77	24	-	3	9	S
6	73	29	-	1	3	S
7	76	26	-	1	6	SW
8	79	20	-	6	13	SW
9	81	17	-	9	19	SW
10	82	18	-	11	23	SW
11	84	19	-	11	21	SW
12	85	17	-	11	18	SW
1	87	16	-	12	21	SW
2	88	12	-	12	22	W
3	88	9	-	13	26	SW
4	88	9	-	13	21	SW
5	88	9	-	11	25	W
6	87	8	-	10	18	SW
7	85	9	-	10	19	W
8	82	9	-	8	16	SW
9	81	10	-	7	15	SW
10	79	11	-	6	14	W
11	78	14	-	5	11	NW
12	75	19	-	2	5	W

NWS-Luke AFB

NWS-Luke AFB

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	84	10		14	14	SW
2	80	10		13	13	SW
3	79	10		15	15	SW
4	79	10		14	14	S
5	75	10		7	7	SW
6	75	10		10	10	S
7	77	10		11	11	SW
8	81	10		17	17	SW
9	85	10		20	20	SW
10	86	10		23	23	SW
11	87	10		21	30	SW
12	89	10		21	28	SW
1	91	10		9	34	SW
2	91	10		26	37	W
3	91	10		20	31	W
4	91	10		22	29	W
5	89	10		17	33	W
6	88	10		20	25	W
7	85	10		21	26	SW
8	83	10		16	16	W
9	82	10		16	16	W
10	81	10		18	18	NW
11	78	10		9	9	W
12	78	10		13	13	W

NWS-Yuma MCAS

NWS-Yuma MCAS

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	82	10		0	0	N
2	81	10		7	7	W
3	77	10		6	6	S
4	77	10		3	3	SW
5	74	10		5	5	SW
6	75	10		9	9	W
7	76	10		5	5	W
8	81	10		13	13	W
9	83	10		14	23	NW
10	85	10		16	24	NW
11	87	10		16	16	NW
12	89	9		18	26	W
1	92	9		14	25	NW
2	93	10		16	25	W
3	95	10		17	24	NW
4	95	10		20	30	W
5	91	4	BLDU	29	37	W
6	87	4	BLDU	26	33	W
7	83	9		21	29	W
8	80	9		21	28	W
9	77	10		18	28	W
10	76	10		18	26	W
11	75	10		16	28	W
12	74	10		15	15	W

Event Contrib. Analysis

Hourly PM_{10} Conc. (µg/m^3)

MONITORS:

1-W43RD
2-YUMA CH
3-Mon 3

Monitor:	24-Hr. Avg PM_{10} with Event	w/o Event
1-W43RD	279	66
2-YUMA	164	76

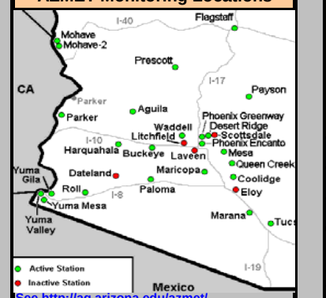
> NAAQS | < NAAQS

Pink=Event Contrib.

Conclusion: As shown above, the PM_{10} concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).

Hr	1	2
1	87	51
2	47	67
3	40	71
4	29	39
5	32	49
6	60	58
7	55	67
8	135	84
9	519	178
10	1208	171
11	601	196
12	413	192
1	535	192
2	837	160
3	735	140
4	255	161
5	225	467
6	243	504
7	263	210
8	105	266
9	77	175
10	69	168
11	58	139
12	70	140

AZMET Monitoring Locations



See http://ag.arizona.edu/azmet/

wnd @3m agl / Dir corrected to true north

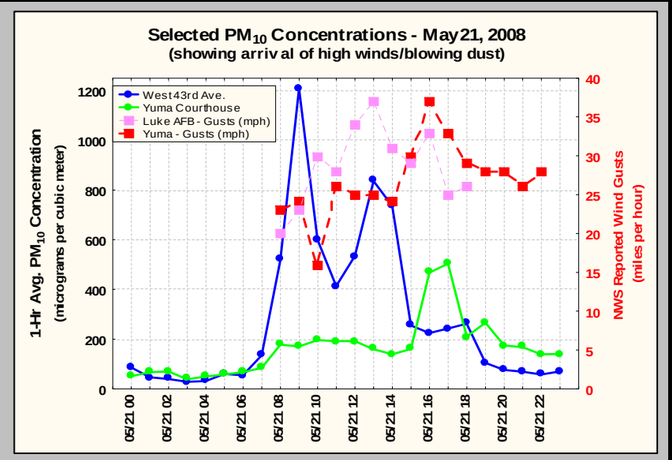
HIGHLIGHTING	Col.	Parameter
Max Wind > 15 mph	T(F)	Temp. (Deg. F.)
>25 mph	RH	Rel Humidity %
HR - Time (End)	Rn	Rain (Inches/hr)
A.M.	Spd	Avg Speed mph
P.M.	Max	Max Speed mph
	Dir	Wind Dir. (from)

Figure 1. Key Data for Event of May 21, 2008

PHX WINDS	KEY	PM10 PLOT
CEN. AZ WINDS		SAT IMAGES
SO AZ WINDS		PHX VIS. CAMERAS

SUMMARY OF EVENT

Between 7:00 a.m. and noon, gusts in the Valley were noted from the south to southwest between 26 to 29 mph at five sites at 9:00 a.m. At 10:00 a.m., winds were from the southwest to west with gusts up to 33 mph.



PARKER

08-Parker

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	79	27	-	12	17	S
2	75	31	-	11	15	S
3	74	31	-	6	11	S
4	74	32	-	7	14	S
5	73	33	-	7	10	S
6	76	27	-	8	17	SW
7	78	25	-	16	28	W
8	78	22	-	18	31	W
9	80	19	-	22	32	NW
10	81	16	-	21	30	NW
11	84	15	-	20	27	NW
12	85	15	-	18	26	NW
1	87	14	-	18	24	NW
2	88	13	-	17	24	NW
3	89	12	-	15	26	W
4	89	12	-	15	26	W
5	87	12	-	13	20	W
6	87	12	-	13	20	W
7	86	13	-	11	19	NW
8	83	13	-	15	25	NW
9	81	14	-	16	26	NW
10	78	15	-	14	22	NW
11	77	16	-	15	23	NW
12	75	16	-	13	18	NW

SOUTHEAST PHOENIX

22-Queen Creek

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	79	24	-	4	7	S
2	70	39	-	3	6	E
3	71	33	-	4	5	SE
4	65	48	-	3	6	S
5	65	44	-	5	7	S
6	63	47	-	4	7	SE
7	69	35	-	5	8	SE
8	76	27	-	8	18	S
9	82	18	-	12	20	S
10	85	13	-	13	24	SW
11	86	15	-	12	25	SW
12	87	17	-	14	26	W
1	87	19	-	15	27	W
2	86	19	-	16	30	W
3	85	18	-	16	27	W
4	86	16	-	16	28	W
5	85	14	-	17	26	W
6	84	12	-	16	27	W
7	82	13	-	13	20	W
8	80	14	-	13	24	W
9	78	12	-	9	16	W
10	77	12	-	8	15	W
11	75	14	-	10	17	W
12	74	21	-	12	19	SW

MARICOPA

06-Maricopa

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	75	29	-	4	6	S
2	73	30	-	3	6	SE
3	72	29	-	3	6	SE
4	71	31	-	4	9	S
5	69	29	-	4	8	SE
6	68	29	-	6	10	S
7	73	25	-	8	15	S
8	79	19	-	13	22	S
9	83	17	-	14	21	S
10	88	13	-	14	22	SW
11	90	12	-	17	27	W
12	90	14	-	17	27	W
1	90	13	-	18	34	W
2	90	12	-	18	27	W
3	90	11	-	18	29	W
4	90	10	-	17	29	W
5	89	10	-	17	30	W
6	88	10	-	14	22	W
7	85	11	-	14	21	W
8	83	11	-	10	18	W
9	80	10	-	6	12	W
10	77	13	-	7	13	W
11	76	18	-	7	13	W
12	74	25	-	10	16	W

Historical Distribution

5-Yr. Dist. of Values (µg/m^3)

MONITORS:

1-WEST FORTY THIR
2-YUMA COURTHOU

Column Index

Yr - All Data (5-Yrs)
Sea - Data for Spring season only (5-Yrs)

Cum. Freq.	Mon 1 Yr	Mon 1 Sea	Mon 2 Yr	Mon 2 Sea
Min	5	8	8	8
0.5%	9	9	12	9
1.0%	11	11	14	14
2.5%	15	13	16	16
5%	19	19	19	19
10%	29	28	23	22
25%	44	46	31	29
50%	65	63	42	40
75%	91	82	57	51
90%	121	107	77	76
95%	139	125	96	109
97.5%	157	134	127	182
99.0%	192	194	186	210
99.5%	227	220	211	212
Max	313	313	349	349
Flagged Value	279		164	

Conclusion: Flagged Value is exceptional

YUMA

02-YumaValley

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	78	19	-	7	18	W
2	73	28	-	4	13	SW
3	68	34	-	3	8	SW
4	68	37	-	5	8	SW
5	62	54	-	2	6	SW
6	64	53	-	4	6	SW
7	67	47	-	4	13	SW
8	77	32	-	11	21	NW
9	78	32	-	13	20	NW
10	80	31	-	13	20	NW
11	82	30	-	15	23	NW
12	83	27	-	15	24	NW
1	86	23	-	13	23	NW
2	87	20	-	12	19	NW
3	89	17	-	13	22	NW
4	89	16	-	14	22	NW
5	86	21	-	20	31	W
6	82	24	-	20	31	W
7	81	26	-	17	23	W
8	77	30	-	16	26	NW
9	74	34	-	13	21	W
10	73	34	-	14	21	NW
11	72	32	-	15	24	NW
12	72	31	-	16	25	NW

PALOMA

19-Paloma

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	72	49	-	6	8	SW
2	71	50	-	6	9	SW
3	71	43	-	6	8	SW
4	69	38	-	6	8	SW
5	73	27	-	9	14	S
6	71	31	-	9	13	SW
7	74	29	-	11	17	SW
8	77	27	-	12	15	SW
9	80	30	-	15	22	SW
10	82	29	-	20	33	SW
11	85	27	-	22	32	W
12	86	23	-	22	31	W
1	87	18	-	21	32	W
2	88	15	-	22	31	W
3	87	17	-	20	29	W
4	88	18	-	19	28	W
5	87	16	-	17	27	W
6	86	17	-	17	26	W
7	84	14	-	13	22	W
8	79	18	-	12	20	W
9	76	28	-	15	20	W
10	74	31	-	15	21	W
11	71	39	-	11	16	SW
12	70	40	-	13	19	W

MARANA

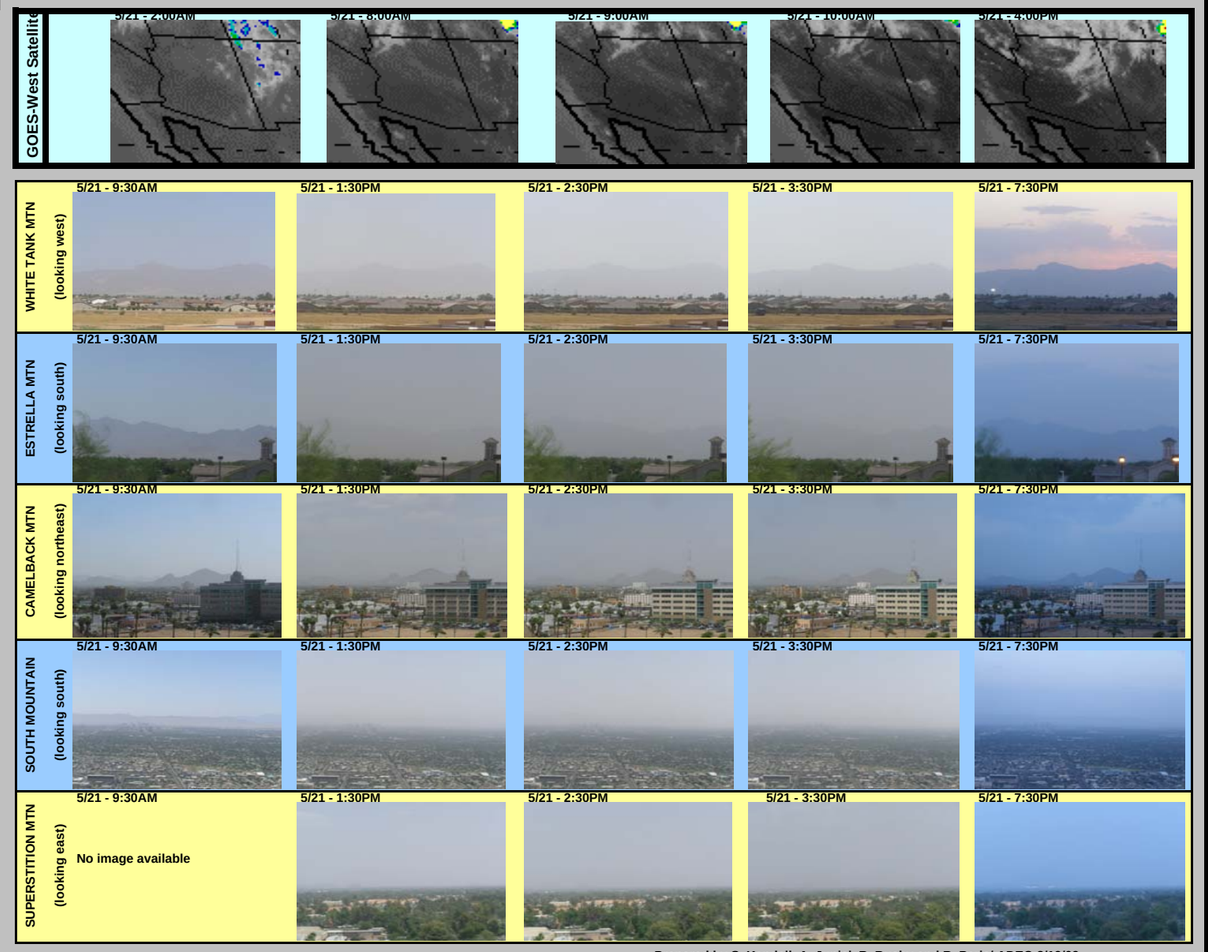
13-Marana

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	79	19	-	1	3	N
2	71	26	-	2	5	E
3	69	29	-	3	6	E
4	67	31	-	2	6	E
5	67	28	-	1	4	E
6	67	26	-	1	4	E
7	72	24	-	3	9	E
8	82	14	-	9	20	S
9	85	11	-	14	21	S
10	88	10	-	13	24	SW
11	91	9	-	14	21	SW
12	93	8	-	16	24	W
1	94	8	-	18	28	W
2	94	8	-	18	30	W
3	93	9	-	21	30	W
4	92	9	-	20	29	W
5	89	10	-	19	30	W
6	86	10	-	17	25	W
7	83	11	-	17	24	W
8	80	13	-	15	22	W
9	77	16	-	11	18	W
10	74	22	-	12	17	SW
11	73	23	-	11	17	SW
12	71	26	-	8	13	SW

TUCSON

01-Tucson

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	76	24	-	1	5	SE
2	73	27	-	3	4	E
3	70	30	-	2	4	E
4	69	31	-	3	4	E
5	68	32	-	4	6	E
6	66	33	-	4	8	E
7	71	29	-	3	8	E
8	81	15	-	6	16	SE
9	84	11	-	8	17	S
10	87	10	-	8	17	SW
11	89	9	-	10	18	SW
12	89	10	-	10	17	SW
1	90	8	-	11	25	SW
2	91	8	-	12	24	SW
3	91	9	-	12	21	SW
4	90	9	-	15	28	W
5	88	10	-	16	27	W
6	87	9	-	14	23	W
7	84	9	-	12	21	W
8	80	12	-	13	24	W
9	77	14	-	13	24	W
10	75	19	-	9	18	SW
11	72	23	-	8	17	SW
12	70	26	-	6	13	SW



Prepared by S. Kendall, A. Juniel, B. Busby and B. Paris/ ADEQ 3/19/09

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM_{10} readings from the West 43rd Ave. and Yuma Courthouse monitoring sites were valid for May 21st. Audits of the analyzers revealed operations were within acceptable tolerance.

2. Review suspected contributing sources. On May 21, 2008, strong westerly to southwesterly winds were occurring in the Phoenix area due to a low pressure system approaching from the west with a cold front passing over Arizona. The high wind event was a regional phenomenon that affected the entire Phoenix Metro area as well as Yuma. However, PM sources are highly variable across space; therefore, the locations of higher PM_{10} concentrations in Phoenix (namely the Salt River channel) are likely an indication that these locations (or areas upwind of these locations) contain greater sources of PM than other locations within the Phoenix Metropolitan area. While no specific source allocation can be determined for this particular day, the 2005 ADEQ revised PM_{10} SIP for the Salt River area (attached) contains modeled source contributions on high wind days (see section 4.2 – Source Categories). Results estimate that approximately 76% of PM_{10} concentrations can be attributed to windblown dust, of which 21% is from agricultural fields, 15% from alluvial channels, and 21% from vacant lots. It is not clear whether similar source allocations can be assumed for this April 30, 2008, high wind event (see attachment for likely PM sources within the Salt River area). PM_{10} concentrations also spiked at the Yuma Courthouse monitor between 8:00 a.m. and 9:00 p.m., roughly coincident with the spikes recorded at the West 43rd Ave. monitor. The plot of hourly PM_{10} concentrations and max wind data in the upper right corner of Figure 1 confirms the nearly identical timing of the elevated PM_{10} concentrations and strong wind gusts recorded at the West 43rd Ave monitor.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the "Historical Distribution" Table in Figure 1 has been included to demonstrate that the event is associated with a measured concentration in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Additionally, the winds associated with the elevated PM_{10} concentrations may be characterized as unusual as described in "Impact of Exceptional Events' 'Unusual Winds' on PM_{10} Concentrations" (see "References").

4. Examine the meteorological conditions before and during the event. The NWS, MC, ADEQ and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to what meteorological conditions were in place on May 21st. The meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. As can be seen in Figure 1, wind speeds did not pick up in central and southern Arizona until approximately 8:00 a.m., when several stations reported gusty winds over 20 mph. This timing corresponds to the onset of elevated PM_{10} concentrations recorded at the West 43rd Ave. and Yuma Courthouse monitoring sites, both of which remained elevated through the afternoon and into the evening.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM_{10} concentrations in the Phoenix area can be attributed to soil emissions that were transported over portions of the Phoenix Metro area in Maricopa County. While it is possible that local soil sources may have contributed to the West 43rd Ave. monitor being the only one to exceed the NAAQS in the Phoenix Metro area, no source specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on May 21, 2008. Visual evidence of reduced visibility can be seen in the images located in the lower right portion of Figure 1. In the Yuma area, visibility was reduced to 4 miles and blowing dust was reported by trained weather spotters at the Yuma MCAS during the late afternoon and early evening hours. Yuma radar data also suggests that blowing dust was occurring in southeastern California and southwestern Arizona (see attachment).

6. Estimation of Contribution from Source or Event. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the "Event Contrib. Analysis" Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at West 43rd Ave. and the Yuma Courthouse were attributed to a natural event.

Conclusion

Transport of dust from soils by high winds. The region wide elevated PM_{10} event on May 21, 2008, in Yuma and Maricopa Counties was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should be flagged for air quality planning purposes. The "high wind" (RJ) flag should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.

Appendix R
Event Public Process & Comments

Transmittal of Assessment Report of May 21, 2008
Submitted November 17, 2009

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Janice K. Brewer
Governor

Benjamin H. Grumbles
Director

NOV 17 2009

Electronic Submittal (to be followed by U.S. Mail)

Deborah Jordan, Air Division Director
U.S. Environmental Protection Agency, Region IX
Air-1
75 Hawthorne Street
San Francisco, CA 94105

SUBJECT: Submittal of Final Demonstrations of the 2008 Greater Phoenix Area Exceptional/Natural Events and Request for Concurrence

Dear Ms. Jordan:

The purpose of this letter is to request the Environmental Protection Agency's (EPA) review of information regarding exceptional events that resulted in exceedances of the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS) in the Greater Phoenix Area in 2008. After investigating the unusual nature of the exceedances, the Arizona Department of Environmental Quality (ADEQ) is recommending that EPA concur with ADEQ's findings that the aforementioned sample data are exceptional events in the Air Quality Subsystem (AQS) database. ADEQ staff worked with EPA staff to add certain components to the assessment reports to improve clarity and better document the conditions that caused the exceedances. The events that have been flagged, and for which final demonstrations have been prepared to provide EPA a basis for applying concurrence flags, are listed in Table 1 (enclosed).

Enclosed in this letter are detailed analyses of exceptional events titled "Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the..." (Enclosure 1 binder). This policy was revised on June 22, 2007, after a multiple month stakeholder process and transmitted to you on June 23, 2007. These analyses rely upon the "Technical Criteria Document for Determination of Natural and Exceptional Event" finalized on December 12, 2005. ADEQ concludes it is important to exclude these readings because of their exceptional causes. ADEQ requests EPA provide written concurrence with the flagging determinations contained in the attached assessment reports.

To help understand the nature of exceptional/natural events in Arizona, ADEQ researched threshold wind speeds that suspend dust into the air and special circumstances that lead to elevated dust levels. This research is described in the white paper titled "Impact of Exceptional Events 'Unusual Winds' in PM_{10} Concentrations in Arizona." ADEQ also examined the effectiveness of PM_{10} control measure for high wind events in Arizona. This research is described in the white paper titled "High Wind Exceptional Events and Control Measures for PM_{10} Areas." Future submittals will refer to these white papers as reference material. Copies of the white papers have been included in Enclosure 1 and were available during the public comment period.

As required by EPA's Exceptional Event Rule (40 CFR 50.14 (c)(3)(i)) and ADEQ Policy 2009.001, ADEQ requested comments on its flagging of these exceptional/natural events, on its final demonstrations, and on the two white papers. ADEQ made copies of the demonstrations and the white papers available for public review for a 30-day public comment period beginning October 15, 2009, on the ADEQ Web-site and at the ADEQ library in Phoenix. No comments were received from the public during the comment period. Enclosure 2 contains a copy of the affidavit of publication of the public notice of the 30-day comment period.

Enclosure 3 (Excel spreadsheet) is a checklist created by EPA that ADEQ staff used in the preparation of the assessment reports to ensure that the analyses meet the requirements of the Federal Exceptional Events Rule (EER, May 21, 2007).

Enclosure 4 (CD) is a compact disc containing an electronic copy of the exceptional/natural event analyses in Enclosure 1, along with this letter and Enclosures 2 and 3.

Those who are being copied on this letter will only receive Enclosures 2 through 4.

If you have any questions related to this request, please do not hesitate to contact me at (602) 771-2308 or Steven Peplau, Air Quality Assessment Manager, at (602) 771-2274.

Sincerely,

Nancy C. Wrona, Director
Air Quality Division

Enclosures (4)

cc: Colleen McKaughan, USEPA, Region IX (w/enclosures 2-4)
John Kelley, USEPA, Region IX (w/enclosures 2-4)
Coleman Owen, USEPA, Region IX (w/enclosures 2-4)
Lawrence Odle, Director, MCAQD (w/enclosures 2-4)
Don Gabrielson, PCAQCD (w/enclosures 2-4)

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
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Director

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM_{10}) Concentration Events in the Phoenix and Yuma Areas on May 21, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma and Phoenix areas as part of their Natural Events Action Plans. On Tuesday May 20, 2008, in response to an approaching trough of low pressure, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a high risk of wind-blown dust for Wednesday May 21st, in Maricopa County. In anticipation of this potential wind-blown dust event, ADEQ also issued a High Pollution Advisory for Maricopa County for May 21, 2008. The approaching trough was forecast to impact the Yuma area as well, and ADEQ air quality forecasters subsequently called for a high risk of wind-blown dust in their Yuma and Vicinity Dust Control Action Forecast for Wednesday, May 21st. This potential regional high-wind event equated to a significant risk of exceeding the PM_{10} National Ambient Air Quality Standards (NAAQS) in both Yuma and Maricopa County. The forecasts/ advisories satisfy the requirement in 40 CFR 51.930(a)(1).

The forecast for May 21st for both Maricopa County and Yuma called for sustained winds at 20-30 mph with the possibility of gusts greater than 40 mph capable of producing significant wind-blown dust. This potential wind-blown dust event equated to a high risk of exceeding the PM_{10} NAAQS in Maricopa County. Strong winds did occur and were observed in the Phoenix Metro and the Yuma areas on May 21st, 2008. Beginning in the morning and continuing through the evening hours of May 21st, strong southwesterly and westerly winds in Phoenix and strong west-northwesterly winds in Yuma generated areas of blowing dust. All appropriate State Implementation Plan (SIP) control measures were in place during the event, demonstrating per 40 CFR 50.1(j) that the event "is not reasonably controllable or preventable." A discussion of commonly employed Best Available Control Measures (BACM) for dust in Maricopa and Yuma counties can be found in "High Wind Exceptional Events and Control Measures for PM_{10} Areas" (see "References").

The initialization of a wind-blown dust event is evident in the Phoenix visible camera images, as well as the Arizona Meteorological Network (AzMET), Maricopa County (MC), ADEQ, and National Weather Service (NWS) monitors (see Fig. 1). Strong winds gusting over 25 mph and as high as 35 mph at the MC West 43rd monitor location and 37 mph at the NWS Luke Air Force Base were reported. The Yuma Marine Corps Air Stations (MCAS) also measured wind gusts up to 37 mph along with reports of reduced visibility. This significant wind event brought elevated ambient concentrations of PM_{10} to the Phoenix and Yuma areas that exceeded the NAAQS at the West 43rd Ave. and Yuma Courthouse monitors. Due to the spatial variability of PM sources both within and outside of the Phoenix urban core, the PM_{10} NAAQS was only exceeded at the West 43rd monitors operated by Maricopa County, though other Phoenix area monitors did show elevated levels of PM_{10} (see Section 2 for more detail). The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event "affects air quality." The following are the key PM_{10} monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM_{10}	1-hr Max PM_{10}	Max Time	Flag**
YUMA AREA					
Yuma Courthouse (ADEQ/TEOM)	**04-027-0004***	**164**	**504**	**1700**	**RJ**
PHOENIX METRO AREA					
West 43rd Ave (MC/TEOM)	**04-013-4009***	**279**	**1208**	**0900**	**RJ**
Durango Complex (MC/TEOM)	**04-013-9812***	**110**	**310**	**0900**	None
Greenwood (MC/TEOM)	**04-013-3010***	**89**	**219**	**0900**	None
South Phoenix (MC/TEOM)	**04-013-4003***	**122**	**334**	**0900**	None

* EPA Air Quality System Identification Number
** 24-hr PM_{10} concentration influenced by natural or exceptional event to be flagged.
Type Abbreviations: TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

The preliminary findings from this analysis were presented at stakeholders meeting on November 19, 2008, and March 19, 2009, in Phoenix, Arizona. Following the stakeholders meetings, ADEQ supplemented and finalized the analysis and a public comment period was held from October 15, 2009 through November 13, 2009. This finalized document and any comments received are being submitted to EPA to satisfy the requirements in 40 CFR 50.14(c)(3)(i).

16659 (112.14Wx33.41N)

MC - WEST FORTY THIR

Hr	T(F)		PM	Spd	Max	Dir
1	89		87	9	21	SW
2	87		46	9	19	SW
3	85		40	5	11	SW
4	81		28	2	7	W
5	82		32	3	14	S
6	82		60	4	9	S
7	83		54	2	9	S
8	86		135	10	21	SW
9	88		518	15	29	SW
10	89		1207	18	32	SW
11	90		600	17	30	W
12	92		413	15	29	W
1	94		534	15	34	SW
2	94		836	17	35	W
3	94		735	19	34	W
4	94		254	16	30	W
5	92		224	16	30	W
6	90		243	15	32	W
7	87		262	16	31	W
8	84		104	12	22	W
9	82		76	11	20	W
10	80		69	8	17	W
11	78		58	10	21	W
12	77		89	8	16	SW

16377 (112.08Wx33.40N)

MC - SOUTH PHOENIX

Hr	T(F)		PM	Spd	Max	Dir
1	91		29	4	15	W
2	88		39	6	18	W
3	87		41	4	15	W
4	85		26	2	10	SW
5	83		31	2	9	SW
6	84		27	2	14	S
7	86		27	5	13	S
8	88		30	4	15	SW
9	90		44	6	19	SW
10	89		334	10	30	W
11	90		159	9	23	W
12	91		139	11	26	W
1	93		205	11	32	W
2	93		300	14	34	W
3	93		286	16	31	W
4	93		280	16	32	W
5	92		193	14	30	W
6	91		167	14	28	W
7	89		198	14	29	W
8	86		112	9	27	W
9	84		83	8	22	W
10	82		58	5	14	W
11	81		57	7	20	W
12	79		63	3	9	W

NWS-Luke AFB

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	84	10		14	14	SW
2	80	10		13	13	SW
3	79	10		15	15	SW
4	79	10		14	14	S
5	75	10		7	7	SW
6	75	10		10	10	S
7	77	10		11	11	SW
8	81	10		17	17	SW
9	85	10		20	20	SW
10	86	10		23	23	SW
11	87	10		21	30	SW
12	89	10		21	28	SW
1	91	10		9	34	SW
2	91	10		26	37	W
3	91	10		20	31	W
4	91	10		22	29	W
5	89	10		17	33	W
6	88	10		20	25	W
7	85	10		21	26	SW
8	83	10		16	16	W
9	82	10		16	16	W
10	81	10		18	18	NW
11	78	10		9	9	W
12	78	10		13	13	W

Event Contrib. Analysis

Hourly PM_{10} Conc. (µg/m^3)

MONITORS:

1-W43RD
2-YUMA CH

Hr	1	2
1	87	51
2	47	67
3	40	71
4	29	39
5	32	49
6	60	58
7	55	67
8	135	84
9	519	178
10	1208	171
11	601	196
12	413	192
1	535	192
2	837	160
3	735	140
4	255	161
5	225	467
6	243	504
7	263	210
8	105	266
9	77	175
10	69	168
11	58	139
12	70	140

24-Hr. Avg PM_{10}

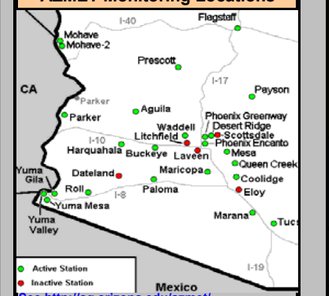
Monitor:	with Event	w/o Event
1-W43RD	279	66
2-YUMA	164	76

> NAAQS | < NAAQS

Pink=Event Contrib.

Conclusion: As shown above, the PM_{10} concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).

AZMET Monitoring Locations



See http://ag.arizona.edu/azmet/

wnd @3m agl / Dir corrected to true north

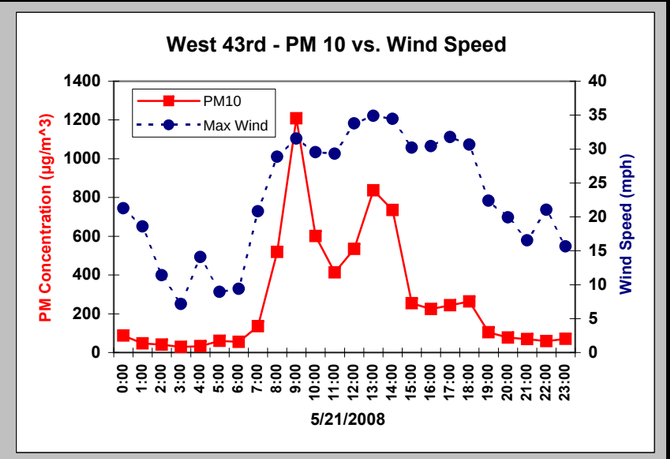
HIGHLIGHTING	Col.	Parameter
Max Wind	T(F)	Temp. (Deg. F.)
> 15 mph	RH	Rel Humidity %
>25 mph	Rn	Rain (Inches/hr)
HR - Time (End)	Spd	Avg Speed mph
A.M.	Max	Max Speed mph
P.M.	Dir	Wind Dir. (from)

Figure 1. Key Data for Event of May 21, 2008

WINDS & PM10 DATA	ECA	KEY	PM10 & WIND PLOT
	HIST		Wx IMAGERY
	DIST		PHX VIS. CAMERAS

SUMMARY OF EVENT

Between 7:00 a.m. and noon, gusts in the Valley were noted from the south to southwest between 26 to 29 mph at five NWS sites at 9:00 a.m. At 10:00 a.m., winds were from the southwest to west with gusts up to 33 mph.



21525 (112.62Wx33.37N)

MC - BUCKEYE

Hr	T(F)	RH	PM	Spd	Max	Dir
1	82	25	40	9	14	SW
2	81	25	41	3	12	SW
3	75	32	49	4	14	W
4	72	36	47	1	5	E
5	74	33	29	4	9	SW
6	73	36	33	7	11	SW
7	73	38	42	4	11	SW
8	80	31	53	10	23	W
9	83	25	82	16	26	SW
10	85	26	200	19	32	SW
11	88	24	91	18	29	SW
12	91	20	175	15	30	W
1	91	15	519	18	33	W
2	92	14	390	20	34	W
3	92	13	197	17	34	W
4	91	13	235	16	35	W
5	90	13	215	16	30	W
6	88	13	143	16	29	W
7	85	15	99	14	24	W
8	81	16	64	12	19	W
9	77	20	77	9	14	W
10	74	23	46	9	14	W
11	73	22	42	8	15	W
12	73	21	47	10	17	W

16477 (112.14Wx33.48N)

MC - WEST PHOENIX

Hr	T(F)		PM	Spd	Max	Dir
1	89		26	7	20	SW
2	87		41	10	26	SW
3	85		48	7	18	SW
4	83		35	4	13	SW
5	80		30	4	12	SW
6	81		33	4	12	SW
7	82		45	4	11	SW
8	84		55	2	15	W
9	87		80	1	99	SE
10	97		141	4	32	SW
11	86		109	13	30	SW
12	88		91	13	35	W
1	90		113	12	33	W
2	91		152	14	34	W
3	91		160	13	32	W
4	90		159	14	33	W
5	90		134	13	31	W
6	88		129	11	28	W
7	87		112	13	27	W
8	84		93	11	25	W
9	82		71	10	22	W
10	80		62	7	16	W
11	80		47	8	19	W
12	78		31	4	13	W

16375 (112.12Wx33.43N)

MC - DURANGO COMPLEX

Hr	T(F)		PM	Spd	Max	Dir
1	88		45	8	21	SW
2	86		43	10	21	W
3	85		46	9	19	W
4	81		41	6	13	SW
5	80		37	7	16	SW
6	80		51	6	15	S
7	81		50	4	12	S
8	85		56	8	18	SW
9	89		131	11	27	SW
10	88		309	16	32	W
11	88		171	16	31	W
12	91		115	14	29	W
1	92		131	14	31	W
2	92		246	17	32	W
3	93		231	17	35	W
4	92		162	17	31	W
5	91		133	15	29	W
6	89		136	15	30	W
7	87		122	16	29	W
8	83		106	13	25	W
9	81		92	11	20	W
10	80		65	9	18	W
11	78		64	9	18	W
12	76		56	5	12	W

Historical Distribution

5-Yr. Dist. of Values (µg/m^3)

MONITORS:

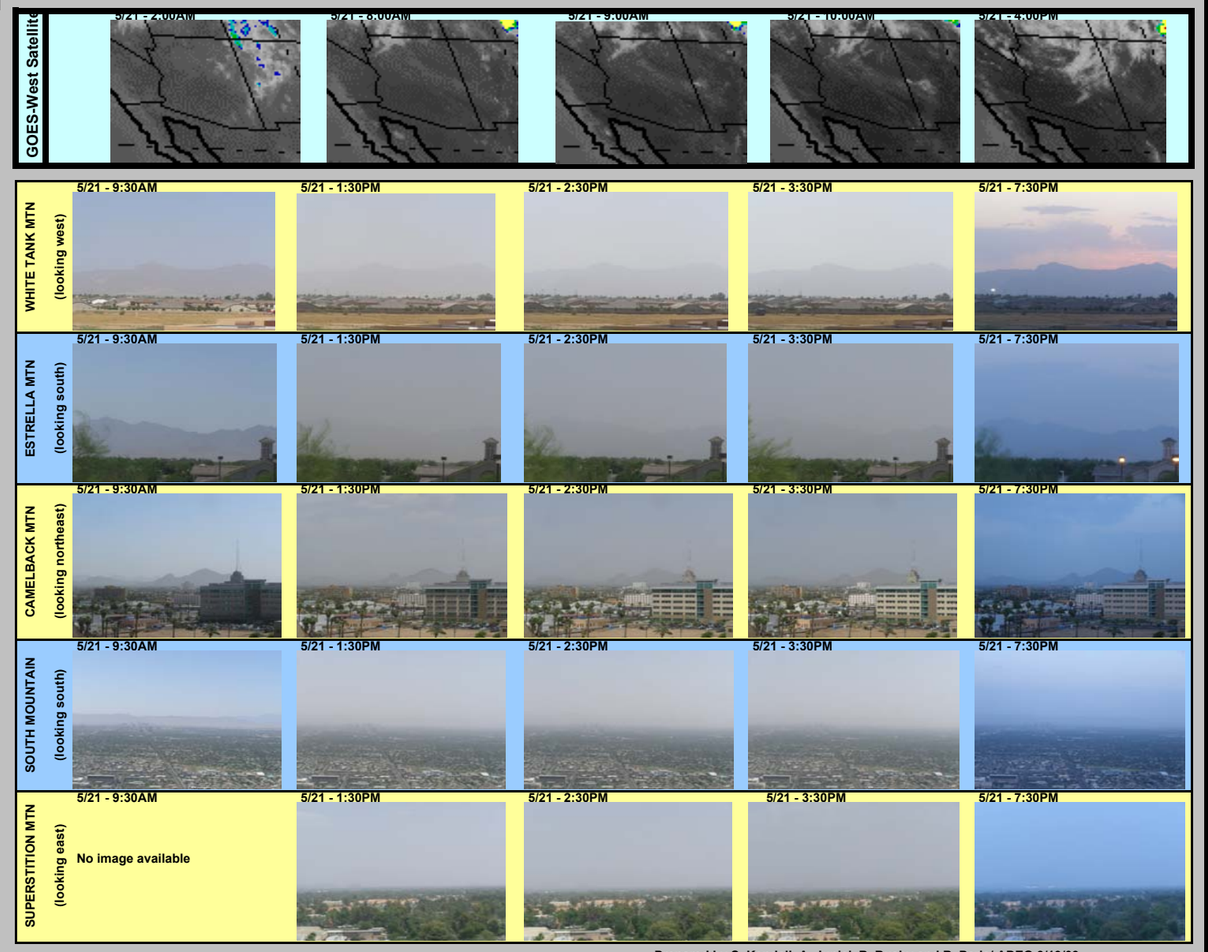
1-WEST FORTY THIR
2-YUMA COURTHOU

Column Index

Yr - All Data (5-Yrs)
Sea - Data for Spring season only (5-Yrs)

Cum. Freq.	Mon 1 Yr	Mon 1 Sea	Mon 2 Yr	Mon 2 Sea
Min	5	8	8	8
0.5%	9	9	12	9
1.0%	11	11	14	14
2.5%	15	13	16	16
5%	19	19	19	19
10%	29	28	23	22
25%	44	46	31	29
50%	65	63	42	40
75%	91	82	57	51
90%	121	107	77	76
95%	139	125	96	109
97.5%	157	134	127	182
99.0%	192	194	186	210
99.5%	227	220	211	212
Max	313	313	349	349
Flagged Value	279		164	

Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)



19040 (114.63Wx32.61N)

ADEQ - YUMA MESA

Hr	T(F)	RH		Spd	Max	Dir
1	71	35		2	5	SE
2	68	41		1	4	W
3	64	52		2	7	SE
4	63	51		3	6	S
5	65	47		0	4	W
6	65	43		3	9	SW
7	68	40		3	9	S
8	76	34		6	15	W
9	79	31		7	17	W
10	80	30		8	20	W
11	82	28		8	23	W
12	84	26		11	26	W
1	85	24		10	25	W
2	87	21		10	24	W
3	89	16		9	22	W
4	89	16		12	31	W
5	87	20		17	33	W
6	83	23		13	29	W
7	80	26		18	31	W
8	76	30		15	27	W
9	73	34		13	24	W
10	71	36		11	24	W
11	69	36		12	21	W
12	68	37		9	19	W

128530 (114.71Wx32.71N)

ADEQ - YUMA AGRI CEN

Hr	T(F)	RH		Spd	Max	Dir
1	81	16		9	19	W
2	74	25		4	13	S
3	71	28		5	13	S
4	72	28		7	12	SW
5	65	43		4	9	SW
6	69	37		6	9	W
7	69	38		5	11	SW
8	77	31		13	24	W
9	78	32		15	25	NW
10	79	31		15	25	NW
11	81	30		16	25	W
12	83	26		16	27	W
1	85	22		14	22	W
2	87	19		13	23	W
3	88	16		14	25	NW
4	89	15		15	27	W
5	86	20		20	35	W
6	83	23		20	36	W
7	81	25		17	32	W
8	78	28		20	28	W
9	75	32		14	25	W
10	73	33		16	25	W
11	73	31		21	32	NW
12	72	30		20	33	NW

NWS-Yuma MCAS

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	82	10		0	0	N
2	81	10		7	7	W
3	77	10		6	6	S
4	77	10		3	3	SW
5	74	10		5	5	SW
6	75	10		9	9	W
7	76	10		5	5	W
8	81	10		13	13	W
9	83	10		14	23	NW
10	85	10		16	24	NW
11	87	10		16	16	NW
12	89	9		18	26	W
1	92	9		14	25	NW
2	93	10		16	25	W
3	95	10		17	24	NW
4	95	10		20	30	W
5	91	4	BLDU	29	37	W
6	87	4	BLDU	26	33	W
7	83	9		21	29	W
8	80	9		21	28	W
9	77	10		18	28	W
10	76	10		18	26	W
11	75	10		16	28	W
12	74	10		15	15	W

AZMET - YUMA

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	78	19	-	7	18	W
2	73	28	-	4	13	SW
3	68	34	-	3	8	SW
4	68	37	-	5	8	SW
5	62	54	-	2	6	SW
6	64	53	-	4	6	SW
7	67	47	-	4	13	SW
8	77	32	-	11	21	NW
9	78	32	-	13	20	NW
10	80	31	-	13	20	NW
11	82	30	-	15	23	NW
12	83	27	-	15	24	NW
1	86	23	-	13	23	NW
2	87	20	-	12	19	NW
3	89	17	-	13	22	NW
4	89	16	-	14	22	NW
5	86	21	-	20	31	W
6	82	24	-	20	31	W
7	81	26	-	17	23	W
8	77	30	-	16	26	NW
9	74	34	-	13	21	W
10	73	34	-	14	21	NW
11	72	32	-	15	24	NW
12	72	31	-	16	25	NW

Prepared by S. Kendall, A. Juniel, B. Busby and B. Paris/ ADEQ 3/19/09

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM_{10} readings from the West 43rd Ave. and Yuma Courthouse monitoring sites were valid for May 21st. Audits of the analyzers revealed operations were within acceptable tolerance.

2. Review suspected contributing sources. On May 21, 2008, strong westerly to southwesterly winds were occurring in the Phoenix area due to a low pressure system approaching from the west with a cold front passing over Arizona. The high wind event was a regional phenomenon that affected the entire Phoenix Metro area as well as Yuma. However, PM sources are highly variable across space; therefore, the locations of higher PM_{10} concentrations in Phoenix (namely the Salt River channel) are likely an indication that these locations (or areas upwind of these locations) contain greater sources of PM than other locations within the Phoenix Metropolitan area. While no specific source allocation can be determined for this particular day, the 2005 ADEQ revised PM_{10} SIP for the Salt River area (attached) contains modeled source contributions on high wind days (see section 4.2 – Source Categories). Results estimate that approximately 76% of PM_{10} concentrations can be attributed to windblown dust, of which 21% is from agricultural fields, 15% from alluvial channels, and 21% from vacant lots. It is not clear whether similar source allocations can be assumed for this April 30, 2008, high wind event (see attachment for likely PM sources within the Salt River area). PM_{10} concentrations also spiked at the Yuma Courthouse monitor between 8:00 a.m. and 9:00 p.m., roughly coincident with the spikes recorded at the West 43rd Ave. monitor. The plot of hourly PM_{10} concentrations and max wind data in the upper right corner of Figure 1 confirms the nearly identical timing of the elevated PM_{10} concentrations and strong wind gusts recorded at the West 43rd Ave monitor.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the "Historical Distribution" Table in Figure 1 has been included to demonstrate that the event is associated with a measured concentration in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Additionally, the winds associated with the elevated PM_{10} concentrations may be characterized as unusual as described in "Impact of Exceptional Events' 'Unusual Winds' on PM_{10} Concentrations" (see "References").

4. Examine the meteorological conditions before and during the event. The NWS, MC, ADEQ and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to what meteorological conditions were in place on May 21st. The meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. As can be seen in Figure 1, wind speeds did not pick up in central and southern Arizona until approximately 8:00 a.m., when several stations reported gusty winds over 20 mph. This timing corresponds to the onset of elevated PM_{10} concentrations recorded at the West 43rd Ave. and Yuma Courthouse monitoring sites, both of which remained elevated through the afternoon and into the evening.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM_{10} concentrations in the Phoenix area can be attributed to soil emissions that were transported over portions of the Phoenix Metro area in Maricopa County. While it is possible that local soil sources may have contributed to the West 43rd Ave. monitor being the only one to exceed the NAAQS in the Phoenix Metro area, no source specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on May 21, 2008. Visual evidence of reduced visibility can be seen in the images located in the lower right portion of Figure 1. In the Yuma area, visibility was reduced to 4 miles and blowing dust was reported by trained weather spotters at the Yuma MCAS during the late afternoon and early evening hours. Yuma radar data also suggests that blowing dust was occurring in southeastern California and southwestern Arizona (see attachment).

6. Estimation of Contribution from Source or Event. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the "Event Contrib. Analysis" Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at West 43rd Ave. and the Yuma Courthouse were attributed to a natural event.

Conclusion

Transport of dust from soils by high winds. The region wide elevated PM_{10} event on May 21, 2008, in Yuma and Maricopa Counties was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should be flagged for air quality planning purposes. The "high wind" (RJ) flag should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.

ATTACHMENTS AND REFERENCES

FOR EXCEPTIONAL EVENTS ANALYSIS

The following are supplemental materials helpful in understanding the exceptional event summarized in the main report. In addition, the reader is referred to the following references.

REFERENCES

Arizona Department of Environmental Quality (ADEQ), *Air Quality Exceptional and Natural Events Policy*, Policy Number 2009.002 (April 28, 1999; revised January 10, 2006 and June 22, 2007).

Arizona Department of Environmental Quality (ADEQ), *Technical Criteria Document for Determination of Natural Exceptional Events for Particulate Matter Equal to or Less Than Ten Microns in Aerodynamic Diameter (PM_{10})* (May 31, 2000).

Arizona Department of Environmental Quality (ADEQ), *Technical Criteria Document for Determination of Natural and Exceptional Events* (December 12, 2005).

Arizona Department of Environmental Quality (ADEQ), *Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations* (October 14, 2009).

Arizona Department of Environmental Quality (ADEQ), *High Wind Exceptional Events and Control Measures for PM_{10} Areas* (October 14, 2009).

Environmental Protection Agency (EPA), *The Treatment of Data Influenced by Exceptional Events (Exceptional Event Rule)*, 73 FR 70597; 40 CFR Parts 50 and 51 (November 21, 2008).

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.epa.gov/airnow/aqibroch

NEW!!! CLICK HERE FOR UPDATED 2008 OZONE SEASON STATS NEW!!!

AIR QUALITY FORECAST FOR WEDNESDAY, MAY 21, 2008

This report is updated by 1:00 p.m. Sunday thru Friday and is valid
for areas within and bordering Maricopa County in Arizona

FORECAST DATE	YESTERDAY MON 05/19/2008	TODAY TUE 05/20/2008	TOMORROW WED 05/21/2008	EXTENDED THU 05/22/2008
NOTICES (*SEE BELOW FOR DETAILS)	**OZONE HEALTH WATCH** **NWS EXCESSIVE HEAT WARNING**	**OZONE HIGH POLLUTION ADVISORY** **NWS EXCESSIVE HEAT WARNING**	**PM-10 HIGH POLLUTION ADVISORY** **OZONE HEALTH WATCH** **NWS WIND ADVISORY**	**PM-10 HEALTH WATCH POSSIBLE** **DUST**
AIR POLLUTANT	Highest AQI Reading/Site (Preliminary data only)			
O3*	**97** **TONTO NATIONAL MONUMENT**	**124** **UNHEALTHY FOR SENSITIVE GROUPS**	**93** **MODERATE**	**80** **MODERATE**
CO*	**14** **PHOENIX SUPERSITE**	**09** **GOOD**	**06** **GOOD**	**06** **GOOD**
PM-10*	**80** **WEST FORTY THIRD**	**74** **MODERATE**	**140** **UNHEALTHY FOR SENSITIVE GROUPS**	**92** **MODERATE**
PM-2.5*	**44** **DURANGO**	**32** **GOOD**	**53** **MODERATE**	**55** **MODERATE**

* O3 = Ozone CO = Carbon Monoxide PM-10 = Particles 10 microns & smaller PM-2.5 = Particles smaller than 2.5 microns

*"Ozone Health Watch" means that the highest concentration of OZONE may approach the federal health standard.
"PM-10 or PM-2.5 Health Watch" means that the highest concentration of PM-10 or PM-2.5 may approach the federal health standard.
"High Pollution Advisory" means that the highest concentration of OZONE, PM-10, or PM-2.5 may exceed the federal health standard.
"DUST" means that short periods of high PM-10 concentrations caused by outflow from thunderstorms are possible.

Health message for Tuesday, May 20: Active children and adults, and people with lung disease such as asthma, should reduce prolonged or heavy outdoor exertion.
Health message for Wednesday, May 21: Active children and adults, and people with lung disease such as asthma, should reduce prolonged or heavy exertion.

Synopsis and Discussion

AN OZONE HIGH POLLUTION ADVISORY REMAINS IN EFFECT TODAY MAY 20
A PM-10 HIGH POLLUTION ADVISORY AND AN OZONE HEALTH WATCH HAVE BEEN ISSUED FOR WEDNESDAY MAY 21

Local ozone levels approached unhealthy levels at several east Valley locations on Monday, and as of 10:00 a.m. this morning hourly concentrations were running 10-15 parts per billion higher than 24 hours ago at most monitoring sites; therefore, today's High Pollution Advisory will continue thru the early evening hours. All eyes now turn to the significant wind/blowing dust/unhealthy PM-10 (coarse particle) event that is looking inevitable for Wednesday. A transition from record heat to below average temperatures will begin on Wednesday as a surface cold front moves over the state ahead of an intense upper level trough. A sharp temperature contrast will be reflected in tight pressure and contour gradients that will be capable of producing sustained winds over 30 mph and wind gusts in excess of 40 mph over a wide area, much of it open desert. The likelihood that widespread blowing dust will be generated by afternoon has prompted the issuance of a PM-10 High Pollution Advisory. Under sunny skies and with continuing additional ozone transport from California, local ozone levels could also be a concern. -Reith

MONITORING SITE MAPS: STATIC MAP - http://www.azdeq.gov/environ/air/monitoring/images/map.jpg
INTERACTIVE MAPS - http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx
http://www.airnow.gov/

POLLUTION MONITOR READINGS FOR MONDAY, MAY 19, 2008

O3 (OZONE)

For facts on new 8-hr ozone standard go to: http://www.epa.gov/air/ozonepollution/pdfs/2008_03_aqi_changes.pdf
For maps go to: http://www.airnow.gov/index.cfm?action=airnow.currentconditions

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Alamo Lake (La Paz County)	NOT AVBL	NOT AVBL	NOT AVBL
Apache Junction (Pinal County)	68	77	
Blue Point	66	71	
Buckeye	54	46	
Casa Grande (Pinal County)	64	64	
Cave Creek	66	71	
Central Phoenix	62	58	
Combs School (Pinal County)	57	48	
Dysart	54	46	
Falcon Field	67	74	
Fountain Hills	67	74	
Glendale	54	46	
Humboldt Mountain	64	64	
Maricopa (Pinal County)	55	47	
North Phoenix	61	54	
Phoenix Supersite	63	61	
Pinal Air Park (Pinal County)	60	51	
Pinnacle Peak	63	61	
Queen Valley (Pinal County)	72	90	
Rio Verde	70	84	
South Phoenix	66	71	
South Scottsdale	62	58	
Tempe	64	64	
Tonto Nat'l Mon. (Gila County)	74	97	
West Chandler	61	54	
West Phoenix	64	64	
Yuma (Yuma County)	57	48	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.9	10	
Greenwood	1.1	13	
Phoenix Supersite	1.2	14	
West Indian School	1.0	11	
West Phoenix	0.6	07	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Buckeye	47	44	
Central Phoenix	41	38	
Combs School(Pinal County)	59	53	
Coyote Lakes	37	34	
Durango	54	50	
Greenwood	47	44	
Higley	46	43	
Maricopa (Pinal County)	74	60	
Phoenix Supersite	33	31	
South Phoenix	50	46	
West Forty Third	113	80	
West Phoenix	42	39	

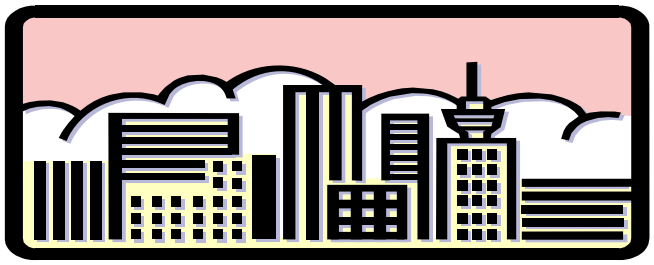
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

For maps go to: http://www.airnow.gov/

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Durango	13.6	44	
Dysart	4.3	14	
Estrella Mountain Park	6.4	21	
Phoenix Supersite	13.0	42	
Vehicle Emissions Lab	6.2	20	
West Phoenix	10.7	35	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

Description – This is a secondary pollutant that is formed by the reaction of other primary pollutants (precursors) such as VOCs (volatile organic compounds) and NOx (Nitrogen Oxides) in the presence of heat and sunlight.

Sources – VOCs are emitted from motor vehicles, chemical plants, refineries, factories, and other industrial sources. NOx is emitted from motor vehicles, power plants, and other sources of combustion.

Potential health impacts – Exposure to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other effects include decrease in lung function, chest pain, and cough.

Unit of measurement – Parts per billion (ppb).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight).

Reduction tips – Curtail daytime driving, refuel cars and use gasoline-powered equipment as late in the day as possible.

CO (CARBON MONOXIDE):

Description – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely.

Sources – In cities, as much as 95 percent of all CO emissions emanate from automobile exhaust. Other sources include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak concentrations occur in colder winter months.

Potential health impacts – Reduces oxygen delivery to the body's organs and tissues. The health threat is most serious for those who suffer from cardiovascular disease.

Unit of measurement – Parts per million (ppm).

Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight)

Reduction tips – Keep motor vehicle tuned properly and minimize nighttime driving.

PM-10 & PM-2.5 (PARTICLES):

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations such as the "Valley Brown Cloud" (see http://www.phoenixvis.net/). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.
Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.
Units of measurement – Micrograms per cubic meter (ug/m3)
Averaging interval – 24 hours (midnight to midnight).
Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 08/14/2007**}

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

MARICOPA COUNTY
DUST CONTROL ACTION FORECAST
ISSUED TUESDAY, MAY 20, 2008
Three-day weather outlook:

In the wake of the heat wave on Monday and Tuesday the approach of an intense late-season trough in the mid-latitude storm track will make for very windy conditions region-wide beginning on Wednesday. On that day a surface cold front will move over Arizona ahead of the trough; both the duration and speed of the winds have the potential to produce widespread blowing dust over the desert areas with a HIGH risk of unhealthy PM-10 levels in the Phoenix area; High Pollution Advisory will be issued as a result. On Thursday and Friday somewhat less gradient wind may be enhanced by thunderstorm downdrafts so the risk level will remain elevated both days.

R I S K F A C T O R S

	WINDS		STAGNATION		RISK LEVEL
Day #1: Wed 05/21/2008	Southwest to westerly 15-30 mph with gusts near 40 mph possible.	+	Rather stagnant during the morning hours with improvement by afternoon.	=	**HIGH**
Day #2: Thu 05/22/2008	Southwest to westerly 15-25 mph with stronger gusts near thunderstorms.	+	Little if any stagnation expected.	=	**MODERATE**
Day #3: Fri 05/23/2008	Southerly 15-25 mph by afternoon with higher gusts near thunderstorms.	+	Little if any stagnation expected.	=	**MODERATE**

The Maricopa County Dust Control Action Forecast is issued to assist in the planning of work activities to help reduce dust pollution. To review the complete air quality forecast for the Phoenix metropolitan area and the health effects of air pollution, please see ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf, or call 602-771-2367 for recorded forecast information.

ADEQ Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

YUMA AND VICINITY
DUST CONTROL ACTION FORECAST
ISSUED TUESDAY, MAY 20, 2008

Three-day weather outlook:

In the wake of the heat wave on Monday and Tuesday the approach of an intense late-season trough in the mid-latitude storm track will make for very windy conditions region-wide beginning on Wednesday. On that day a surface cold front will move over Arizona ahead of the trough; both the duration and speed of the winds have the potential to produce widespread blowing dust over the desert areas with a HIGH risk of unhealthy PM-10 levels in the Yuma area. Equally strong down-river winds are possible on Thursday, enhanced by the possibility of thunderstorm downdrafts.

	WINDS	WIND-BLOWN DUST RISK
Day #1: Wed 05/21/2008	West to northwesterly 20-30 mph with gusts over 40 mph possible by afternoon.	**HIGH**
Day #2: Thu 05/22/2008	Northwest to northerly 20-30 mph with gusts approaching 40 mph.	**HIGH**
Day #3: Fri 05/23/2008	Southerly 15-25 mph with gusts to 30 mph except stronger near thunderstorms.	**MODERATE**

PM-10 & PM-2.5 (PARTICLES)

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations (brown cloud). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.

Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.

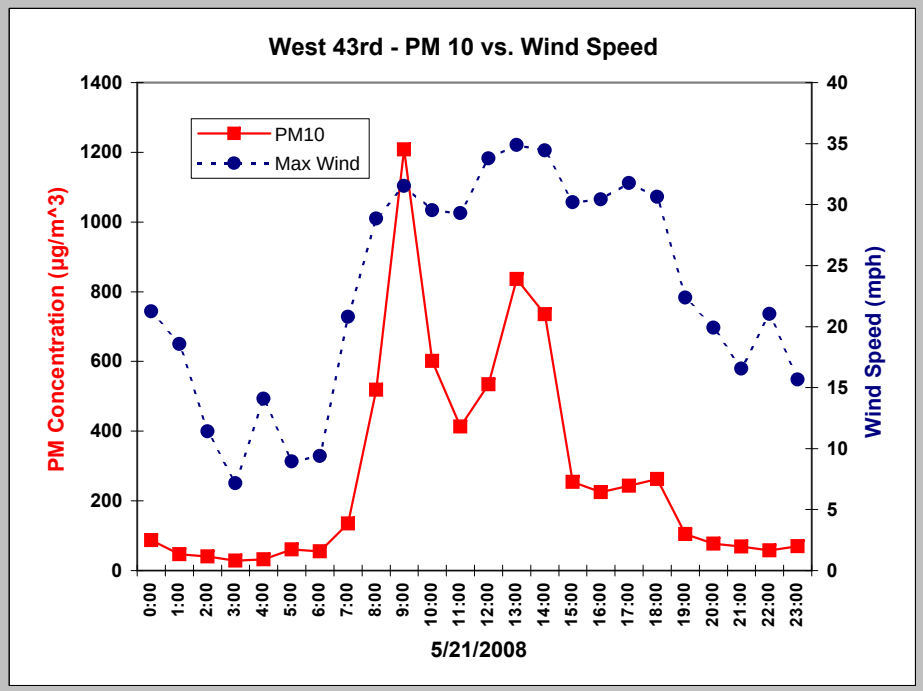
Units of measurement – Micrograms per cubic meter (ug/m3)

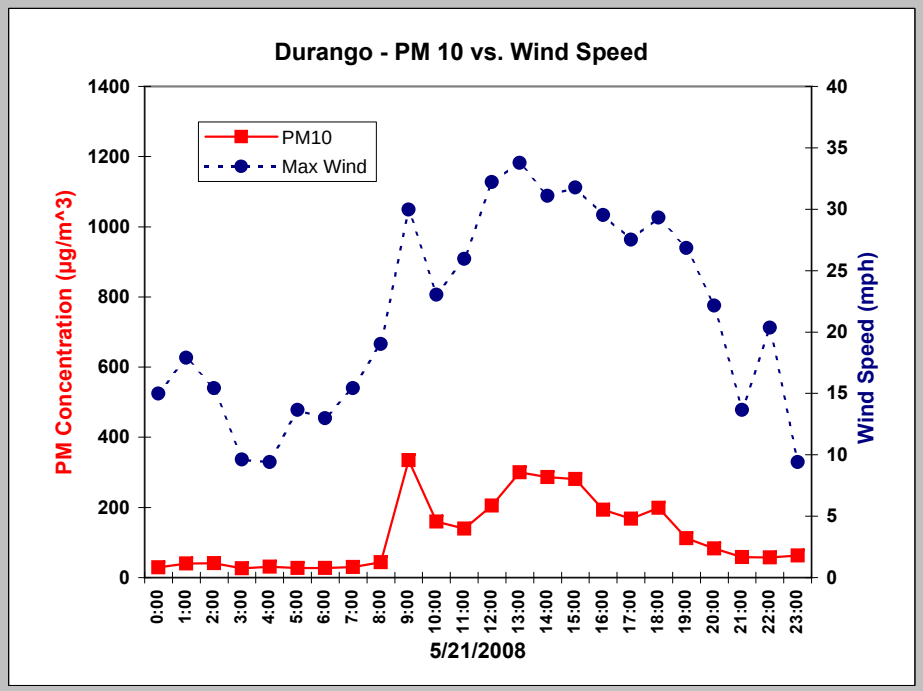
Averaging interval – 24 hours (midnight to midnight).

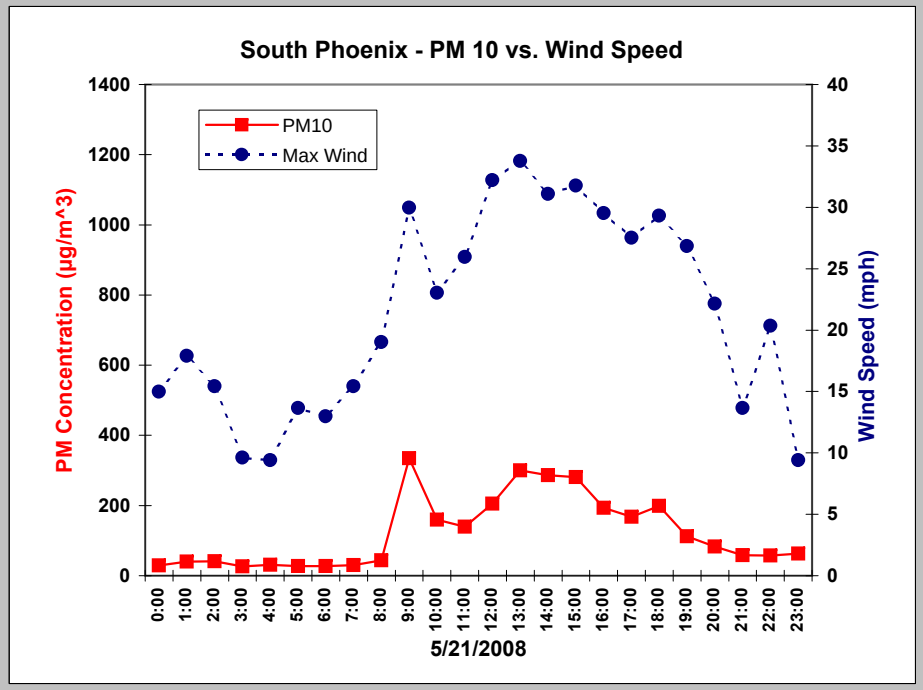
Reduction tips – Stabilize loose soils, minimize travel on dirt roads, utilize tarps on haul trucks, limit use of leaf-blowers, and on high-wind days reduce outdoor activities.

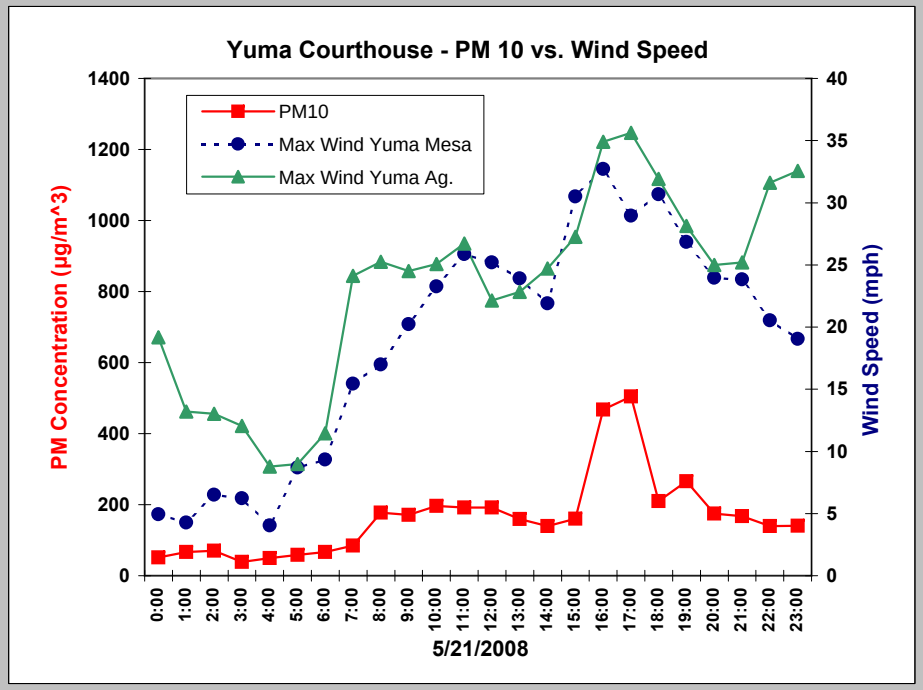
CKR 05/09/2005

05/21/2008 - ADDITIONAL GRAPHS

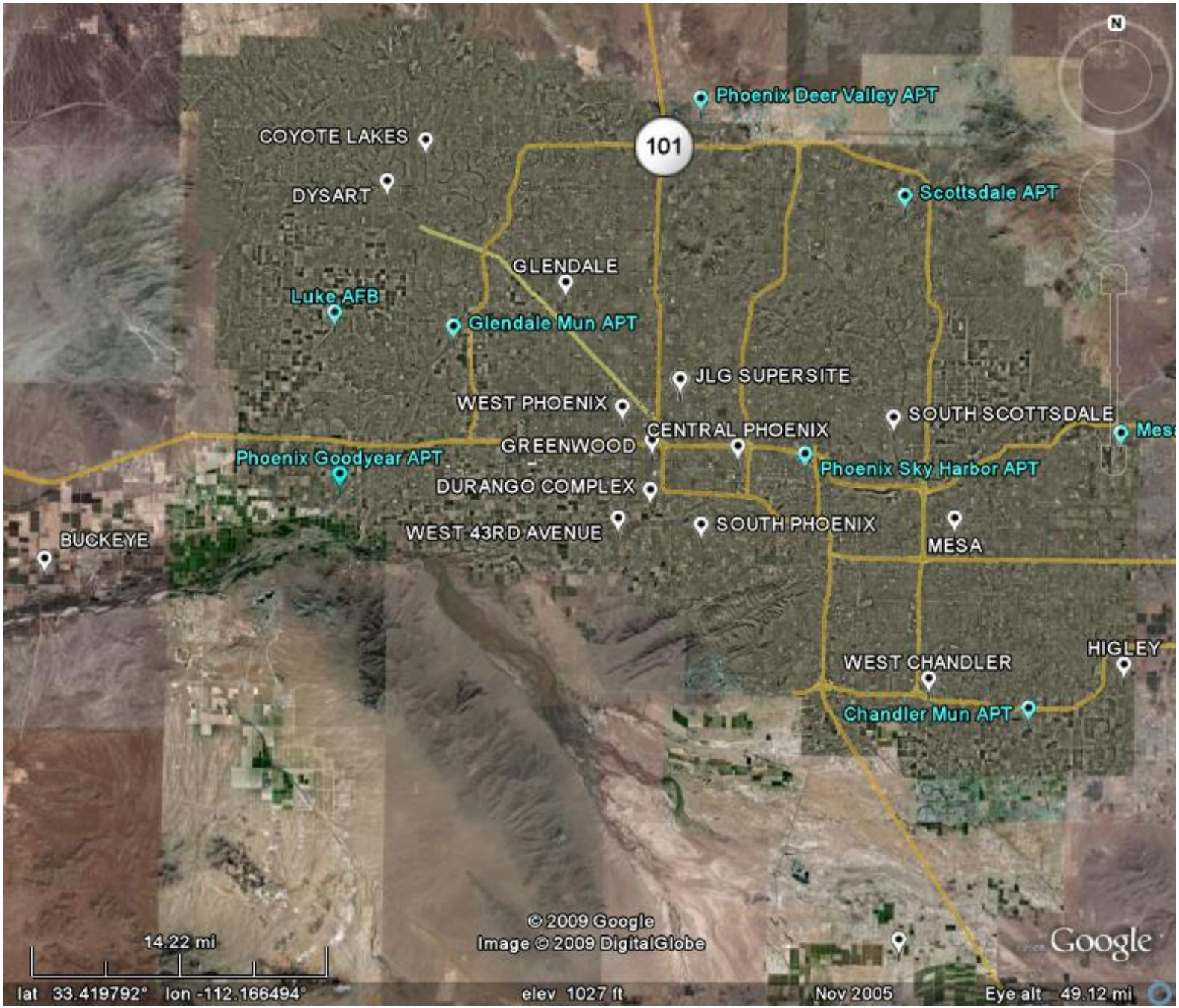








Phoenix Area PM_{10} and Meteorological Monitors



Source: US EPA, ADEQ, & Google Earth

Yuma Area PM_{10} and Meteorological Monitors

Source: US EPA, ADEQ, & Google Earth

May 21st 2008 Radar and Satellite Data

Radar data obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center in conjunction with MODIS satellite photography obtained from NASA's Rapid Response System allows for a visual reassessment of the event. These data were downloaded as KMZ files and displayed using Google Earth software. The overlay of the products clearly shows that much of the suspended dust originated in southeastern California and was transported to the east. It can be seen that large sources of dust appear to come from the Imperial Sand Dunes of southern California (also known as the Algodones Dunes) and other similar dunes or open desert areas to the southwest of the Salton Sea. Another common source of blowing dust appears to be an area of open desert to the south / southeast of Yuma. While some of the radar images are obscured by noise, the dust sources are still clearly visible.

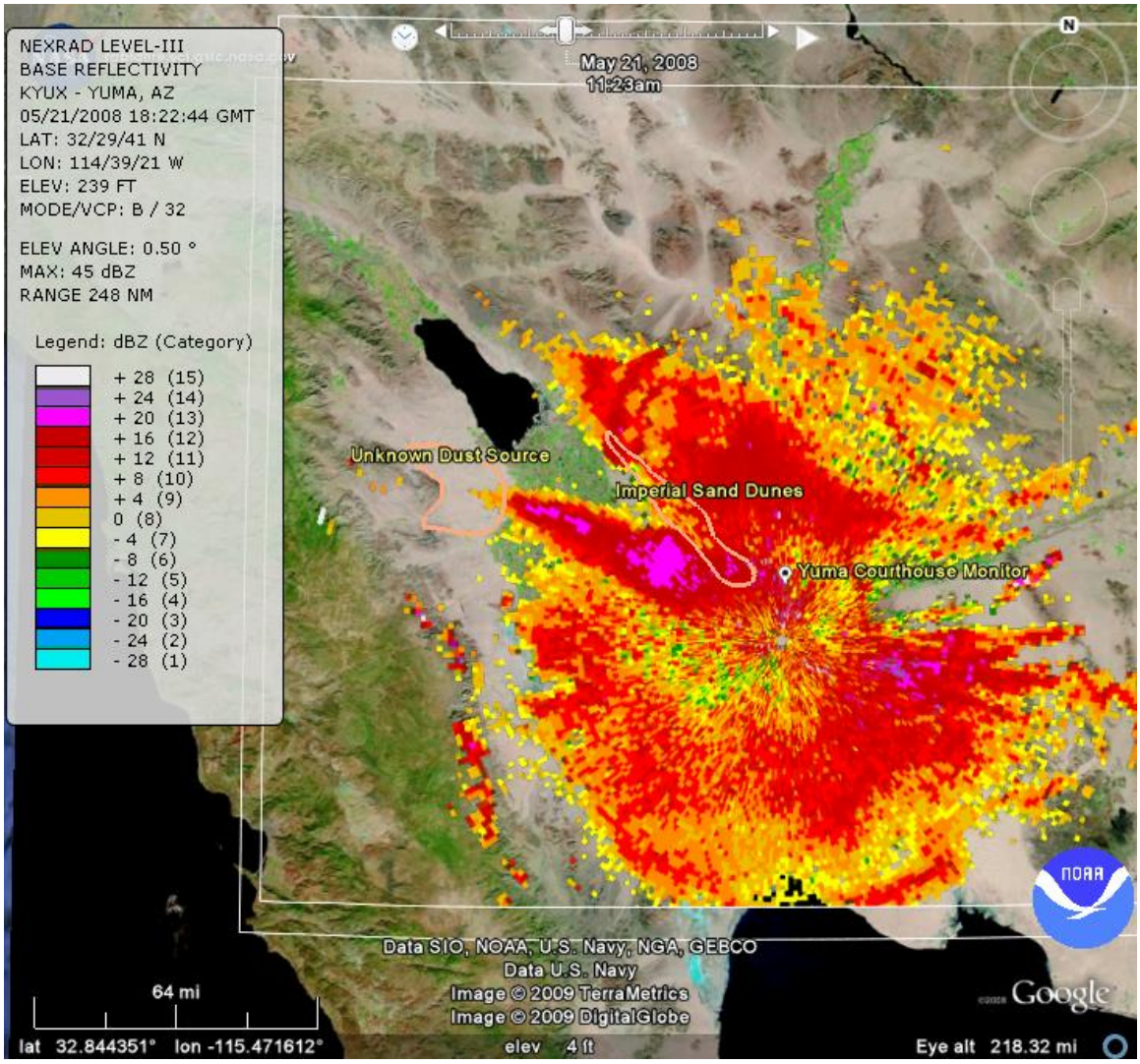


Figure 1 - Radar data and MODIS satellite imagery show a major source of blowing dust located to the southwest of the Salton Sea.

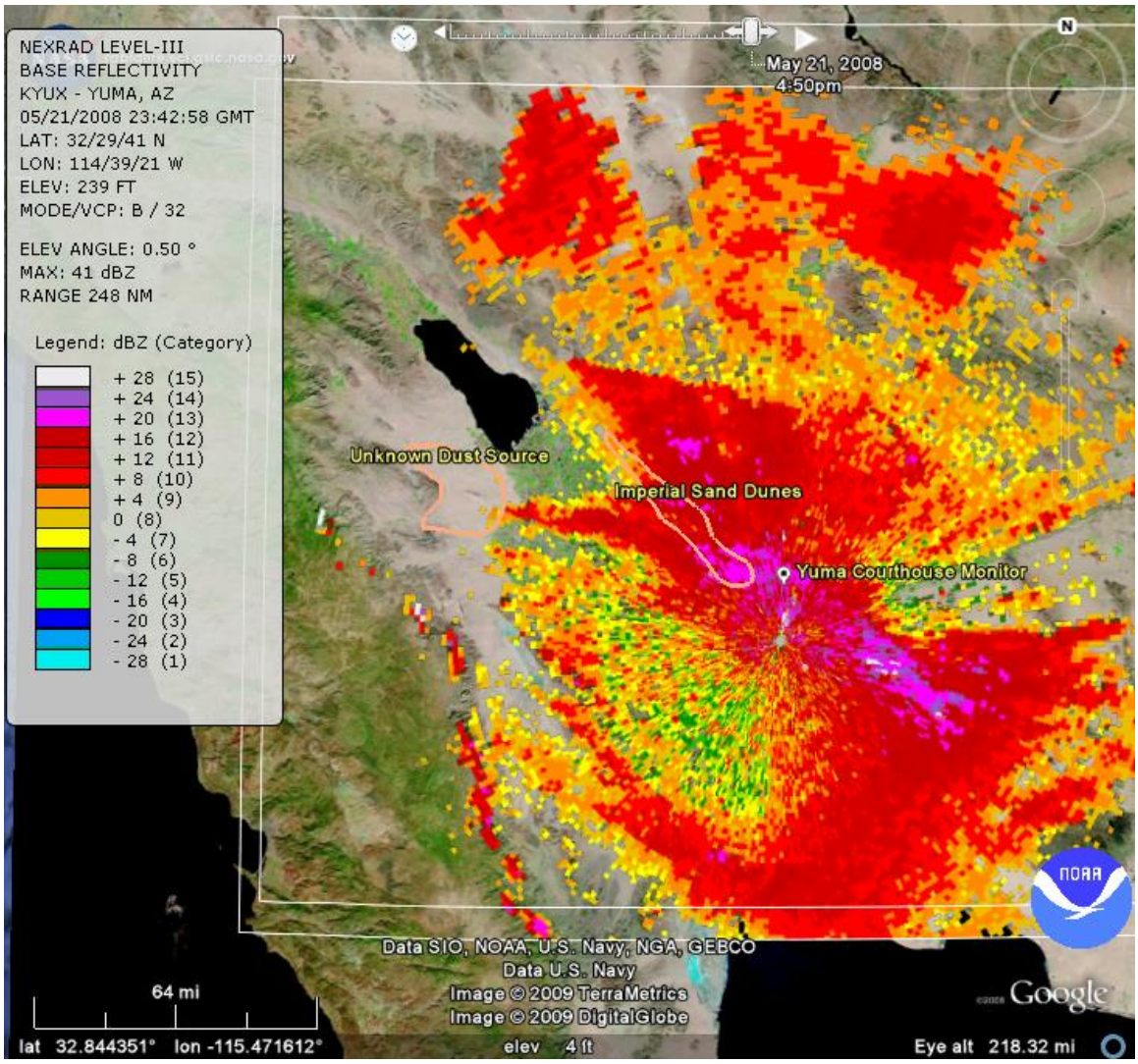


Figure 2 – Right around the time of highest PM_{10} concentrations and lowest visibilities in the Yuma area, radar data show what are likely high concentrations of blowing dust to the west / northwest of Yuma. These returns (shown as purple colors) are likely indicative of blowing dust originating from the Imperial Sand Dunes.

The MODIS satellite data are from the Terra satellite with 250 meter resolution and use bands 7, 2, and 1 to accentuate vegetation. Lighter tan areas are indicative of open desert while darker brown areas indicate areas of higher elevation or differing soil type (compared to that of the open desert). The suspected PM sources are outlined in the image below.

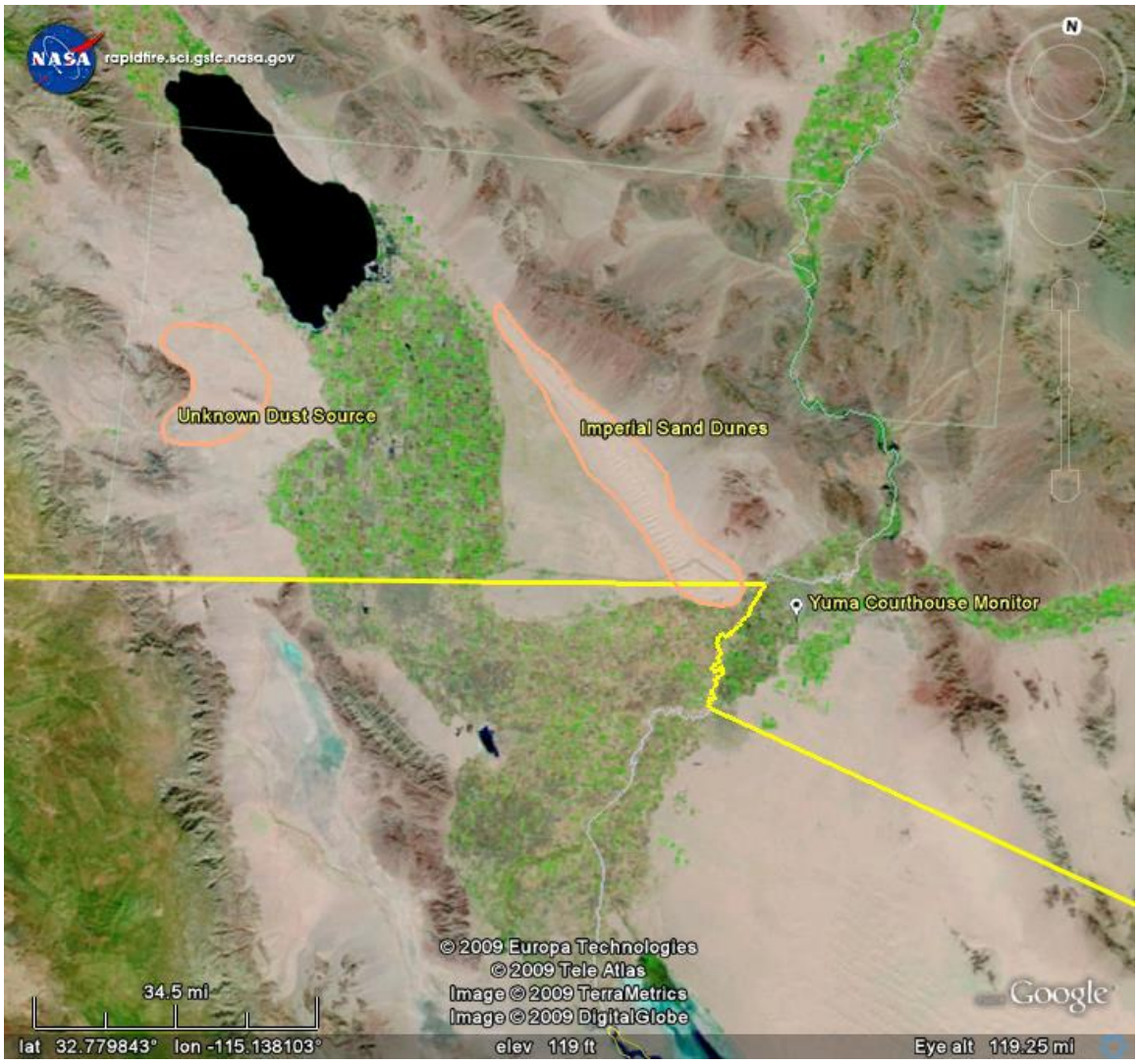


Figure 3 - Image courtesy of MODIS Rapid Response Project at NASA/GSFC displayed using Google Earth software.

CHAPTER 4: OVERVIEW OF PM_{10} CONTROL MEASURES

4.1 INTRODUCTION

Chapter 1.2.2 of this SIP ("Regulatory History of the Metropolitan Maricopa PM_{10} Nonattainment Area") notes that on July 25, 2002, EPA approved the Maricopa Serious PM_{10} Nonattainment Area, and granted Arizona's request, in accordance with CAA § 188(e), to extend the CAA deadline for attainment of the annual and 24-hour PM_{10} standards from December 31, 2001, to December 31, 2006 (67 FR 48718).

Because the attainment deadline for this plan revision is also December 31, 2006, and the measures must be applied to all similar sources throughout the Phoenix Nonattainment Area (see 67 FR 44369, July 2, 2002), the control strategies must meet the "Most Stringent Measures" test, as well as the “Best Available Control Measures/Technology” test. In its July 25, 2002, approval of the Maricopa County Plan, EPA defined “most stringent measures” (MSMs) as the most stringent measures included in any state implementation plan, or being implemented in any state, that are economically and technologically feasible for the nonattainment area in question. “Best Available Control Measures” (BACM) must be applied in serious nonattainment areas, also taking into account the economic and technological feasibility of each measure.

This chapter details the proposed BACM and MSM that were evaluated for each significant source category.

4.2 SOURCE CATEGORIES

The Salt River Study Area 2002 base year emissions inventory is described in Chapter 3.0 and the TSD’s Chapter 4.0. The 2002 emissions source category contributions to ambient PM_{10} are depicted in Table 4.2.1. The average concentrations are derived from the modeled concentrations outlined in the TSD, Chapter 6.

Assumptions used to calculate trackout emissions appear in Appendix K “Methodology for Weighting Trackout Emissions” and Appendix P “Mapping Weighted Trackout Emissions into Predicted Concentrations” of the October 2004 TSD. Calculation methodology for street sweeping emissions reductions appears in Appendix L “Street Sweeping Reductions” of the October 2004 TSD.

Table 4.2.1 2002 Salt River Study Area Source Category Contributions to Ambient PM_{10} Concentrations

Source Category	Average Low Wind Day Contribution	Average High Wind Day Contribution	Highest Contribution($\mu g/m^3$)	
	Percentage Contribution	Percentage Contribution	Low Wind Day	High Wind Day
Industrial Sources	**25.9%**	**8.3%**	**60.2**	**31.8**
Point Emissions	2.7%	1.1%	5.3	3.0
Area Emissions	23.2%	7.2%	54.9	28.8
Construction	**5.8%**	**0.9%**	**6.0**	**4.4**
Area Sources	**4.2%**	**0.7%**	**8.0**	**3.1**
Unpaved Parking Lots	1.7%	0.2%	0.8	1.4
Unpaved Shoulders	2.5%	0.4%	7.2	1.7

Table 4.2.1 2002 Salt River Study Area Source Category Contributions to Ambient PM_{10} Concentrations				
Source Category	**Average Low Wind Day Contribution**	**Average High Wind Day Contribution**	**Highest Contribution($\mu g/m^3$)**	
	Percentage Contribution	**Percentage Contribution**	**Low Wind Day**	**High Wind Day**
Roads & Trackout	**63.7%**	**13.5%**	**73.6**	**42.7**
Freeway	0.4%	0.2%	0.7	0.4
Primary Roads	43.6%	9.3%	44.8	33.3
Secondary Roads	7.5%	1.5%	6.9	1.5
Trackout	12.1%	2.5%	21.2	7.5
Agricultural Tillage	**0.4%**	**NA**	**0.2**	**NA**
Windblown Dust	**NA**	**76.7%**	**NA**	**290.1**
Agricultural Fields	NA	21.3%	NA	**84.9**
Alluvial Channels	NA	14.9%	NA	**79.5**
Construction	NA	3.5%	NA	**14.0**
Industrial	NA	7.3%	NA	**33.6**
Disturbed Areas	NA	5.2%	NA	**25.9**
Stockpiles	NA	3.6%	NA	**12.6**
Vacant Lots	NA	20.9%	NA	**39.6**

Note: Bold concentrations exceed the 5 $\mu g/m^3$ threshold for significant sources.

In Table 4.2.2, the modeled contributions for each of the source categories are given for the 2006 attainment case. These percentages are similar to the 2002 case, but with several significant differences. For example, the windblown contribution decreases from 77% to 59% from 2002 to 2006.

Table 4.2.2 Salt River Study Area Source Category Contributions to Ambient PM_{10} Concentrations for the 2006 Attainment Case		
Source Category	**Average Low Wind Day Contribution**	**Average High Wind Day Contribution**
	Percentage Contribution	**Percentage Contribution**
Industrial Sources	**29.7%**	**12.1%**
Point Source Emissions	4.4%	3.1%
Area Emissions	25.2%	8.9%
Construction	**5.2%**	**1.8%**
Area Sources	**7.1%**	**2.1%**
Unpaved Parking Lots	0.5%	0.6%
Unpaved Shoulders	6.6%	1.5%
Roads & Trackout	**58.0%**	**24.7%**
Freeway	0.9%	0.4%
Primary Roads	48.3%	21.6%
Secondary Roads	6.8%	1.9%
Trackout	2.0%	0.7%
Agricultural Tillage	**0.1%**	**NA**
Windblown Dust	**NA**	**59.4%**
Agricultural Fields	NA	8.9%
Alluvial Channels	NA	15.4%
Construction	NA	4.2%
Industrial	NA	6.7%
Disturbed Areas	NA	10.1%
Stockpiles	NA	5.9%
Vacant Lots	NA	8.4%