



Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

**State of Arizona
Exceptional Event Documentation
for the Event of September 6, 2012,
for the Phoenix PM₁₀ Nonattainment Area**



Final Report prepared for
Arizona Department of Environmental Quality
Phoenix, AZ
February 2013

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for the Event of September 6, 2012,
for the Phoenix PM₁₀ Nonattainment Area

Final Report
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1. Introduction

On September 6, 2012, an air quality monitor in the Phoenix PM₁₀ nonattainment area recorded a 24-hr average PM₁₀ concentration in excess of the National Ambient Air Quality Standard (NAAQS) for PM₁₀ of 150 µg/m³. The purpose of this report is to demonstrate that this exceedance was due to naturally occurring windblown dust, was not reasonably controllable or preventable, was historically unusual, and would not have occurred “but-for” the windblown dust and that it therefore constitutes an Exceptional Event as defined by the U.S. Environmental Protection Agency’s (EPA) Exceptional Events Rule (EER).

1.1 Report Contents

Section 2 of this assessment contains a conceptual model of the windblown dust event that transpired on September 6, 2012, providing a background narrative of the exceptional event and an overall explanation showing that the event affected air quality. Section 2 also provides evidence that the event was a natural event.

Section 3 of this assessment establishes a clear causal connection between the natural event on September 6, 2012, and the exceedance of the 24-hr PM₁₀ standard at the monitoring station. The evidence in this section also confirms that the event in question both affected air quality and was the result of natural events.

Section 4 of this assessment illustrates that the event of September 6, 2012, produced PM₁₀ concentrations in excess of normal historical fluctuations.

Section 5 of this assessment details the existing dust control measures and demonstrates that, despite the presence and enforcement of these controls, the event of September 6, 2012, was not reasonably controllable or preventable.

Section 6 of this assessment builds upon the demonstrations made in the previous sections, showing a clear causal connection between the natural event and the exceedance, and concludes that the exceedance of the 24-hr PM₁₀ standard on September 6, 2012, would not have occurred “but for” the event.

Appendix A contains time-series graphs and data tables to supplement Section 3. **Appendix B** contains links to videos, images, and media reports to supplement Section 3. **Appendix C** contains air quality forecasts issued by the Arizona Department of Environmental Quality (ADEQ) and weather statements and warnings issued by the National Weather Service. **Appendix D** contains a copy of the affidavit of public notice concerning this assessment report.

1.2 Exceptional Event Rule Requirements

In addition to the technical requirements that are contained within the EER, procedural requirements must also be met in order for the EPA to concur with the flagged air quality monitoring data. This section of the report lists the requirements of the EER and associated guidance and discusses how ADEQ addressed those requirements.

1.2.1 Public Notification that the Event Was Occurring (40 CFR 50.14(c)(1)(i))

ADEQ issued Dust Control Action Forecasts and Air Quality Forecasts for Maricopa County advising citizens of the potential for high wind dust events on September 6, 2012. More information on ADEQ's forecasts can be found in Section 5.2 of this report. The forecast products that were issued for September 6, 2012, are included in Appendix C.

1.2.2 Place Informal Flag on Data in AQS (40 CFR 50.14(c)(2)(ii))

ADEQ and other operating air quality agencies in Arizona submit data into the EPA's Air Quality System (AQS), the official repository of ambient air quality data. This data submittal to AQS includes particulate matter (PM) data from both filter-based and continuous monitors operated in Arizona.

When ADEQ and/or another agency operating monitors in Arizona suspect that data may be influenced by an exceptional event, ADEQ and/or the other operating agency expedites analysis of the filters collected from the potentially-affected filter-based air monitoring instruments, quality-assures the results, and submits the data into AQS. ADEQ and/or other operating agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If ADEQ and/or other operating air quality agencies have determined that a potential exists that a monitor's reading(s) have been influenced by an exceptional event, a preliminary flag is submitted for the measurement in AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1 of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag on the September 6, 2012, data can be confirmed in AQS.

1.2.3 Notify EPA of Intent to Flag Through Submission of Initial Event Description by July 1 of Calendar Year Following Event (40 CFR 50.14(c)(2)(iii))

ADEQ submitted notice to EPA on August 29, 2012 listing all days from calendar year 2012 that ADEQ intends to analyze under the Exceptional Events Rule. The PM₁₀ exceedance that occurred on September 6, 2012, in the Phoenix PM₁₀ nonattainment area was included on this list. This assessment report serves as demonstration supporting the flagging of the data.

1.2.4 Document that the Public Comment Process Was Followed for Event Documentation (40 CFR 50.14(c)(3)(iv))

ADEQ posted this assessment report on the ADEQ webpage and placed a hard copy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on January 14, 2013. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv). See Appendix D for a copy of the affidavit of public notice.

1.2.5 Submit Demonstration Supporting Exceptional Event Flag (40 CFR 50.14(a)(1-2))

At the close of the public comment period, and after ADEQ has had the opportunity to consider any comments submitted on this document, ADEQ will submit this document, the comments received, and ADEQ's responses to those comments to EPA Region 9 headquarters in San Francisco, California. The deadline for the submittal of this package is September 30, 2015.

1.2.6 Documentation Requirements (40 CFR 50.14(c)(3)(iii))

The EER states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j) that
 - a. the event affected air quality,
 - b. the event was not reasonably controllable or preventable, and
 - c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
2. There is a clear causal relationship between the measurement(s) under consideration and the event;
3. The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
4. There would have been no exceedance or violation but for the event.

2. Conceptual Model

This section provides a narrative background and summarizes the meteorological and air quality conditions in place on September 6, 2012 in the Phoenix area. Elements described in this section include

- A description and map of the geographic setting of the air quality and meteorological monitors.
- A description of Phoenix's climate.
- An overall description of meteorological and air quality conditions on the event day.

2.1 Geographic Setting and Monitor Locations

Phoenix is located in the Salt River Valley in south-central Arizona. It lies at an elevation of 1,090 feet above mean sea level (msl) in the northeastern part of the Sonoran Desert. Other than the mountains in and around the city, the topography of Phoenix is generally flat. The Phoenix area is surrounded by the McDowell Mountains (~4,200 ft above msl) to the northeast, the foothills of the Bradshaw (~7,900 ft above msl) and Mazataal (~7,900 ft above msl) ranges to the north, the White Tank Mountains (~4,500 ft above msl) to the west, the Sierra Estrella (~4,450 ft above msl) to the southwest, and the Superstition Mountains (~5,000 ft above msl) far to the east. Within the City are the Phoenix Mountains (~2,600 ft above msl) and South Mountain (~2,600 ft above msl). Current development is pushing north, west, and south into Pinal County.

A fairly dense network of air quality and meteorological monitors exists throughout the Phoenix area, with a much less dense network of monitors throughout the rest of Arizona. **Figure 2-1** shows the general geographic setting of Phoenix, as well as the location of the PM₁₀ monitor that recorded an exceedance on September 6, 2012. The monitors shown in the map include AQS monitors, which measure air quality and meteorological data, and National Weather Service (NWS) monitors, which measure meteorological data only. Some of the AQS monitors in the Phoenix area are run by the Maricopa County Air Quality Department (MCAQD), while others are run by ADEQ. The PM₁₀ exceedance on September 6, 2012, was recorded at the West Chandler monitor. Phoenix Sky Harbor International Airport (KPHX) and Chandler Municipal Airport (KCHD) were the primary NWS sites used in this demonstration package because of those sites' high data quality, data completeness, proximity to the West Chandler monitor, and representativeness of meteorological conditions in the Phoenix area. **Figure 2-2** shows the locations of PM₁₀ monitors statewide on September 6, 2012.

Figure 2-3 depicts the drainage systems or watersheds for the State of Arizona. Many of the rivers that form Arizona's drainage system are dry for most of the year and, consequently, are sources of silt and fine soils that become suspended and add to regional PM₁₀ loadings during high wind events. Much of this alluvial matter and fine soil is deposited in the low-lying areas of central and southern Arizona, with larger depositional areas focused in and around the confluences of dry river channels.

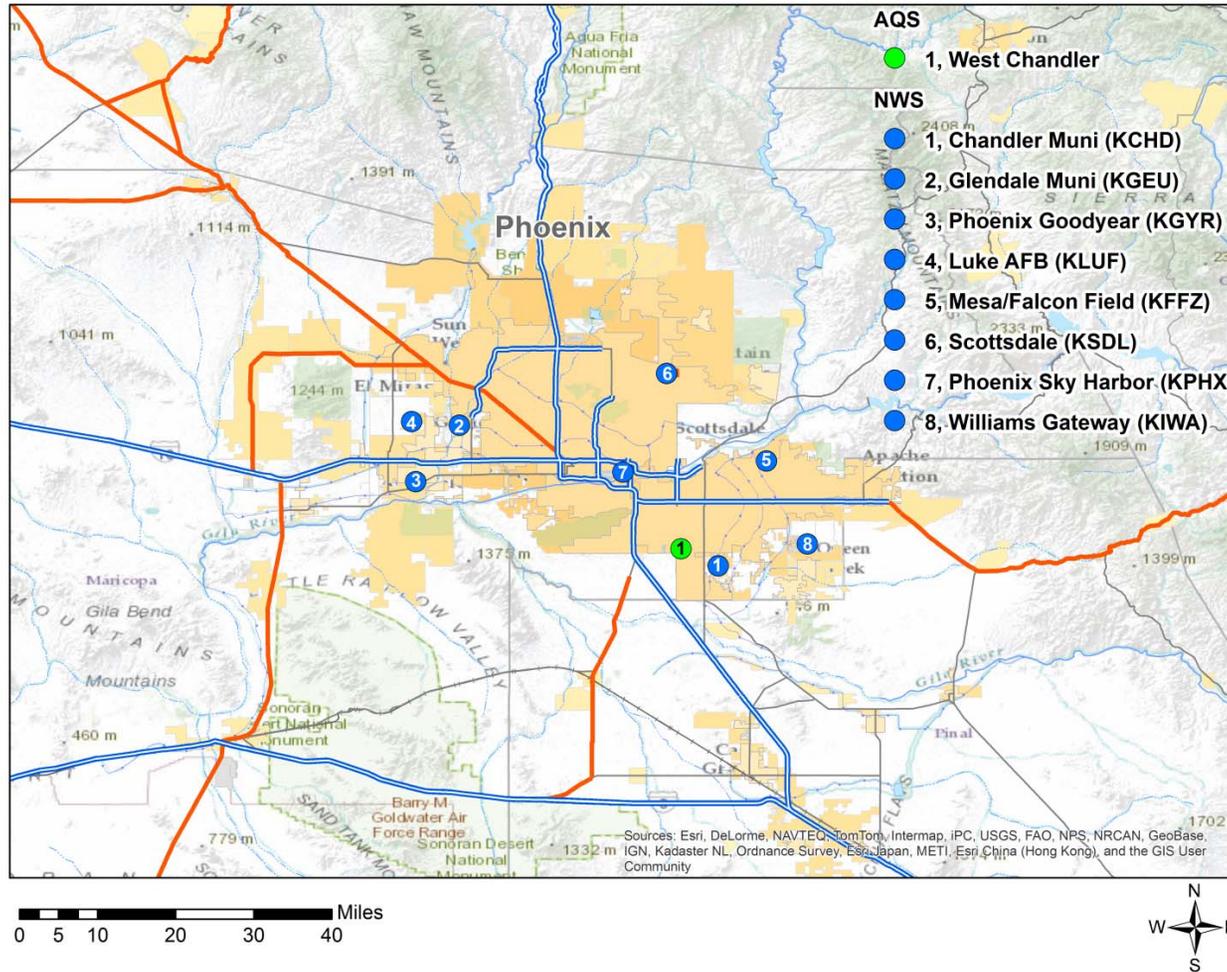


Figure 2-1. Locations of the air quality monitor that recorded an exceedance of the 24-hr PM₁₀ NAAQS on September 6, 2012, and NWS monitors described in this report.

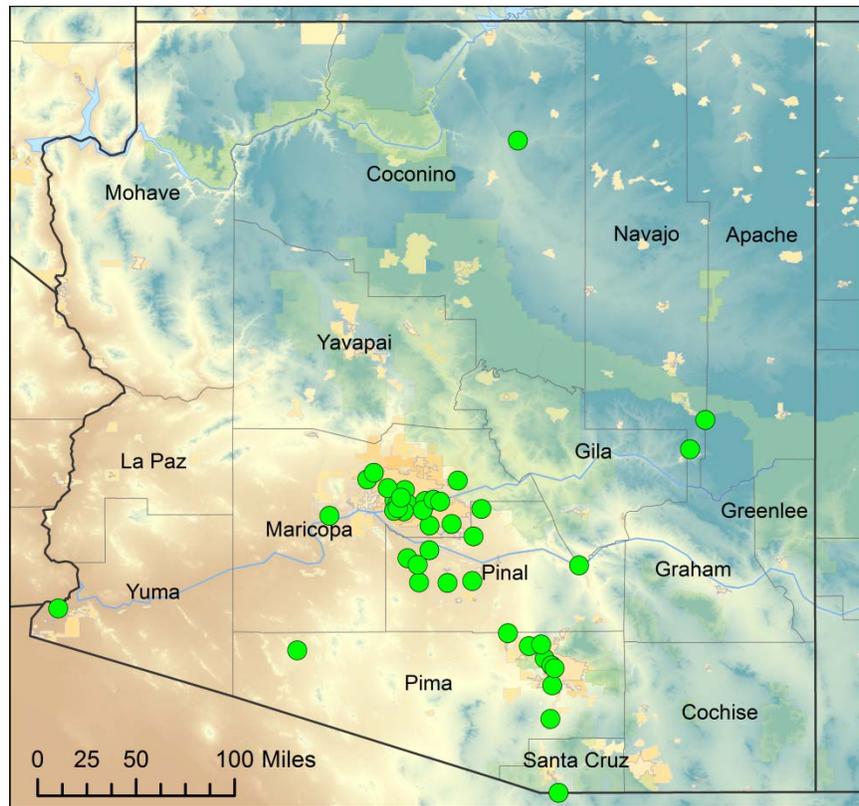
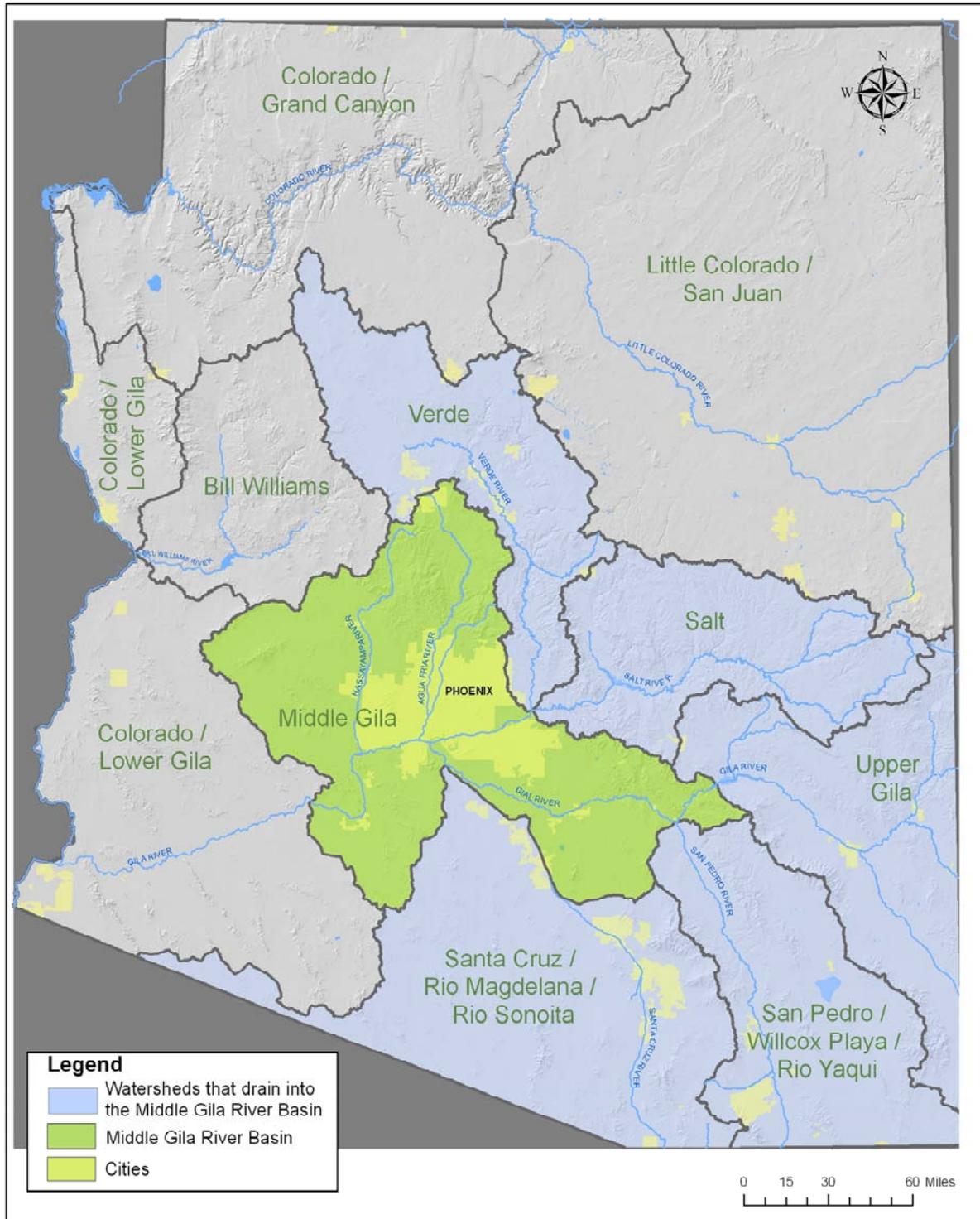


Figure 2-2. Location of sites monitoring PM₁₀ in Arizona on September 6, 2012.



Author: N. Caroli, March 15, 2010



Figure 2-3. Drainage system of Phoenix, Arizona.

2.2 Climate

Phoenix has an arid climate, with very hot summers and temperate winters. The average summer high temperatures are among the hottest of any populated area in the United States (**Figure 2-4**). Temperatures reach or exceed 100°F an average of 110 days annually, and reach or exceed 110°F an average of 18 days annually. Phoenix receives an average of 7.66 inches of rain per year. The bulk of this rain usually falls during the December through March and July through August time periods. During the December through March period, winter storms originating from the Pacific Ocean can produce significant rains in southwestern Arizona. During the mid- to late-summer time period, monsoonal moisture originating from the Gulf of California, Gulf of Mexico, and large thunderstorm complexes over the Sierra Madre Occidental Mountains in Mexico move northward into Arizona.

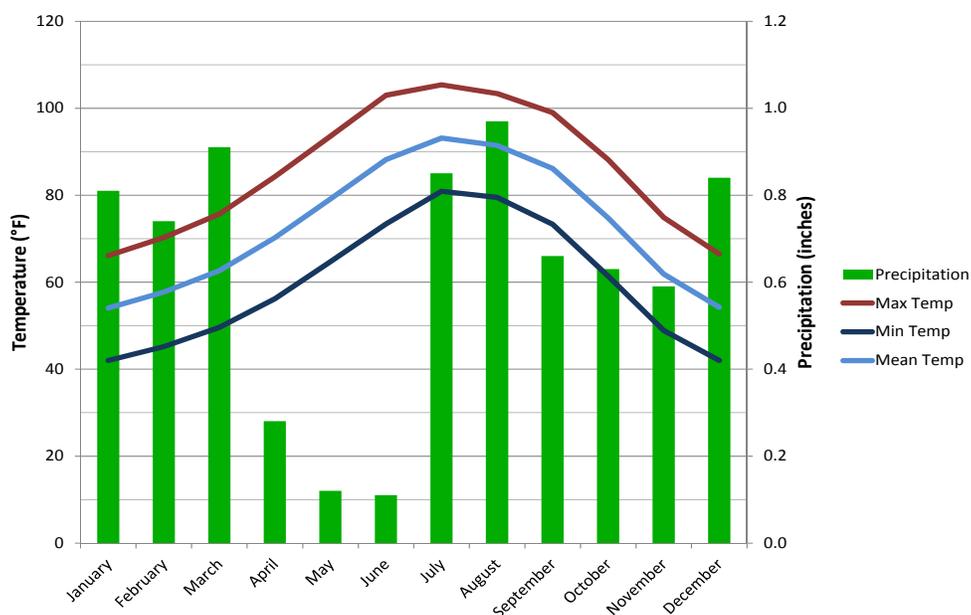
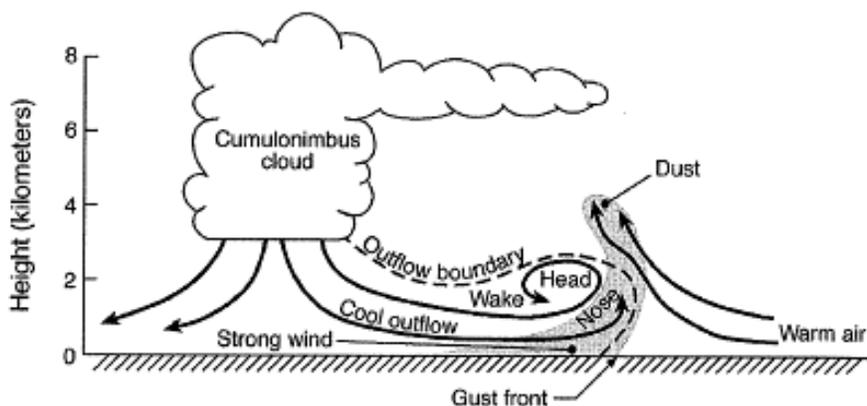


Figure 2-4. Average monthly temperatures and precipitation for Phoenix, 1981–2010.

The influx of moisture associated with the monsoon, combined with strong solar heating, can result in unstable atmospheric conditions that are favorable for the development of thunderstorms. Heavy precipitation associated with thunderstorms, and the eventual collapse or dissipation of thunderstorms, can generate what are known as downbursts. Downbursts are the rapid descent of rain-cooled air in a thunderstorm. Upon reaching the surface, this air rapidly disperses horizontally away from the storm as the outflow boundary (also called gust fronts), as shown in **Figure 2-5**. The high winds associated with outflow boundaries can efficiently loft dust into the air and transport the dust over long distances, resulting in dust storms (also called haboobs) with high PM₁₀ concentrations and low visibilities.

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16 Severe weather in the desert



Cross-section schematic of a haboob caused by the cool outflow from a thunderstorm, with the leading edge that is propagating ahead of the storm called an outflow boundary. The strong, gusty winds that prevail at the boundary are defined as a gust front. The leading edge of the cool air is called the nose, and the upward-protruding part of the features is referred to as the head. Behind the roll in the windfield at the leading edge is a turbulent wake. The rapidly moving cool air and the gustiness at the gust front raise dust (shaded) high into the atmosphere.

Figure 2-5. Cross-section of a thunderstorm creating an outflow boundary and haboob. (Source: *Desert Meteorology*, Thomas T. Warner, 2004.)

Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before subsequent rains moisten the soil and limit potential lofting of soil into the air. However, depending on the amount and frequency of precipitation received during the monsoon season, the extremely hot temperatures can dry the surface soils very quickly; thus, dust storms can occur at any time during the year. Specific PM_{10} source regions are difficult to determine during thunderstorm-driven dust storms because the thunderstorm outflow can carry dust over long distances that encompass many possible sources of dust. Instead, we consider general PM_{10} source regions, which are typically identified based on the locations of the thunderstorms that are believed to have generated the dust-laden outflow winds.

2.3 Event Day Summary

On the afternoon and evening of September 6, 2012, strong winds generated by thunderstorms over south-central Arizona transported dust northward into the Phoenix area. The windblown dust resulted in 24-hr average PM_{10} concentrations in exceedance of the NAAQS at one air quality monitor (**Table 2-1**). The PM_{10} concentration measured at this monitor was in excess of normal historical fluctuations. The dust was naturally occurring and likely originated over undeveloped lands south of the Phoenix area, and wind gusts in excess of 30 mph overwhelmed reasonable dust control measures. Monitors across Maricopa and Pinal counties recorded high PM_{10} concentrations during this dust storm, illustrating the widespread, regional nature of the event.

Table 2-1. Arizona PM₁₀ measurements on September 6, 2012. The exceedance monitors discussed in this report are shown in bold.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (LST)	AQS Qualifier Flag
<i>Apache County</i>							
N/A	TEOM	WMAT	04-001-1003-81102-1	12	25	700	
<i>Coconino County</i>							
N/A	N/A	ADEQ	04-005-1237-81102-1	N/A	N/A	N/A	
<i>Gila County</i>							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	41	139	1100	
<i>Maricopa County</i>							
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-1	125	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-2	121	N/A	N/A	
Lehi Air Monitoring Station	N/A	SRP-MIC	04-013-7022-81102-1	150	N/A	N/A	
West Phoenix	BAM	MC	04-013-0019-81102-1	30	117	1800	
North Phoenix	BAM	MC	04-013-1004-81102-1	N/A	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	39	185	1700	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	64	624	1700	
Greenwood	TEOM	MC	04-013-3010-81102-1	46	247	1700	
South Phoenix	TEOM	MC	04-013-4003-81102-1	79	870	1700	
West Chandler	TEOM	MC	04-013-4004-81102-1	164	3056	1700	RJ
Tempe	TEOM	MC	04-013-4005-81102-1	103	1535	1700	
Higley	TEOM	MC	04-013-4006-81102-1	128	2189	1700	
West 43 rd Ave	TEOM	MC	04-013-4009-81102-1	65	508	1700	
Dysart	TEOM	MC	04-013-4010-81102-1	50	282	1700	
Buckeye	TEOM	MC	04-013-4011-81102-1	46	325	1700	
Zuni Hills	TEOM	MC	04-013-4016-81102-1	60	631	1800	
South Scottsdale	TEOM	MC	04-013-3003-81102-1	101	1094	1700	
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	N/A	N/A	N/A	
Durango Complex	TEOM	MC	04-013-9812-81102-1	81	862	1700	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	37	113	600	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	N/A	N/A	N/A	
<i>Navajo County</i>							
N/A	TEOM	WMAT	04-017-1002-81102-1	16	35	1600	
<i>Pima County</i>							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	N/A	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	42	300	1400	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	27	N/A	N/A	

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (LST)	AQS Qualifier Flag
Prince Road	FRM	PCDEQ	04-019-1009-81102-1	18	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	22	N/A	N/A	
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	17	N/A	N/A	
<i>Pinal County</i>							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	92	978	1500	
Apache Junction Fire Station	FRM	PCAQCD	04-021-3002-81102-3	83	746	1700	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	121	1649	1600	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	70	497	1700	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	N/A	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	164	2964	1600	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	159	2659	1600	RJ
Bapchule	FRM	GRIC	04-021-7004-81102-1	613	N/A	N/A	RJ
Bapchule	FRM	GRIC	04-021-7004-81102-2	547	N/A	N/A	RJ
<i>Santa Cruz County</i>							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	17	38	1200	
<i>Yuma County</i>							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	25	159	2000	

TEOM: Tapered Element Oscillating Microbalance monitor
 FRM: Federal Reference Method
 WMAT: White Mountain Apache Tribe of Fort Apache Reservation, AZ
 SRP-MIC: Salt River Pima-Maricopa Indian Community of Salt River Reservation, AZ
 PCDEQ: Pima County Department of Environmental Quality
 PCAQCD: Pinal County Air Quality Control District
 GRIC: Gila River Indian Community
 RJ: qualifier flag for high winds

¹ PM₁₀ data for 1600 and 1700 on September 6, 2012, were not available.

3. Causal Relationship

3.1 Discussion

Meteorological and air quality observations indicate that dust carried by thunderstorm outflow was directly responsible for the high PM₁₀ concentrations observed in the Phoenix area on September 6, 2012. On the afternoon of September 6, a large area of thunderstorms developed over south-central Arizona, south of the Phoenix area (**Figure 3-1**). As these thunderstorms drifted north, they generated a dust-carrying outflow boundary that propagated northward into the Phoenix area. As stated in Section 2.2, thunderstorms associated with the summer monsoon season can generate strong winds and blowing dust across Arizona. The likely source region for PM₁₀ during the September 6, 2012, event was the deserts south of Phoenix and largely outside the Phoenix PM₁₀ nonattainment area. This region mainly consists of natural, undisturbed desert. In addition, the two weeks leading up to the event were dry in the Phoenix area, with the last measureable rainfall at KPHX occurring on August 23. This combination of geography and lack of rainfall preceding the event resulted in a large fetch of soils that were particularly vulnerable to particulate suspension.

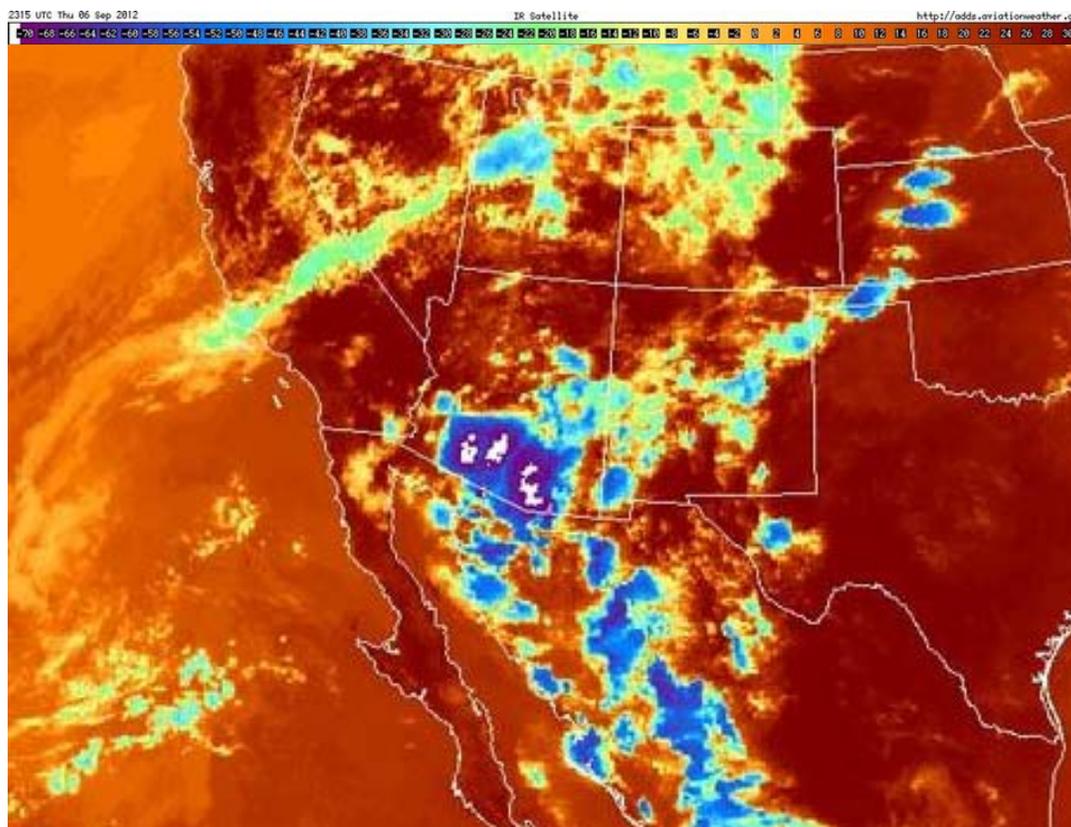


Figure 3-1. Infrared satellite image from 1615 LST on September 6, 2012 (GOES-West). Colder temperatures (blues, purples, and white) indicate tall, convective (thunderstorm) clouds. Thunderstorms over south-central Arizona generated outflow boundaries that carried dust northward into Arizona.

The effects of the thunderstorm outflow and associated windblown dust were evident at most Pinal County monitors between 1600 and 1700 LST on September 6, with PM₁₀ concentrations exceeding 2,500 µg/m³ at two monitors (**Figure 3-2**). The thunderstorm outflow and associated dust continued northward and arrived in the Phoenix area between 1700 and 1800 LST on September 6, with visibility reduced to near zero at KCHD (**Figure 3-3**). PM₁₀ concentrations at the West Chandler monitor increased sharply over this time period, with 1-hr PM₁₀ concentrations exceeding 3,000 µg/m³ (**Figure 3-4**). Collocated wind observations at West Chandler showed wind gusts in excess of 30 mph coincident with the high PM₁₀ concentrations. Several other monitors in the Phoenix area reported gusty winds at the same time as the high PM₁₀ concentrations, including a wind gust of 40 mph at KCHD (Appendix A). Visibility cameras in the Phoenix area also clearly showed a reduction in visibility and blowing dust as the outflow arrived (**Figure 3-5**). Links to these videos and other media coverage and images pertaining to this windblown dust event are shown in Appendix B. It is also important to note that before the abrupt increase in PM₁₀ in the Phoenix area, winds were lighter, visibilities were greater, and PM₁₀ concentrations were much lower, illustrating the correlation between the high winds and the dust. In response to the approaching thunderstorm outflow and associated dust and low visibilities, the NWS office in Phoenix issued a Blowing Dust Advisory and Dust Storm Warning for portions of western Pinal and Maricopa Counties (Appendix C). The Blowing Dust Advisory and Dust Storm Warning specifically mentioned the Chandler area, which is where the West Chandler monitor is located.

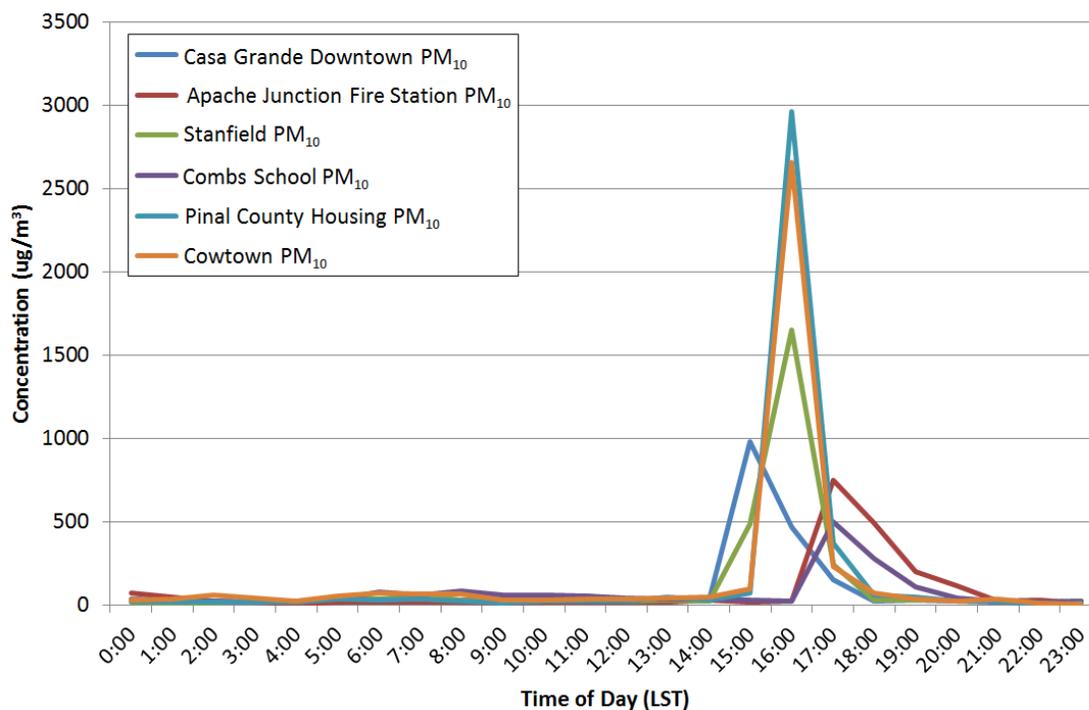


Figure 3-2. Hourly PM₁₀ concentrations at Pinal County monitors on September 6, 2012. PM₁₀ concentrations sharply increased between 1500 and 1700 LST, indicating the arrival of windblown dust.

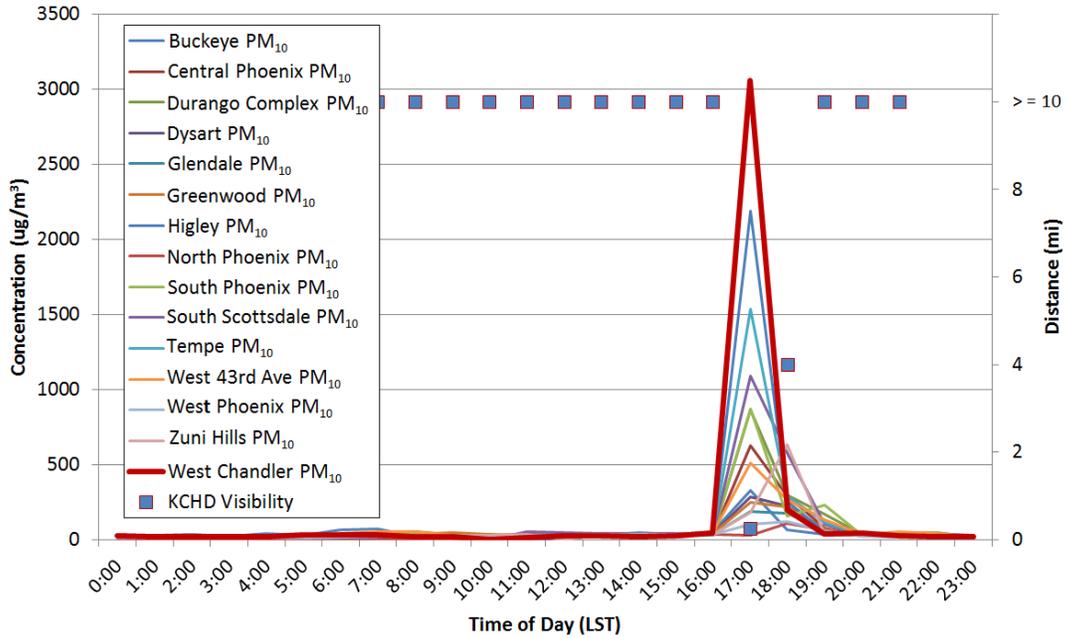


Figure 3-3. Hourly PM₁₀ concentrations at Maricopa County monitors and visibility at KCHD on September 6, 2012. Visibility was greatly reduced at 1700 and 1800 LST on September 6, 2012, coinciding with the sharp increase in PM₁₀ concentrations at Maricopa County monitors, indicating the arrival of windblown dust.

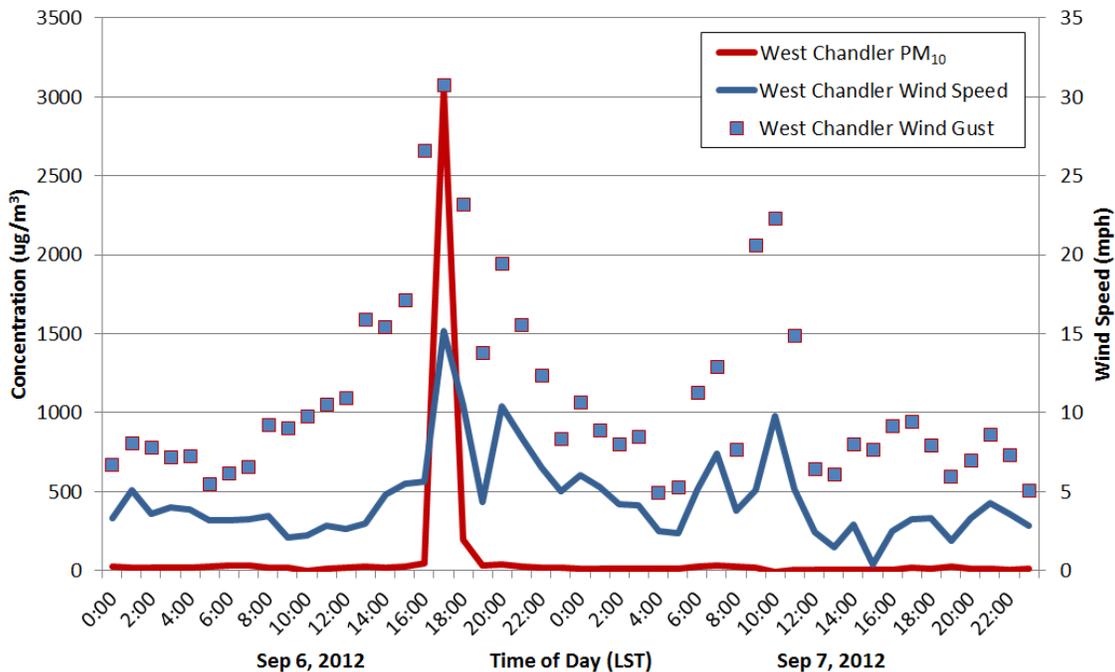


Figure 3-4. Hourly PM₁₀ concentrations and wind speeds at the West Chandler monitor on September 6 and 7, 2012. PM₁₀ concentrations and wind speeds sharply increased at 1700 LST on September 6, 2012, indicating the arrival of windblown dust.



Figure 3-5. Image from an ADEQ visibility camera on North Mountain looking south toward downtown Phoenix and the South Mountains. Windblown dust associated with thunderstorm outflow reduced visibility throughout the Phoenix area, obscuring the downtown skyline and South Mountains.

The progression of the thunderstorm outflow and windblown dust through the Phoenix area is summarized by the radar velocity and wind vector spatial plots below (**Figures 3-6 through 3-9**).

1530-1600 LST (Figure 3-6)

Observations at area monitors generally showed light winds with a westerly component, high visibilities, and low PM_{10} concentrations across Maricopa County. At this time, thunderstorm outflow was just beginning to impact monitors in western Pinal County, but the outflow boundary itself was not yet detected on Doppler radar.

1630-1700 LST (Figure 3-7)

Between 1630 and 1700 LST, the outflow boundary was detectable on Doppler radar over northwestern Pinal County and far southern Maricopa County and was just south of the West Chandler monitor. Note that the outflow boundary exhibited a bowed structure, with a

bulge northward aimed at the West Chandler monitor. In quasi-linear thunderstorm boundaries, bowing structures, and especially the apex of a bowing structure, are often locations of stronger wind speeds. Thus, the structure and motion of the outflow boundary on September 6, 2012, was particularly favorable for the development of strong winds specifically in the vicinity of the West Chandler monitor. Monitors in western Pinal County were already impacted by the outflow boundary and windblown dust, reporting PM_{10} concentrations above $2,500 \mu\text{g}/\text{m}^3$, gusty southwesterly winds, and decreased visibilities. Monitors across Maricopa County had not yet been affected by the outflow, and thus continued to report low PM_{10} concentrations, generally light winds, and high visibilities.

1730-1800 LST (Figure 3-8)

The outflow boundary continued moving northward into Maricopa County, affecting several monitors in the Phoenix metropolitan area, but most strongly impacting the east and southeast side of the Phoenix area. Conditions near and south of the outflow boundary were characterized by gusty south-southwesterly winds, visibilities as low as 0.25 miles, and high PM_{10} concentrations. Although only the West Chandler monitor in Maricopa County recorded an exceedance of the NAAQS, several other monitors reported 5-minute PM_{10} concentrations in excess of $2,500 \mu\text{g}/\text{m}^3$. PM_{10} concentrations and wind speeds decreased at Pinal County monitors as the outflow boundary moved northward out of Pinal County.

The West Chandler monitor likely recorded the highest PM_{10} concentrations because of its location on the southeastern side of the Phoenix urban area, closer to the undeveloped lands of western Pinal County where much of the dust and PM_{10} likely originated. And, as mentioned above, the bowed structure of the outflow boundary favored locally stronger winds in the vicinity of the West Chandler monitor. Also of note were very high 24-hour average PM_{10} concentrations at the filter-based monitor operated by the Gila River Indian Community (see Table 2-1), which is in northern Pinal County very near the West Chandler monitor. Thus, the West Chandler monitor was likely subject to greater quantities of transported PM_{10} compared to other monitors in the nonattainment area.

1830-1900 LST (Figure 3-9)

As the outflow boundary continued northward, PM_{10} concentrations decreased at most Maricopa and Pinal county monitors, including at West Chandler. Winds remained gusty across Maricopa County but shifted to westerly, which was no longer conducive to transport of dust and PM_{10} from the south. Finally, visibilities quickly returned to at or above 10 miles as the outflow boundary departed to the north of the Phoenix area.

3.2 Summary

The information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM_{10} exceedance measured in the Phoenix PM_{10} nonattainment area on September 6, 2012. The wind, visibility, PM_{10} , and radar data shown in this section illustrate the spatial and temporal extent of the dust storm as it moved through Maricopa County.

In addition, meteorological data tables found in Appendix A show that the sharp increase in PM₁₀ concentrations coincided with the gusty winds, low visibilities, and airport observer reports of blowing dust. The fact that PM₁₀ concentrations in Pinal County spiked prior to PM₁₀ concentrations increasing in Maricopa County illustrate that a vast majority of the dust that impacted the nonattainment area monitors originated outside of Maricopa County and was transported into the Phoenix PM₁₀ nonattainment area. While PM₁₀ concentrations were high regionally during the event, the West Chandler monitor was the closest Maricopa County monitor to the open and desert areas of western Pinal County, resulting in an exceedance at the West Chandler monitor. The proximity of the West Chandler monitor to open and desert areas of Pinal County provides solid evidence as to why this was the only monitor within the Maricopa County nonattainment area that recorded an exceedance.

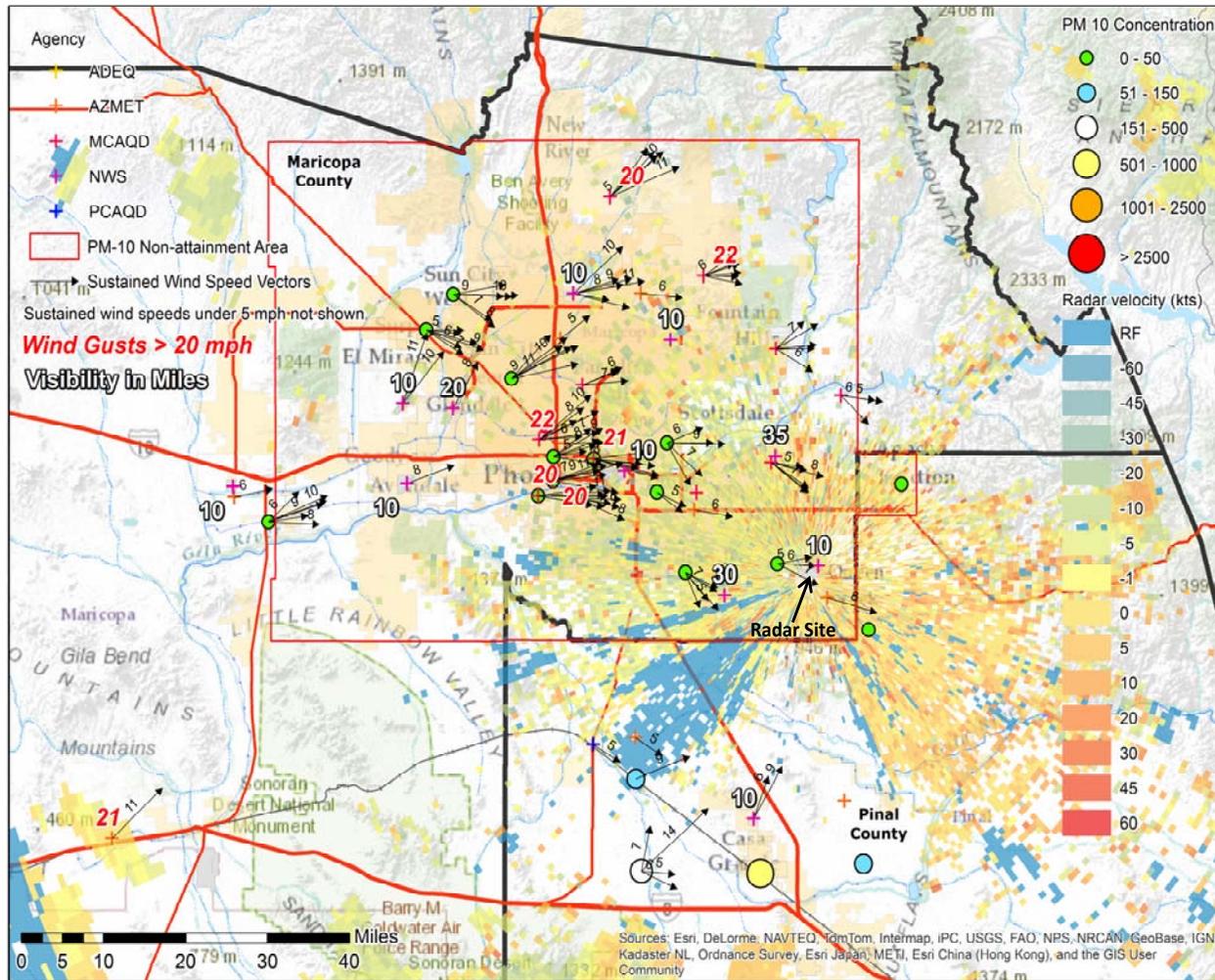


Figure 3-6. Maximum 5-minute PM₁₀ concentrations (colored circles), 5-minute wind speed and direction (vectors), maximum wind gusts (red numbers), and minimum visibility observations (white numbers) at Maricopa and Pinal county monitors between 1530 and 1600 LST on September 6, 2012. Where 5-minute data are unavailable (e.g., PM₁₀ data in Pinal County), 1-hour data are used. Underlying colors are Doppler radar velocity data at 1534 LST, where greens indicate motion toward the radar and oranges/reds indicate motion away from the radar.

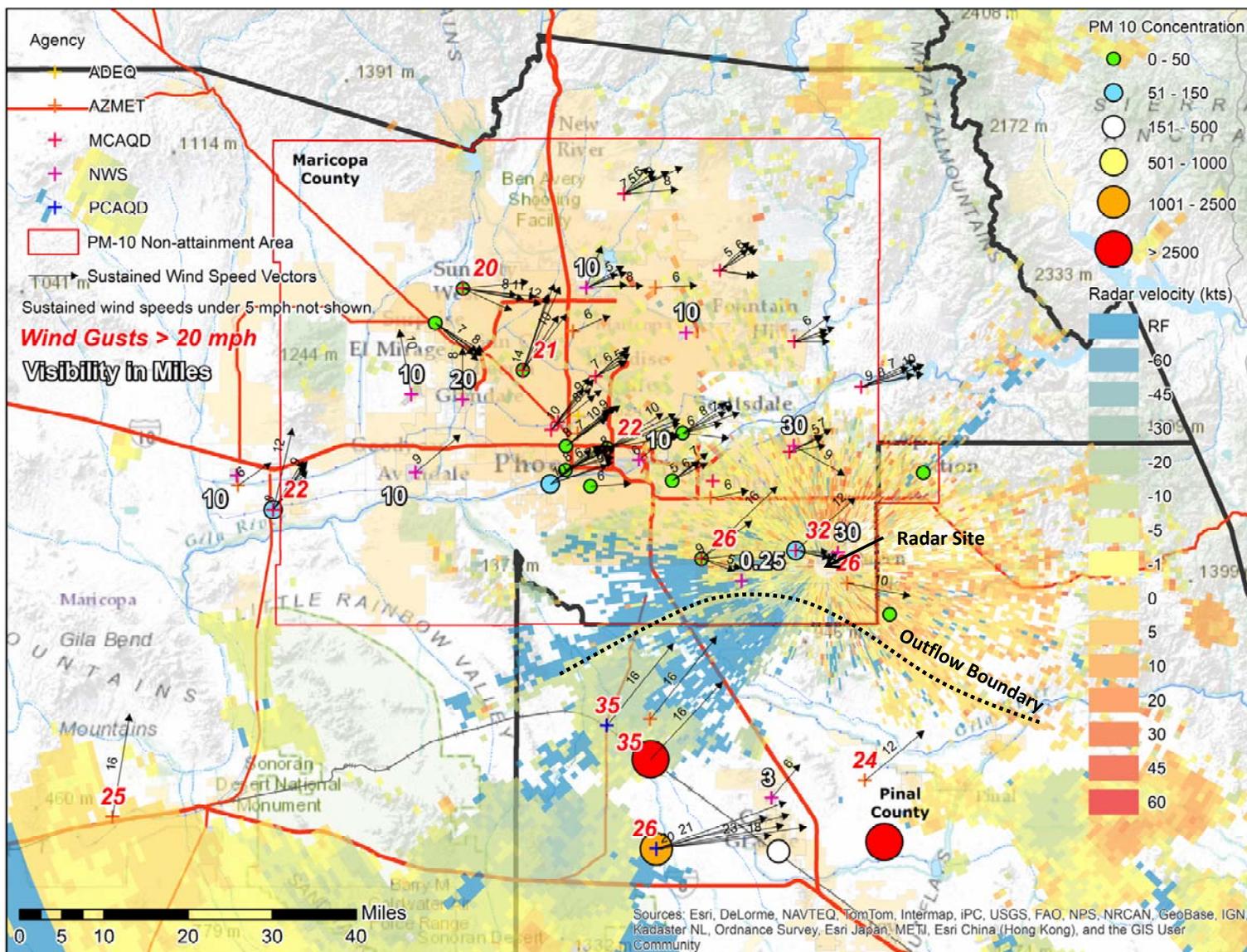
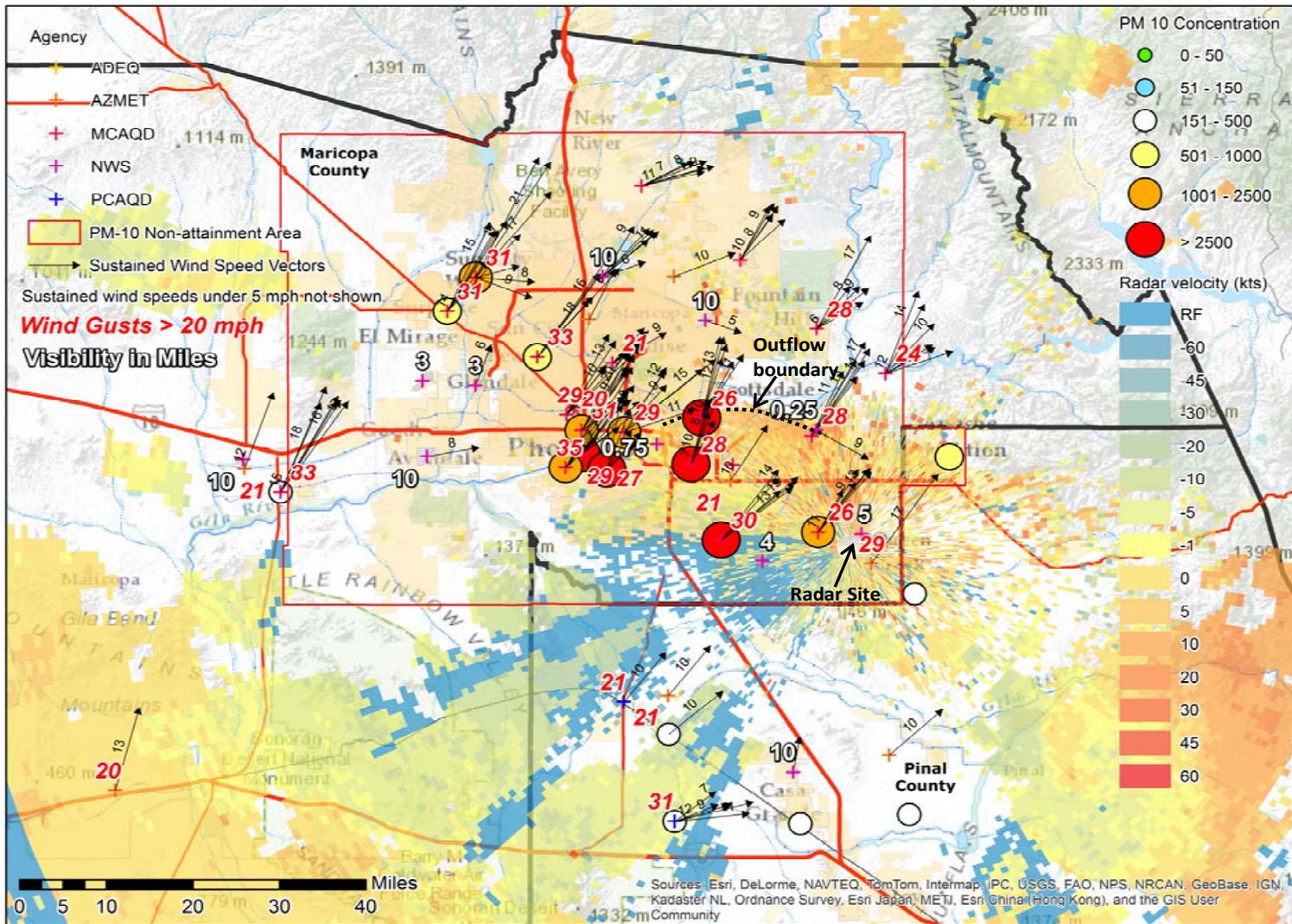


Figure 3-7. Similar to Figure 3-6, but representing observations from 1630 to 1700 LST. Doppler radar data are from 1644 LST.



6

Figure 3-8. Similar to Figure 3-6, but representing observations from 1730 to 1800 LST. Doppler radar data are from 1730 LST.

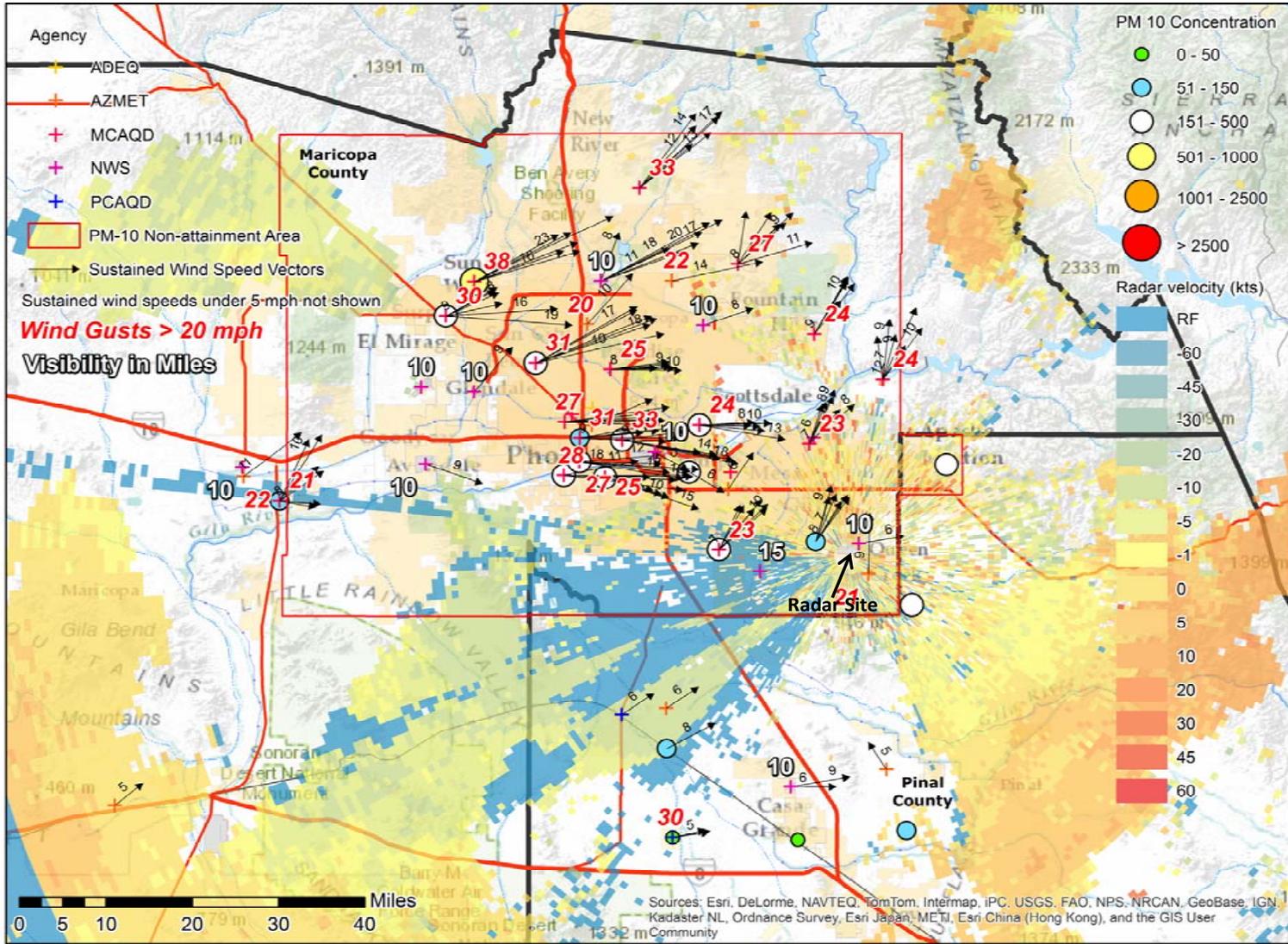


Figure 3-9. Similar to Figure 3-6, but representing observations from 1830 to 1900 LST. Doppler radar data are from 1838 LST.

4. Historical Norm

4.1 Analysis

PM₁₀ concentrations measured at Phoenix-area monitors on September 6, 2012, were unusual and in excess of normal historical fluctuations. To establish the severity of this event, PM₁₀ concentrations measured on September 6, 2012, were compared to a historical 2007 to 2012 annual data set at the West Chandler monitor. The PM₁₀ concentrations measured at the West Chandler monitor on September 6, 2012, resulted in some of the highest 24-hr averages (Figure 4-1) and daily maximum hourly averages (Figure 4-2) measured over the 5-year period.

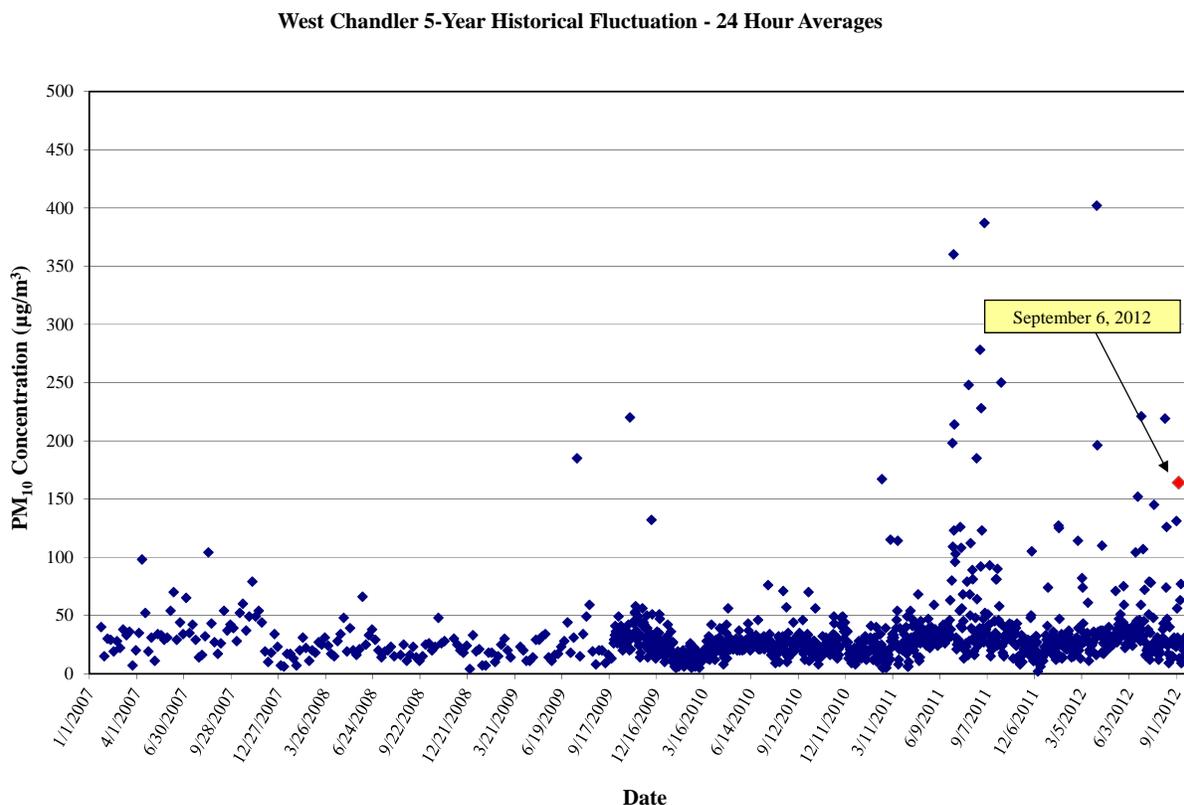


Figure 4-1. 24-hr average PM₁₀ concentrations at the West Chandler monitor (2007–2012). The 24-hr average PM₁₀ concentration on September 6, 2012, is shown in red and highlighted by the arrow.

West Chandler 5-Year Historical Fluctuation - Daily Maximum Hourly Averages

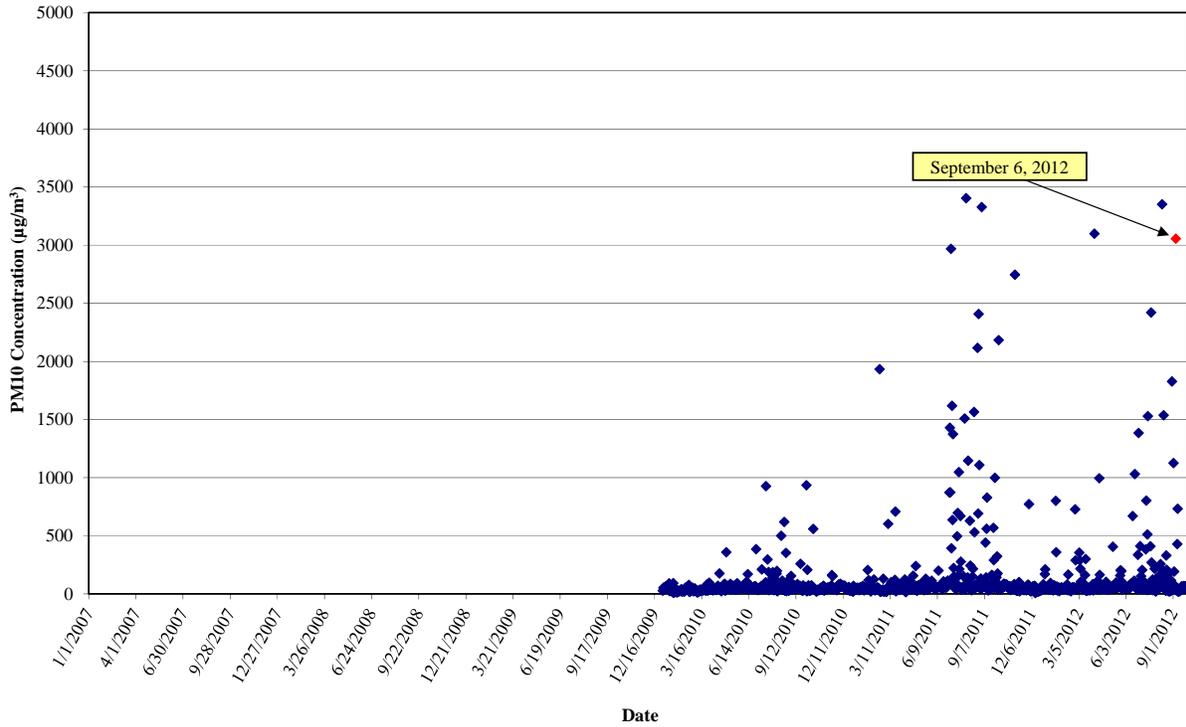


Figure 4-2. Daily maximum hourly average PM₁₀ concentrations at the West Chandler monitor (2007–2012). The daily maximum hourly average PM₁₀ concentration on September 6, 2012, is indicated by the arrow.

4.2 Summary

Given the recorded values and using a methodology similar to the one accepted by EPA, it is clear that the PM₁₀ levels on September 6, 2012, were outside normal historical fluctuations. This analysis provides evidence that the event affected air quality on a historic scale.

5. Not Reasonably Controllable or Preventable

5.1 Background

ADEQ and MCAQD are responsible for implementing regulatory measures to control emissions from agricultural sources, stationary sources, fugitive dust sources, and open burning within Maricopa County. Three major programs provide or contribute to air pollution control measures for the Greater Phoenix area. These programs include

1. ADEQ's Agricultural Best Management Program (Ag BMP)
2. Maricopa County's Inspection and Compliance Program
3. ADEQ's Air Quality Forecasting Program

Specifically, ADEQ is responsible for compliance assistance and enforcement of Agricultural Best Management Practices developed by the Governor's Agricultural Best Management Practices Committee, while MCAQD is responsible for compliance assurance for all other significant sources of PM₁₀ emissions. In addition to routine inspections and inspections driven by complaints, inspections are often increased when (1) ADEQ forecasters issue a Maricopa County Dust Control Forecast of "High Risk," (2) ADEQ forecasters issue a High Pollution Advisory, or (3) near-real-time monitoring data indicate unique activity via high PM concentrations. The forecasting program and inspection/compliance programs work together so that resources can be best utilized during days of greatest risk for elevated PM emissions.

On July 25, 2002, EPA took initial action to finalize approval of the Best Available Control Measure (BACM) and the Most Stringent Measure (MSM) demonstrations in the Serious Area PM₁₀ plan for the Maricopa County portion of the metropolitan Phoenix PM₁₀ nonattainment area (67 FR 48718). These BACM and MSM demonstrations were again approved by EPA on July 14, 2006 (71 FR 43979). The Agricultural Best Management Practices General Permit rule and related definitions have been adopted into the Arizona Administrative Code as R18-2-610 and R18-2-611, pursuant to Arizona Revised Statutes §49-457¹ Updates to the Ag BMP program in December 2011 clarified BMPs.

5.1.1 Control Measures

Maricopa County regulations of PM₁₀ emissions are listed in **Table 5-1**.

¹ Updates to the Ag BMP program in December 2011 clarified BMPs for crops and added BMPs for animal operations. Effective 12/29/2011, R18-2-611 was renumbered to R18-2-610.01 **Agricultural PM₁₀ General Permit for Crop Operations** and R18-2-611.01 **Animal Operations PM₁₀ General Permit** was added. Definitions for Crop Operations were revised at R18-2-610 and new definitions for Animal Operations were added at R18-2-611.

Table 5-1. Rules and ordinances regulating PM emissions in Maricopa County.

Rule/Ordinance Number & Title	Description
Rule 300: Visible emissions	Establishes standards for visible emissions and opacity.
Rule 310: Fugitive dust from dust-generating operations	Establishes limits for the emissions of particulate matter into the ambient air from any property, operations, or activity that may serve as a fugitive dust source.
Rule 310.01: Fugitive dust from non-traditional sources of fugitive dust	Establishes limits for the emissions of particulate matter into the ambient air from open areas, vacant lots, unpaved parking lots, and unpaved roadways which are not regulated by Rule 310 and which are not required to have either a permit or a dust control plan.
Rule 311: Particulate matter from process industries	Establishes emission rates based on process weight applicable to any affected operations not subject to Rule 316.
Rule 312: Abrasive blasting	Establishes limits for particulate emissions from abrasive blasting operations.
Rule 314: Open outdoor fires and indoor fireplaces at commercial and institutional establishments	Establishes limits for the emissions of air contaminants produced from open burning.
Rule 316: Nonmetallic mineral processing	Establishes limits for the emissions of particulate matter into the ambient air from any nonmetallic mining operation or rock product processing plant.
Rule 317: Hospital/medical/infectious waste incinerators	Establishes limits for the emissions of air pollutants from medical waste incinerators.
Rule 322: Power plant operations	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter from existing power plants and cogeneration plants.
Rule 323: Fuel burning equipment from industrial/commercial/institutional (ICI) sources	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from ICI sources.
Rule 324: Stationary internal combustion (IC) engines	Establishes limits for the emissions of carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds, and particulate matter from stationary internal combustion engines, including stationary IC engines used in cogeneration.
Rule 325: Brick and structural clay products (BSCP) manufacturing	Establishes limits for particulate matter emissions from the use of tunnel kilns for curing in the BSCP manufacturing processes.
Ordinance P-25: Leaf blower restriction	Establishes restrictions for leaf blowers in incorporated and unincorporated sections of Area A in Maricopa County.
Ordinance P-26: Residential wood burning restriction	Establishes restrictions for residential wood burning.
Ordinance P-27: Vehicle parking and use on unstabilized vacant lots	Establishes restrictions for vehicle parking and use on unstabilized vacant lots in unincorporated sections of Area A in Maricopa County.
Ordinance P-28: Off-road vehicle use in unincorporated areas of Maricopa County	Establishes restrictions for operating vehicles on unpaved property in unincorporated areas of Maricopa County.

Rule/Ordinance Number & Title	Description
Arizona Administrative Code R18-2-611 & 610: Agricultural PM ₁₀ general permit	Establishes a requirement for commercial farmers to implement best management practices and maintain a record demonstrating compliance.

5.1.2 Additional Measures

In addition to the rules and regulations listed in **Table 5-1**, other PM₁₀-reducing control measures (e.g., paving unpaved roads, PM₁₀-certified street sweepers, controlling unpaved parking lots, etc.) have been committed to and implemented by local jurisdictions throughout the PM₁₀ nonattainment area and incorporated into the Arizona state implementation plan (SIP) through PM₁₀ plans such as the Revised Maricopa Association of Governments' (MAG) 1999 Serious Area Particulate Plan for PM₁₀ for the Maricopa County Nonattainment Area. The Pinal County Air Quality Control District (PACQCD) also implements regulatory control measures on emissions from existing and new non-point sources within Pinal County (see **Table 5-2**). Additionally, the PACQCD implements specific nonattainment rules for that part of the Phoenix PM₁₀ nonattainment area that resides in Pinal County (see **Table 5-3**).

Table 5-2. Pinal County rules regulating existing and new non-point sources in Pinal County.

Article Number & Title	Description
Article 2: Fugitive dust	Provides a mechanism to reasonably regulate operations which periodically may cause fugitive dust emissions into the atmosphere.
Article 3: Construction sites – fugitive dust	Improves the control of excessive fugitive dust emissions that have been traditionally associated with construction, earthwork, and land development, and thereby minimize nuisance impacts.

Table 5-3. Pinal County rules regulating fugitive dust in Pinal County portion of the Phoenix PM₁₀ Nonattainment Area.

Article Number & Title	Description
Article 4: Nonattainment area rules; dustproofing for commercial parking, drives, and yards	Establishes rules to avoid violations of the prevailing PM ₁₀ standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from unpaved parking lots.
Article 5: Nonattainment area rules; stabilization for residential parking and drives	Establishes rules for stabilizing residential properties.
Article 6: Restrictions on vehicle parking and use on vacant lots	Establishes rules for unpaved or unstable vacant lots.
Article 7: Construction sites in nonattainment areas – fugitive dust	Establishes rules to avoid violations of the prevailing PM ₁₀ standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from activities associated with construction, earthwork, or land development.

Article Number & Title	Description
Article 8: Nonattainment area rules, requirement for stabilization of disturbed areas at vacant lots	Establishes rules for stabilizing disturbed areas at vacant lots.

5.1.3 PM₁₀ Rule Effectiveness

MCAQD analyzed the effectiveness of its fugitive dust rules (Rules 310, 310.01, and 316) in terms of permit compliance rates. This rule effectiveness (RE) study was designed to assess how many sources regulated by MCAQD during the subject time period received no PM₁₀ emissions-related violations. As a basis for comparison, the percentage of permitted sources in compliance during calendar year 2007 was 76% for sources subject to Rule 310, 85% for Rule 310.01 sources, and 40% for Rule 316 sources. In early 2008, Rules 310, 310.01, and 316 were strengthened, and new ordinances (covering additional source categories such as leaf blowers, vacant lots, and off-road vehicles) were adopted. These enhancements resulted from MCAQD’s obligations under such agreements as the 2005 Revised PM₁₀ State Implementation Plan for the Salt River Area and the Maricopa Association of Governments 2007 Five Percent Plan for PM₁₀ for the Maricopa County Nonattainment Area to reduce PM₁₀ emissions throughout the county. Three major areas that contributed to increased compliance were an increase in departmental staffing (especially inspectors), a robust training program, and regulatory changes that broadened and strengthened control measures under Rules 310, 310.01, and 316.

Source compliance rates were re-assessed for FY 2009 (July 2008–June 2009), a period that allowed time for the new and revised regulations to take effect. The results showed significant increases in compliance compared with the earlier period: to 90% (from 76%) for Rule 310 sources, 95% compliance (from 85%) for Rule 310.01 sources, and 65% (from 40%) for Rule 316 sources. These improvements continued into calendar year 2010 with compliance rates of 94% for Rule 310 sources, 96% for Rule 310.01 sources, and 73% for Rule 316 sources. The timeline below (**Figure 5-1**) illustrates the improvements in RE over the last several years; it also points out significant revisions to previous rules, as well as newly adopted rules and ordinances.

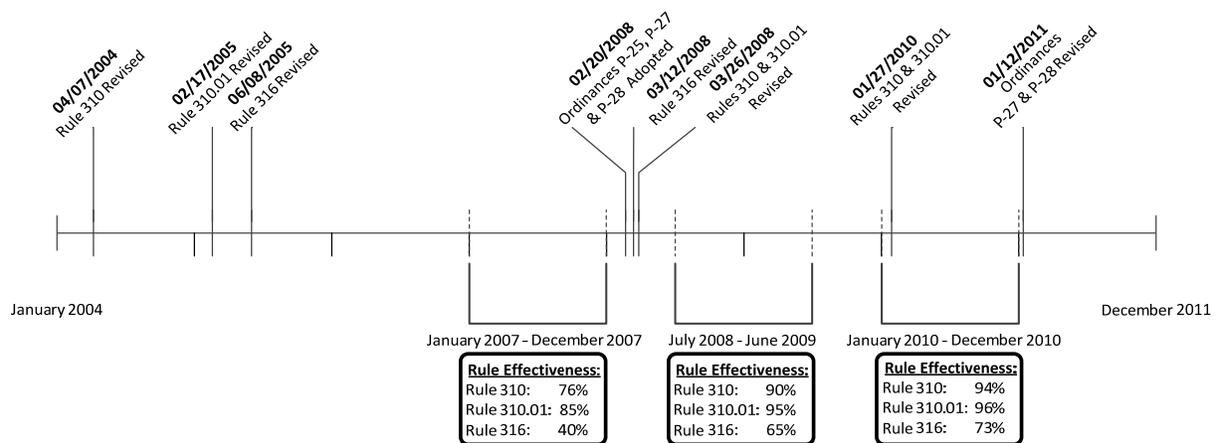


Figure 5-1. Timeline of Maricopa County fugitive dust rules and ordinances.

5.1.4 Compliance and Enforcement Activities

MCAQD is prepared to proactively respond to high wind events and protect human health and well-being. MCAQD’s approach consists of two primary components: proactive inspections conducted routinely, as well as surveillance inspections conducted during and after significant air quality events. MCAQD routinely inspects dust control-permitted sites and increases the frequency of inspections for permits covering areas of 10 acres or more. Rule 316 sources are also regularly inspected multiple times every year. Maricopa County responds to the majority of complaints within 24 hours.

Maricopa County monitors the ADEQ Five-Day Dust Control Forecast to identify the potential for elevated PM₁₀ pollution levels due to high winds or stagnant conditions. When a High Pollution Advisory (HPA) is issued for Maricopa County, MCAQD conducts increased surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities during exceedance days that had not been forecast (i.e., those instances in which an HPA had not been issued).

Pre-event surveillance consists of surveying high-risk areas for any dust-generating activities, educating sources of the impending HPA event, and issuing violations for failure to comply with local, state, or federal regulations. During the event, MCAQD inspectors survey high-risk areas to confirm that control measures are in place, document any violations, and contact other regulatory agencies if necessary. Post-event activities include continued surveys of high-risk areas, re-inspecting sources that had incurred violations within two business days, and an internal MCAQD debriefing of event activities.

During 2011 and 2012, a total of 17 MCAQD air monitoring sites were upgraded with new equipment that allows the monitoring sites to automatically report measured readings at 5-minute intervals. Previously, only hourly readings were available. The real-time data reporting system includes a mechanism to alert MCAQD field staff when PM concentrations are elevated. The system allows MCAQD responders to review concentrations at the monitors and

to consult the National Weather Service website to check for weather event activity. This capability allows the MCAQD responder to identify regional events and monitor specific issues. If necessary, the MCAQD responders can inform nearby stakeholders and local governments of the elevated PM₁₀ concentrations.

5.1.5 Review of Source-Permitted Inspections and Public Complaints

ADEQ's Arizona Unified Repository for Information Tracking of the Environment (AZURITE) database was queried to compile a list of inspections for the permitted sources in the Maricopa area around the time of the September 6, 2012, PM₁₀ exceedances. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation did not indicate any evidence of unusual anthropogenic-based PM₁₀ emissions. During the period of September 3 through 9, 2012, MCAQD inspectors conducted a total of 144 inspections of permitted facilities, of which 102 were at fugitive dust sources. Additionally, MCAQD conducted 69 inspections on vacant lots and unpaved parking lots. During this 7-day period, a total of 24 citations for violations were issued countywide for PM₁₀ and non-PM₁₀ related violations. One violation was issued for PM₁₀ emissions within a 4-mile radius of an exceeding monitor (West Chandler).

On September 4, 2012, a violation was issued to an earthmoving operation of 0.15 acres for not obtaining a dust control permit. A dust control permit was issued to this site on September 19, 2012. No unstable area was discovered during the inspection on September 4, 2012, or the subsequent inspections performed on September 10, 2012, and October 15, 2012. The site was located approximately 3.4 miles west of the West Chandler monitor. Since winds during the thunderstorm outflow and high PM₁₀ event were from the south, it is highly unlikely that this violation impacted PM₁₀ concentrations at the West Chandler monitor on September 6, 2012.

MCAQD was prepared for any complaints received due to the high wind event. During the 7 day period from September 3, 2012 through September 9, 2012, MCAQD received 18 complaints, of which 11 were windblown dust-related. Each complaint was assigned to and investigated by a MCAQD inspector. A review of all pertinent records from this period indicates that MCAQD inspectors observed no PM₁₀ violations of local, state, or federal regulations within a 4-mile radius of the exceeding monitor.

In addition to MCAQD's efforts in pre-event surveillance and proactive inspections, ADEQ's Ag BMP inspector also monitors the ADEQ Five-Day Dust Control Forecast and the MCAQD air monitoring sites that include real-time data. The ADEQ Ag BMP inspector uses specific knowledge of seasonal activities and associations with the local growers and dairymen to communicate the importance of limiting dust-generating activities, especially during high wind events. Additional outreach is conducted with facility representatives prior to forecast high wind alert days. Should the PM₁₀ readings at a MCAQD air monitoring site show a notable increase, the ADEQ Ag BMP inspector is dispatched to contact the owners and operators of agricultural fields in the area to discern whether their activities are causing negative impacts. The Ag BMP inspector is prepared to respond to most agriculture complaints within 24 hours.

Based on a review of the inspection reports and site visit documentation, there is no evidence to suggest that agricultural activities produced unusual PM₁₀ emissions. On September 6, 2012, the ADEQ Ag BMP inspector received one complaint and conducted outreach in response to a dust complaint at an agricultural composting location in the area of Lindsey Road and Ocotillo Road.

5.2 Forecasts and Warnings

Dust forecasts and statements were released prior to the event by both ADEQ and the NWS office in Phoenix (Appendix C). On September 5, 2012, a Maricopa County Dust Control Forecast for September 6, 2012, was issued by ADEQ, indicating a moderate risk level for unhealthy PM₁₀. The Dust Control Forecast also indicated a potential for gusty winds near thunderstorm outflow.

The NWS office in Phoenix issued several Blowing Dust Advisories, Dust Storm Warnings, and Severe Thunderstorm Warnings between 1600 and 1800 LST for portions of Pinal and Maricopa counties, coincident with the period of gusty outflow winds and high PM₁₀ concentrations in the Phoenix area. These advisories warned residents of the potential for gusty winds to 40 mph and visibilities reduced below ¼ mile due to blowing dust generated by thunderstorm outflow moving northward from Pinal County into Maricopa County.

5.3 Wind Observations

Wind data during the event (Figure 3-2 and Appendix A) showed widespread wind gusts of over 30 mph coincident with the high PM₁₀ concentrations, including a wind gust of 40 mph at KCHD (near the West Chandler PM₁₀ monitor).

5.4 Summary

The thunderstorm outflow event of September 6, 2012, produced strong winds that transported dust and PM₁₀ into the Phoenix PM₁₀ nonattainment area. The source region of the outflows that caused the exceedances was largely located in areas outside the Phoenix PM₁₀ nonattainment area, primarily the deserts south of Maricopa County. The Phoenix area is designated as a serious nonattainment area for PM₁₀ and is required to have BACM for all significant sources of PM₁₀. BACM on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.

Despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the thunderstorm outflow transported high concentrations of PM₁₀ into, and also overwhelmed controls within, the Phoenix PM₁₀ nonattainment area. Widespread wind gusts over 30 mph were strong enough to overwhelm available efforts to limit PM₁₀ concentrations during the event. The fact that these were natural

events involving strong winds that transported PM₁₀ emissions into and across Maricopa County, with a majority of the PM₁₀ emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM₁₀ nonattainment area, provides strong evidence that the exceedance of September 6, 2012, recorded within the Phoenix PM₁₀ nonattainment area was not reasonably controllable or preventable.

6. But-For Analysis

6.1 Discussion

Section 50.14(c)(3)(iv)(D) in 40 CFR Part 50 requires that an exceptional event demonstration satisfy the condition that “[t]here would have been no exceedance or violation but for the event.” The prior sections of this submittal have provided detailed information that, in regard to the PM₁₀ exceedance at the West Chandler monitor on September 6, 2012,

- the exceedance was not reasonably controllable or preventable, and
- there was a clear causal relationship between PM₁₀ transported strong winds originating in desert areas outside the Phoenix PM₁₀ nonattainment area and the measured PM₁₀ exceedance at the West Chandler monitor.

The weight of evidence in these sections demonstrates that, but for the existence of dust emissions generated by strong winds and the associated transport of PM₁₀, there would have been no exceedance of the NAAQS for 24-hr average PM₁₀.

As shown in Section 3, maps and time-series plots of PM₁₀ and wind speeds establish a clear causal relationship between windblown dust due to thunderstorm outflow and elevated PM₁₀ concentrations at Phoenix-area monitors. Multiple independent measurements of wind speed, wind direction, and visibility point to the presence of gusty winds generated by thunderstorm outflow as the mechanism for transport of PM₁₀ into the Phoenix nonattainment area. In addition, PM₁₀ concentrations were well below the NAAQS on days immediately before and after the windblown dust event. The source region for the PM₁₀ is clearly identified as desert areas south of the Phoenix PM₁₀ nonattainment area. The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of September 6, 2012, to any causal source except PM₁₀ transported by strong winds, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.

As detailed in Section 5, all reasonable control measures were in place and/or implemented on a continual basis. Air quality-related inspection and compliance data revealed one violation with 4 miles of the exceedance monitor; however, the meteorological conditions on September 6, 2012, indicate that the source of this violation does not explain and could not have resulted in the very high PM₁₀ concentrations observed. Local regulatory agencies, industry, and the general public were alerted to the possibility of dust storms due to strong winds via daily forecasts and media reports.

6.2 Summary

The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of September 6, 2012, to any causal source other than PM₁₀ transported by gusty winds due to thunderstorm outflow, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.

7. Conclusions

The PM₁₀ exceedance that occurred on September 6, 2012, satisfy the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

- The event satisfies the criteria set forth in 40 CFR 50.1 (j) that
 - a. the event affected air quality,
 - b. the event was not reasonably controllable or preventable, and
 - c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
- There is a clear causal relationship between the measurement(s) under consideration and the event;
- The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
- There would have been no exceedance or violation but for the event.

7.1 Affects Air Quality

As stated in the preamble to the EER, the event in question is considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in Sections 2, 3, 4, and 5, we can reasonably conclude that the event in question affected air quality.

7.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable control measures in place within Maricopa County, high winds overwhelmed all reasonably available controls (Section 5). The PM₁₀ exceedance discussed in this report was caused by naturally occurring gusty winds associated with thunderstorm outflow that transported dust into the Phoenix area from areas largely outside the Phoenix PM₁₀ nonattainment area. These facts provide strong evidence that the PM₁₀ exceedance on September 6, 2012, was not reasonably controllable or preventable.

7.3 Natural Event

As discussed above, the PM₁₀ exceedance at the West Chandler monitor on September 6, 2012, was shown to be caused by transport of PM₁₀ into the Phoenix area from gusty winds associated with thunderstorm outflow. The event therefore qualifies as a natural event.

7.4 Clear Causal Relationship

The following points demonstrate that the high PM₁₀ concentrations were caused by windblown dust:

- Time-series graphs of PM₁₀ concentrations show that the timing of high PM₁₀ at Phoenix area monitors was consistent with gusty winds and low visibilities at Phoenix-area meteorological stations (Section 3).
- High PM₁₀ concentrations and gusty winds were reported at several monitors throughout the Phoenix metropolitan area (Sections 3 and 5).
- PM₁₀ concentrations were well below the NAAQS on days immediately before and after the windblown dust event (Section 3).
- Dry conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by high winds (Section 3).
- Wind directions, thunderstorm-generated outflow boundary propagation, and concentration patterns showing elevated levels of PM₁₀ in Pinal County prior to levels increasing in Maricopa County illustrate that a vast majority of the dust that impacted the nonattainment area monitors originated outside of Maricopa County and was transported to the nonattainment area. The particular wind magnitudes and wind direction, and the proximity of the exceeding monitor to open and desert areas of Pinal County, provide solid evidence as to why only one monitor within the Maricopa County nonattainment area recorded an exceedance (Section 3).
- Visibility cameras clearly illustrate the arrival of dust and significant reductions in visibility in the Phoenix area coinciding with the sharp increases in PM₁₀ concentrations.

7.5 Historical Norm

The 24-hr average PM₁₀ values measured at Phoenix area monitors were historically unusual compared to a multi-year data set (Section 4).

7.6 But For

On the basis of the weight of evidence described above and in Section 6, the exceedance of the federal 24-hr PM₁₀ standard on September 6, 2012, in the Phoenix PM₁₀ nonattainment area would not have occurred but for the high winds and transport of dust from areas largely outside the Phoenix PM₁₀ nonattainment area.

Appendix A: Air Quality and Meteorological Data for Maricopa County

This section contains tables of meteorological data from National Weather Service sites in the Phoenix area for September 6, 2012. Reduced visibilities, gusty winds, and blowing dust or dust storms were reported coincident with the arrival of thunderstorm outflow and high PM₁₀ concentrations.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA**

(final)
HOURLY OBSERVATIONS TABLE
CHANDLER MUNICIPAL AIRPORT (53128)
CHANDLER, AZ
(09/2012)

Elevation: 1243 ft. above sea level
Latitude: 33.268
Longitude: -111.812
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0547	0	FEW200	15.00		81	27.0	73	23.0	70	21.0	69	7	040		28.56			M	AA		29.88
06	0647	0	FEW200	35.00		81	27.0	73	23.0	70	21.0	69	3	110		28.59			M	AA		29.91
06	0749	0	FEW200	35.00		84	29.0	74	23.5	70	21.0	63	3	030		28.60			M	AA		29.92
06	0850	0	FEW250	35.00		88	31.0	75	24.1	70	21.0	55	5	VR		28.61			M	AA		29.93
06	0947	0	FEW250	35.00		90	32.0	75	23.7	68	20.0	48	6	VR		28.62			M	AA		29.94
06	1047	0	FEW060 FEW200	35.00		93	34.0	76	24.2	68	20.0	44	3	240		28.61			M	AA		29.93
06	1147	0	FEW060 FEW200	30.00		93	34.0	74	23.5	66	19.0	41	5	270		28.59			M	AA		29.91
06	1247	0	FEW070 SCT200	30.00		97	36.0	75	24.1	66	19.0	36	9	190		28.56			M	AA		29.88
06	1350	0	FEW070 SCT200	30.00		99	37.0	75	23.8	64	18.0	32	9	270		28.53			M	AA		29.85
06	1450	0	SCT070 BKN200	30.00		100	38.0	75	23.6	63	17.0	30	11	290	18	28.48			M	AA		29.80
06	1547	0	SCT070 BKN200	30.00		99	37.0	73	22.9	61	16.0	29	9	270	40	28.49			M	AA		29.81
06	1650	0	VV001	0.25s	BLDUs	95	35.0	74	23.2	64	18.0	36	23	210	37	28.51			M	AA		29.83
06	1727	0	BKN070	1.00	BLDU	86	30.0	72	22.4	66	19.0	51	23	210		28.53			M	AA		29.85
06	1747	0	BKN070 OVC200	4.00	BLDU	86	30.0	74	23.1	68	20.0	55	23	220		28.52			M	AA		29.84
06	1850	0	SCT070 OVC200	15.00		86	30.0	74	23.1	68	20.0	55	17	200		28.54			M	AA		29.86
06	1947	0	BKN070 BKN200	15.00		84	29.0	74	23.5	70	21.0	63	6	150		28.56			M	AA		29.88
06	2047	0	BKN150	15.00		84	29.0	74	23.5	70	21.0	63	17	170		28.61			M	AA		29.93

Figure A-1. Quality-controlled local climatological data hourly observations table for Chandler Municipal Airport, Chandler, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) was reported. For a more detailed explanation of the weather codes shown in the table above, please see <http://www.nws.noaa.gov/oso/oso1/oso12/document/guide.shtml>. Data dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
GLENDALE MUNICIPAL AIRPORT (53126)
GLENDALE, AZ
(09/2012)**

Elevation: 1066 ft. above sea level
Latitude: 33.527
Longitude: -112.295
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0547	0	FEW120	20.00		84	29.0	74	23.5	70	21.0	63	6	190		28.74			M	AA		29.88
06	0647	0	FEW250	20.00		84	29.0	73	22.8	68	20.0	59	3	170		28.77			M	AA		29.91
06	0747	0	FEW250	20.00		88	31.0	73	22.8	66	19.0	48	9	200		28.78			M	AA		29.92
06	0847	0	FEW250	20.00		90	32.0	74	23.1	66	19.0	45	8	210		28.79			M	AA		29.93
06	0947	0	FEW250	20.00		90	32.0	75	23.7	68	20.0	48	8	180		28.80			M	AA		29.94
06	1047	0	FEW250	20.00		91	33.0	75	23.9	68	20.0	47	7	200		28.79			M	AA		29.93
06	1147	0	FEW100 FEW250	20.00		95	35.0	76	24.5	68	20.0	41	9	220		28.78			M	AA		29.92
06	1247	0	FEW100 FEW250	20.00		97	36.0	77	24.7	68	20.0	39	5	140		28.76			M	AA		29.89
06	1347	0	FEW100 SCT250	20.00		99	37.0	76	24.4	66	19.0	34	8	200		28.71			M	AA		29.85
06	1447	0	FEW080 SCT250	20.00		100	38.0	76	24.5	66	19.0	33	11	190	18	28.69			M	AA		29.82
06	1547	0	SCT080 BKN200	20.00		102	39.0	76	24.2	64	18.0	29	11	190		28.66			M	AA		29.79
06	1647	0	SCT080 BKN200	20.00		100	38.0	75	23.9	64	18.0	31	14	190	20	28.68			M	AA		29.81
06	1735	0	SCT080 SCT200 OVC250	3.00	BLDU	97	36.0	75	24.1	66	19.0	36	24	190	37	28.68			M	AA		29.81
06	1747	0	SCT080 BKN200 OVC250	4.00	BLDU	91	33.0	75	23.9	68	20.0	47	25	180	32	28.69			M	AA		29.82
06	1847	0	SCT080 BKN180 OVC250	10.00		88	31.0	75	24.1	70	21.0	55	22	230	31	28.74			M	AA		29.87

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Figure A-2. Quality-controlled local climatological data hourly observations table for Glendale Municipal Airport, Glendale, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) was reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA**

(final)
HOURLY OBSERVATIONS TABLE
PHOENIX GOODYEAR AIRPORT (03186)
GOODYEAR, AZ
(09/2012)

Elevation: 968 ft. above sea level
Latitude: 33.416
Longitude: -112.383
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0547	0	FEW150 FEW250	10.00		82	28.0	74	23.2	70	21.0	67	7	240		28.86			M	AA		29.89
06	0647	0	FEW250	10.00		82	28.0	74	23.2	70	21.0	67	6	230		28.88			M	AA		29.91
06	0747	0	FEW250	10.00		86	30.0	74	23.1	68	20.0	55	7	230		28.90			M	AA		29.93
06	0847	0	FEW250	10.00		88	31.0	74	23.4	68	20.0	52	8	250		28.91			M	AA		29.94
06	0947	0	SCT250	10.00		91	33.0	75	23.9	68	20.0	47	9	230		28.92			M	AA		29.95
06	1047	0	FEW050 FEW250	10.00		91	33.0	76	24.5	70	21.0	50	8	260		28.91			M	AA		29.94
06	1147	0	FEW050	10.00		95	35.0	77	25.1	70	21.0	44	9	290		28.89			M	AA		29.92
06	1247	0	FEW050	10.00		95	35.0	76	24.5	68	20.0	41	6	240		28.87			M	AA		29.90
06	1355	0	FEW070 SCT250	10.00		99	37.0	76	24.4	66	19.0	34	7	260		28.83			M	AA		29.86
06	1455	0	SCT070 SCT250	10.00		100	38.0	76	24.5	66	19.0	33	11	240		28.79			M	AA		29.82
06	1555	0	SCT070 SCT180 BKN250	10.00		100	38.0	76	24.5	66	19.0	33	14	230		28.77			M	AA		29.80
06	1647	0	SCT070 SCT180 BKN250	10.00		100	38.0	76	24.5	66	19.0	33	17	230		28.79			M	AA		29.82
06	1720	0	SCT070 SCT150 OVC200	3.00	BLDU	91	33.0	75	23.9	68	20.0	47	25	220	34	28.78			M	AA		29.81
06	1755	0	SCT070 SCT150 OVC200	10.00		90	32.0	76	24.4	70	21.0	52	17	190	29	28.79			M	AA		29.82
06	1855	0	SCT070 BKN180 OVC250	10.00		88	31.0	75	24.1	70	21.0	55	21	230	29	28.84			M	AA		29.87
06	1947	0	SCT070 BKN180 OVC250	10.00		86	30.0	75	23.8	70	21.0	59	17	210	23	28.83			M	AA		29.86
06	2047	0	BKN070 BKN150 OVC200	10.00	-RA	84	29.0	76	24.5	73	23.0	70	21	220		28.88			M	AA		29.91

Figure A-3. Quality-controlled local climatological data hourly observations table for Phoenix Goodyear Airport, Goodyear, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) was reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
LUKE AFB AIRPORT (23111)
GLENDALE, AZ (09/2012)**

Elevation: 1085 ft. above sea level

Latitude: 33.55

Longitude: -112.366

Data Version: VER2

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Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0055	0	CLR	10.00		87	30.4	76	24.3	71	21.4	59	17	210		28.68			29.76	AA		29.83
06	0155	0	CLR	10.00		86	30.0	76	24.1	71	21.6	61	14	200		28.69	3	002	29.77	AA		29.84
06	0255	0	CLR	10.00		85	29.7	75	23.6	70	21.3	61	13	200		28.69			29.77	AA		29.84
06	0355	0	CLR	10.00		85	29.4	75	23.6	70	21.0	61	10	190		28.70			29.77	AA		29.85
06	0455	0	CLR	10.00		84	29.0	74	23.1	69	20.8	61	9	200		28.71	3	004	29.78	AA		29.86
06	0555	0	CLR	10.00		84	28.7	74	23.1	69	20.4	61	9	200		28.71			29.79	AA		29.87
06	0655	0	CLR	10.00		84	28.7	73	22.8	68	19.9	59	5	200		28.74			29.82	AA		29.89
06	0755	0	CLR	10.00		87	30.7	74	23.3	68	20.0	53	11	200		28.75	3	017	29.83	AA		29.91
06	0831	0	CLR	10.00		88	31.0	74	23.4	68	20.0	52	11	200		28.75			29.84	AA		29.91
06	0855	0	CLR	10.00		89	31.5	75	23.6	68	19.8	50	10	220		28.76			29.84	AA		29.92
06	0955	0	CLR	10.00		91	32.7	75	23.9	68	20.2	47	10	170		28.76			29.85	AA		29.92
06	1055	0	CLR	10.00		93	33.8	76	24.5	69	20.5	46	6	VR		28.76	0	003	29.84	AA		29.92
06	1155	0	CLR	10.00		95	34.9	77	24.8	69	20.5	43	5	VR		28.74			29.82	AA		29.90
06	1255	0	CLR	10.00		96	35.8	77	24.9	69	20.4	42	6	VR		28.71			29.79	AA		29.87
06	1355	0	CLR	10.00		100	37.5	77	24.8	67	19.3	34	13	230		28.68	8	028	29.75	AA		29.83
06	1455	0	CLR	10.00		101	38.4	76	24.4	65	18.1	31	14	210		28.64			29.72	AA		29.79
06	1555	0	CLR	10.00		102	39.0	76	24.2	64	17.6	29	13	250		28.63			29.70	AA		29.78
06	1655	0	FEW090	10.00		100	37.9	76	24.2	65	18.6	32	21	200	25	28.63	5	015	29.71	AA		29.78
06	1729	0	FEW004 SCT090	5.00	HZ	99	37.0	77	25.0	68	20.0	37	31	210	34	28.64			29.71	AA		29.79
06	1730	0	FEW003 SCT090	4.00	HZ	97	36.0	77	24.7	68	20.0	39	31	210	34	28.64			29.71	AA		29.79
06	1742	0	FEW003 SCT090	5.00	HZ	93	34.0	76	24.2	68	20.0	44	24	210	38	28.64			29.72	AA		29.79
06	1751	0	FEW003 BKN080	3.00	BLDU	91	33.0	76	24.5	70	21.0	50	25	210	33	28.65			M	AA		29.80
06	1755	0	FEW003CB SCT080CB	6.00	VCTS DU	91	32.9	76	24.2	69	20.7	49	25	210	32	28.66			29.74	AA		29.81
06	1818	0	SCT085CB	6.00	TS DU	88	31.0	75	24.1	70	21.0	55	26	220		28.69			29.77	AA		29.84
06	1855	0	CLR	10.00		90	32.0	75	23.7	68	20.2	48	17	240		28.70			29.78	AA		29.85
06	1955	0	SCT170	10.00		86	29.9	74	23.4	69	20.7	57	20	200		28.70	0	020	29.78	AA		29.85
06	2055	0	FEW150	10.00		85	29.3	75	23.6	70	20.9	61	21	220		28.74			29.83	AA		29.90
06	2155	0	CLR	10.00		83	28.5	75	23.7	71	21.5	67	14	210		28.74			29.84	AA		29.90
06	2255	0	FEW150	10.00		83	28.4	74	23.3	70	21.1	65	11	180		28.75	1	021	29.84	AA		29.91
06	2355	0	CLR	10.00		83	28.3	73	23.0	69	20.8	63	7	210		28.75			29.84	AA		29.91

Figure A-4. Quality-controlled local climatological data hourly observations table for Luke Air Force Base Airport, Glendale, Arizona (09/06/2012). Note in the Weather Type column that HZ (haze), BLDU (blowing dust), and DU (widespread dust) were reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
FALCON FIELD AIRPORT (03185)
MESA, AZ
(09/2012)**

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: 1380 ft. above sea level
Latitude: 33.466
Longitude: -111.733
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0548	0	FEW200	30.00		82	28.0	73	22.5	68	20.0	63	6	050		28.41			M	AA		29.89
06	0647	0	FEW200	30.00		84	29.0	73	22.8	68	20.0	59	5	VR		28.44			M	AA		29.92
06	0755	0	FEW200	30.00		86	30.0	74	23.1	68	20.0	55	7	050		28.45			M	AA		29.93
06	0847	0	FEW200	30.00		88	31.0	73	22.8	66	19.0	48	0	000		28.46			M	AA		29.94
06	0947	0	FEW150	35.00		88	31.0	73	22.8	66	19.0	48	9	300		28.46			M	AA		29.94
06	1055	0	FEW200	35.00		91	33.0	74	23.2	66	19.0	44	9	300		28.45			M	AA		29.93
06	1147	0	FEW150TCU SCT200	35.00		91	33.0	74	23.2	66	19.0	44	8	230		28.44			M	AA		29.92
06	1247	0	FEW150TCU SCT200	35.00		95	35.0	75	23.8	66	19.0	39	8	270		28.41			M	AA		29.89
06	1448	0	FEW080 SCT160	35.00		100	38.0	75	23.9	64	18.0	31	10	250		28.34			M	AA		29.81
06	1549	0	FEW080TCU BKN200	35.00		99	37.0	74	23.5	63	17.0	31	11	250		28.34			M	AA		29.81
06	1647	0	SCT080TCU BKN200	30.00		M	M	M	M	61	16.0	M	8	230		28.34			M	AA		29.81
06	1732	0	FEW000s	0.25s	BLDU	93	34.0	72	22.0	61	16.0	34	21	190	25	28.35			M	AA		29.83
06	1750	0	SCT080 BKN150	2.00	BLDU	86	30.0	72	22.4	66	19.0	51	17	220	25	28.37			M	AA		29.84

Figure A-5. Quality-controlled local climatological data hourly observations table for Falcon Field Airport, Mesa, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) was reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA**

**(may be updated)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX, AZ (09/2012)**

Elevation: 1107 ft. above sea level
Latitude: 33.427
Longitude: -112.003
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0051	11	SCT250	10.00		90	32.2	74	23.4	67	19.4	47	9	270		28.66			29.77	AA		29.84
06	0151	11	SCT250	10.00		89	31.7	75	23.6	68	20.0	50	6	290		28.68	3	005	29.78	AA		29.85
06	0251	11	FEW250	10.00		88	31.1	74	23.4	68	20.0	52	8	300		28.68			29.79	AA		29.85
06	0351	11	FEW250	10.00		88	31.1	74	23.4	68	20.0	52	6	300		28.68			29.79	AA		29.85
06	0451	11	FEW250	10.00		87	30.6	74	23.3	68	20.0	53	6	280		28.69	2	003	29.79	AA		29.86
06	0551	11	FEW250	10.00		86	30.0	73	22.8	67	19.4	53	6	260		28.69			29.80	AA		29.87
06	0651	11	FEW250	10.00		86	30.0	73	22.8	67	19.4	53	6	230		28.72			29.83	AA		29.90
06	0751	11	FEW250	10.00		87	30.6	73	22.6	66	18.9	50	0	000		28.73	3	017	29.84	AA		29.91
06	0851	11	FEW250	10.00		90	32.2	74	23.1	66	18.9	45	3	VR		28.74			29.85	AA		29.92
06	0951	11	FEW055 SCT250	10.00		93	33.9	76	24.2	68	20.0	44	7	230		28.74			29.86	AA		29.92
06	1051	11	FEW055 SCT250	10.00		93	33.9	76	24.2	68	20.0	44	5	310		28.73	0	002	29.85	AA		29.91
06	1151	11	FEW065	10.00		96	35.6	75	24.0	66	18.9	37	6	300		28.71			29.83	AA		29.89
06	1251	11	FEW075 SCT250	10.00		97	36.1	74	23.5	64	17.8	34	10	280	17	28.69			29.80	AA		29.87
06	1351	11	FEW075 SCT250	10.00		99	37.2	75	23.8	64	17.8	32	10	320		28.66	8	026	29.77	AA		29.83
06	1451	11	FEW075 SCT250	10.00		100	37.8	75	23.6	63	17.2	30	5	270	20	28.62			29.73	AA		29.79
06	1551	11	SCT070 BKN250	10.00		101	38.3	75	23.8	63	17.2	29	11	300	17	28.62			29.72	AA		29.79
06	1651	11	FEW070 SCT200 BKN250	10.00		99	37.2	74	23.2	62	16.7	30	15	220		28.63	5	010	29.74	AA		29.80
06	1733	11	FEW011 SCT080 BKN200	1.75		93	34.0	73	22.9	64	18.0	38	18	200	25	28.63			M	SP		29.80
06	1738	11	SCT014 SCT080 BKN200	0.75		93	34.0	74	23.5	66	19.0	41	16	200	25	28.63			M	SP		29.80
06	1747	11	BKN014 BKN080 OVC250	1.50	BLDU	93	34.0	74	23.5	66	19.0	41	14	200	24	28.63			M	SP		29.80
06	1751	11	BKN014 BKN080 OVC250	2.00	BLDU	92	33.3	74	23.4	66	18.9	42	16	210	23	28.63			29.74	AA		29.80
06	1757	11	BKN019 BKN080 OVC250	4.00	BLDU	93	34.0	74	23.5	66	19.0	41	24	220	29	28.63			M	SP		29.80
06	1824	11	SCT025 SCT080 BKN200	10.00		91	33.0	74	23.2	66	19.0	44	13	250		28.64			M	SP		29.81
06	1851	11	SCT025 SCT080 BKN200	10.00		93	33.9	75	23.8	67	19.4	43	16	280		28.66			29.78	AA		29.84
06	1951	11	FEW080 BKN200 BKN250	10.00		88	31.1	74	23.1	67	19.4	50	16	260	24	28.68	3	017	29.79	AA		29.85
06	2051	11	FEW080 SCT200 BKN250	10.00		88	31.1	74	23.1	67	19.4	50	5	190		28.73			29.85	AA		29.91
06	2151	11	FEW055 SCT110 OVC160	10.00		86	30.0	75	23.8	70	21.1	59	8	110		28.73			29.85	AA		29.91
06	2251	11	FEW055 SCT110 OVC160	10.00		85	29.4	74	23.3	69	20.6	59	9	140		28.73	0	018	29.85	AA		29.91
06	2351	11	FEW110 OVC180	10.00		85	29.4	74	23.3	69	20.6	59	6	110		28.73			29.84	AA		29.91

Figure A-6. Quality-controlled local climatological data hourly observations table for Phoenix Sky Harbor International Airport, Phoenix, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) was reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
SCOTTSDALE AIRPORT (03192)
SCOTTSDALE, AZ (09/2012)**

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: 1473 ft. above sea level
Latitude: 33.622
Longitude: -111.910
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0053	12	CLR	10.00		87	30.6	73	22.9	67	19.4	52	3	VR		28.29			29.80	AA		29.89
06	0153	12	CLR	10.00		86	30.0	74	23.1	68	20.0	55	0	000		28.29	3	006	29.81	AA		29.89
06	0253	12	CLR	10.00		85	29.4	74	23.3	69	20.6	59	6	270		28.29			29.81	AA		29.89
06	0353	12	CLR	10.00		85	29.4	74	23.3	69	20.6	59	0	000		28.29			29.80	AA		29.89
06	0453	12	CLR	10.00		84	28.9	73	22.8	68	20.0	59	0	000		28.30	3	002	29.81	AA		29.90
06	0553	12	CLR	10.00		84	28.9	72	22.4	67	19.4	57	3	310		28.31			29.82	AA		29.91
06	0653	12	CLR	10.00		83	28.3	73	22.6	68	20.0	61	0	000		28.33			29.85	AA		29.93
06	0753	12	CLR	10.00		86	30.0	72	22.4	66	18.9	51	3	280		28.35	3	016	29.86	AA		29.95
06	0853	12	CLR	10.00		87	30.6	73	22.6	66	18.9	50	3	290		28.36			29.87	AA		29.96
06	0953	12	CLR	10.00		88	31.1	74	23.1	67	19.4	50	5	230		28.36			29.88	AA		29.96
06	1053	12	CLR	10.00		91	32.8	74	23.2	66	18.9	44	6	290		28.35	0	002	29.87	AA		29.95
06	1153	12	CLR	10.00		95	35.0	75	23.8	66	18.9	39	8	250		28.33			29.84	AA		29.93
06	1253	12	CLR	10.00		95	35.0	74	23.5	65	18.3	37	0	000		28.30			29.81	AA		29.90
06	1353	12	CLR	10.00		97	36.1	75	23.8	65	18.3	35	8	250		28.27	8	027	29.78	AA		29.87
06	1453	12	CLR	10.00		99	37.2	74	23.5	63	17.2	31	9	280		28.24			29.74	AA		29.83
06	1553	12	CLR	10.00		99	37.2	75	23.7	64	17.8	32	7	230	20	28.23			29.73	AA		29.82
06	1653	12	CLR	10.00		98	36.7	75	23.6	64	17.8	33	7	220		28.24	5	012	29.75	AA		29.83
06	1753	12	CLR	10.00		97	36.1	74	23.2	63	17.2	33	14	210	18	28.25			29.75	AA		29.84
06	1812	12	FEW003 SCT090	2.50	HZ	93	34.0	73	22.9	64	18.0	38	6	200	23	28.25			M	SP		29.84
06	1820	12	FEW005 SCT030 BKN090	1.50	HZ	93	34.0	74	23.5	66	19.0	41	15	230	23	28.26			M	SP		29.85
06	1825	12	FEW005 BKN028 BKN090	3.00	HZ	93	34.0	74	23.5	66	19.0	41	11	230	24	28.26			M	SP		29.85
06	1851	12	SCT020	10.00		91	33.0	74	23.2	66	19.0	44	16	260	24	28.28			M	SP		29.88
06	1853	12	SCT018	10.00		91	32.8	74	23.2	66	18.9	44	17	260	29	28.28			29.80	AA		29.88
06	1953	12	CLR	10.00		87	30.6	73	22.9	67	19.4	52	6	240		28.31	3	024	29.83	AA		29.91
06	2053	12	CLR	10.00		87	30.6	73	22.9	67	19.4	52	5	250		28.34			29.86	AA		29.94
06	2153	12	CLR	10.00		86	30.0	72	22.4	66	18.9	51	6	220		28.35			29.87	AA		29.95
06	2253	12	CLR	10.00		85	29.4	73	22.6	67	19.4	55	0	000		28.35	0	013	29.86	AA		29.95
06	2353	12	CLR	10.00		83	28.3	73	23.0	69	20.6	63	6	140		28.35			29.86	AA		29.95

Figure A-7. Quality-controlled local climatological data hourly observations table for Scottsdale Airport, Scottsdale, Arizona (09/06/2012). Note in the Weather Type column that HZ (haze) was reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration

**QUALITY CONTROLLED LOCAL
CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
WILLIAMS GATEWAY AIRPORT (23104)
PHOENIX, AZ
(09/2012)**

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, North Carolina 28801

Elevation: 1382 ft. above sea level
Latitude: 33.3
Longitude: -111.666
Data Version: VER2

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Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
06	0015	0	CLR	10.00		M	M	M	M	M	M	M	0	000		28.43			M	AA		29.89
06	0035	0	CLR	10.00		M	M	M	M	M	M	M	0	000		28.43			M	AA		29.89
06	0055	0	CLR	10.00		M	M	M	M	M	M	M	0	000		28.43			M	AA		29.89
06	0115	0	CLR	10.00		M	M	M	M	M	M	M	0	000		28.44			M	AA		29.90
06	0135	0	CLR	10.00		M	M	M	M	M	M	M	6	120		28.44			M	AA		29.90
06	0155	0	CLR	10.00		M	M	M	M	M	M	M	7	120		28.44			M	AA		29.90
06	0215	0	CLR	10.00		M	M	M	M	M	M	M	6	110		28.44			M	AA		29.90
06	0235	0	CLR	10.00		M	M	M	M	M	M	M	5	110		28.44			M	AA		29.90
06	0255	0	CLR	10.00		M	M	M	M	M	M	M	5	090		28.44			M	AA		29.90
06	0315	0	CLR	10.00		M	M	M	M	M	M	M	5	070		28.44			M	AA		29.90
06	0335	0	CLR	10.00		M	M	M	M	M	M	M	5	090		28.44			M	AA		29.90
06	0355	0	CLR	10.00		M	M	M	M	M	M	M	5	080		28.44			M	AA		29.90
06	0415	0	CLR	10.00		M	M	M	M	M	M	M	6	090		28.44			M	AA		29.90
06	0435	0	CLR	10.00		M	M	M	M	M	M	M	7	090		28.44			M	AA		29.90
06	0455	0	CLR	10.00		M	M	M	M	M	M	M	6	090		28.44			M	AA		29.90
06	0515	0	CLR	10.00		M	M	M	M	M	M	M	7	100		28.44			M	AA		29.90
06	0547	0	FEW120	30.00		82	28.0	74	23.1	70	21.0	67	7	100		28.45			M	AA		29.91
06	0647	0	FEW200	35.00		82	28.0	74	23.1	70	21.0	67	8	110		28.48			M	AA		29.94
06	0747	0	FEW200	45.00		84	29.0	74	23.5	70	21.0	63	7	120		28.48			M	AA		29.95
06	0847	0	SCT200	30.00		88	31.0	75	24.1	70	21.0	55	5	080		28.49			M	AA		29.96
06	0947	0	FEW060 SCT200	30.00		90	32.0	76	24.4	70	21.0	52	5	100		28.50			M	AA		29.97
06	1147	0	FEW080 SCT100	30.00		93	34.0	76	24.1	68	20.0	44	7	260		28.48			M	AA		29.94
06	1247	0	FEW080 SCT100	30.00		95	35.0	76	24.4	68	20.0	41	9	260		28.45			M	AA		29.91
06	1347	0	FEW080 SCT100	30.00		97	36.0	77	24.7	68	20.0	39	5	250		28.42			M	AA		29.88
06	1447	0	FEW080 SCT100	30.00		99	37.0	75	23.8	64	18.0	32	11	310		28.38			M	AA		29.84
06	1547	0	FEW080 SCT100	10.00		99	37.0	75	23.8	64	18.0	32	11	300		28.38			M	AA		29.84
06	1647	0	FEW080 BKN200	30.00		99	37.0	74	23.5	63	17.0	31	9	240		28.38			M	AA		29.84

06	1700	0	VV001 BKN080	0.50s	DSs	90	32.0	75	23.7	68	20.0	48	17	210	30	28.40			M	AA	29.86
06	1725	0	BKN080 OVC150	1.50	BLDU	88	31.0	74	23.4	68	20.0	52	17	210	23	28.42			M	AA	29.88
06	1747	0	BKN080 OVC120	5.00	BLDU	88	31.0	73	22.8	66	19.0	48	11	240	23	28.41			M	AA	29.87
06	1847	0	BKN060 BKN100	10.00		88	31.0	74	23.4	68	20.0	52	11	200		28.42			M	AA	29.88
06	1947	0	OVC	20.00		86	30.0	M	M	68	20.0	M	6	150		M			M	AA	29.92
06	1955	0	CLR	10.00		M	M	M	M	M	M	M	9	140		28.48			M	AA	29.94
06	2015	0	CLR	10.00		M	M	M	M	M	M	M	13	140		28.49			M	AA	29.96
06	2035	0	CLR	10.00		M	M	M	M	M	M	M	14	140		28.49			M	AA	29.96
06	2055	0	CLR	10.00		M	M	M	M	M	M	M	9	140		28.49			M	AA	29.96
06	2115	0	CLR	10.00		M	M	M	M	M	M	M	7	130		28.49			M	AA	29.96
06	2135	0	CLR	10.00		M	M	M	M	M	M	M	8	140		28.49			M	AA	29.96
06	2155	0	CLR	10.00		M	M	M	M	M	M	M	9	130		28.50			M	AA	29.97
06	2215	0	CLR	10.00		M	M	M	M	M	M	M	9	140		28.50			M	AA	29.97
06	2235	0	CLR	10.00		M	M	M	M	M	M	M	8	130		28.49			M	AA	29.96
06	2255	0	CLR	10.00		M	M	M	M	M	M	M	7	130		28.49			M	AA	29.96
06	2315	0	CLR	10.00		M	M	M	M	M	M	M	6	120		28.48			M	AA	29.95
06	2335	0	CLR	10.00		M	M	M	M	M	M	M	8	130		28.49			M	AA	29.96
06	2355	0	CLR	10.00		M	M	M	M	M	M	M	8	130		28.50			M	AA	29.97

Figure A-8. Quality-controlled local climatological data hourly observations table for Williams Gateway Airport, Phoenix, Arizona (09/06/2012). Note in the Weather Type column that BLDU (blowing dust) and DS (dust storm) were reported. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

Appendix B: Media Coverage, Videos, and Images

Video Links

ADEQ visibility cameras in the Phoenix area:

- South Mountain: www.phoenixvis.net/videos/mpeg4/SOMT_09062012.mp4
- Estrella Mountains: www.phoenixvis.net/videos/mpeg4/ESMO_09062012.mp4
- Camelback Mountains: www.phoenixvis.net/videos/mpeg4/CAME_09062012.mp4
- Superstition Mountains: www.phoenixvis.net/videos/mpeg4/SUPM_09062012.mp4

Local citizens often create videos during storms, documenting their observations. Here are links to two such videos.

- Haboob - Dust Storm Rolling over South Mountain - Phoenix, AZ 9/6/12:
<http://www.youtube.com/watch?v=2GVWgfygaAg>
- September 6, 2012 - Dust Storm Time Lapse:
<http://www.youtube.com/watch?v=Zb9OOhA9vOQ> (*This video is from a YouTube channel based in Phoenix, Arizona*)

Articles and Image Links

http://www.azcentral.com/news/articles/2011/11/04/20111104arizona-drivers-warned-blowing-dust-abrk04-ON.html?nclick_check=1

Dust storm, rain hit Phoenix area

by Domenico Nicosia and Marissa Scott - Sept. 6, 2012 07:21 PM
The Arizona Republic-12 News Breaking News Team

Slow moving thunderstorms northwest of Peoria dropped 2 inches of rain in a one-hour period Thursday evening after a dust storm swept across the Phoenix metropolitan area.

Storms moving north between Surprise and Sun City got between 0.5 and 0.75 inches of rain, said Charlotte Dewey, a meteorologist from the National Weather Service.

Various areas throughout the Valley are receiving gusts of wind at approximately 25 mph following the dissipating dust storm, she said.

Scattered showers helped clear visibility from the approximately 2,500-foot dust wall that passed through the area, meteorologists said.

Rain probability of up to 60 percent could bring scattered showers and thunderstorms before 11 p.m.

The wall that traveled over highways during rush-hour traffic approached the downtown Phoenix area, at speeds of up to 30 mph and lowered visibility in some areas to one-quarter of a mile.

Phoenix Sky Harbor International Airport expected delays of up to 20 minutes around 5:15 p.m. that lasted for about an hour, said Deborah Ostreicher, deputy aviations director at the airport.

The opaque cloud diffused slightly and slowed as it headed away from the desert area and through the downtown buildings.

Motorists who find themselves in the dust are advised to pull to the side of the road and turn off vehicle lights. The wall of dust was reported near Interstate 10 and Ray Road at 5:10 p.m.

The National Weather Service issued a blowing-dust advisory until 7 p.m. Thursday.

The storm may bring showers and thunderstorms to the Phoenix metropolitan area and may cause localized flash floods in the evening, said Valerie Meyers, a meteorologist for the National Weather Service.

The National Weather Service earlier had issued a hazardous-weather outlook for thunderstorms in the Phoenix area on Thursday night.

There is a 50 to 60 percent chance of rain in the greater Phoenix area, with possible local flooding and "ponding" of water in parking lots, Meyers said.

Thunderstorm chances continue through Saturday night and Sunday at 30 percent. There is a 10 percent chance of scattered storms on Friday, she said.

Meyers added that this will be a "wet" weekend with storm chances increasing by the day.

Temperatures in the Phoenix metro area will be the same throughout the weekend. The high on Thursday will be 101, with temperatures remaining in the lower 100s with a high of 102 on Friday, 103 on Saturday and 103 on Sunday.

<http://www.myfoxphoenix.com/story/19478870/2012/09/06/dust-storm-envelopes-maricopa> (go to link for news video)

Rain comes to wash away dust storm's remnants

Sep 06, 2012 5:15 PM

PHOENIX - It's another day of active weather -- dust storms over the valley and later, rain.

A long line of dust, 2,500 feet tall, crept into the valley from the south Thursday night, right in the middle of rush hour, reducing visibility for drivers. It wrapped east to west from Phoenix to Scottsdale as it moved north.

Planes approaching Sky Harbor were seen changing direction to avoid the wall of dust. Some planes were prevented from takeoff as the storm rolled in.

The National Weather Service issued a dust storm warning on Thursday. It expired at 7 p.m.

Wind speeds reached 25 to 35 miles per hour, with gusts up to 40 miles per hour. Visibility was under a quarter-mile at times, according to NWS.

About 9:30 p.m., rain started falling in downtown Phoenix to wash away what was left by the dust storm.

Heavy rain also fell in Tucson. Officials made six swift-water rescues. Most of those involved motorists who were briefly trapped by floodwaters on desert-area roads.

The monsoon season officially ends Sept. 30.

Driving tips from NWS:

Drivers need to be ready for a sudden drop in visibility.

If you encounter blowing dust or sand on the road or see it approaching, pull off and put your vehicle in park.

Turn the lights off and keep your foot off the brake pedal.

Photos from AZ Central

<http://www.azcentral.com/photo/23288>



A dust storm moves over the ASU campus in Tempe on Sept. 6, 2012.
PHOTO BY: Cheryl Evans/The Republic.



A dust storm moves through the Phoenix area on Sept. 6, 2012.
PHOTO BY: Pat Shannahan/The Arizona Republic.



A dust storm moves Thursday from the southeast towards the northwest as it climbs above South Mountain, with the tower at Sky Harbor International Airport in the foreground.
PHOTO BY: Tom Tingle/The Republic.



South Parking Lot of South Mountain Community College taken at 5:30 on 9.6.2012.
PHOTO BY: Kathleen Hawkins.



A dust storm moves through the Phoenix area on Sept. 6, 2012.
PHOTO BY: Cathie Wilkerson.



Fully Engulfed in Dust! Taken 9.6.2012.
PHOTO BY: Kathleen Hawkins.



A dust storm moves through the metro Phoenix area on Sept. 6, 2012.
PHOTO BY: 12 News.



A dust storm moves through the Phoenix area on Sept. 6, 2012.
PHOTO BY: Kelli Andrews.

Appendix C: ADEQ and NWS Forecast Products



MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED Wednesday, September 5, 2012

Three-day weather outlook:

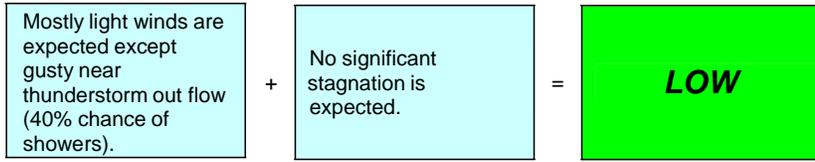
NOTE: DURING THE ACTIVE SUMMER MONSOON PERIODS, STRONG OUTFLOW WINDS FROM EVEN DISTANT THUNDERSTORMS CAN GENERATE PERIODS OF DENSE BLOWING DUST

Showers and thunderstorms will continue to dance around the perimeter of the Phoenix metro area through Friday. We could see an upswing in moisture over the weekend with a good shot at some wetting rains by Monday. Until then, dust remains a possibility. Thus, the risk of exceeding the 24-hr PM10 health standard in Phoenix is forecast to be **Moderate** through Saturday, dropping to **Low** by Sunday.

R I S K F A C T O R S

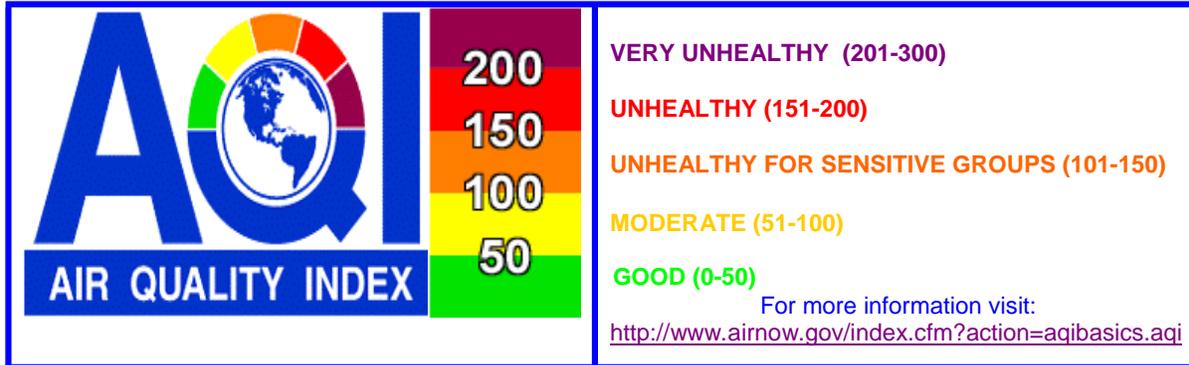
	<u>WINDS</u>	+	<u>STAGNATION</u>	=	<u>UNHEALTHY PM-10 RISK LEVEL</u>
Day 1: Thu. 9/6/2012	Mostly light winds are expected except gusty near thunderstorm out flow (20% chance of showers).	+	No significant stagnation is expected.	=	MODERATE
Day 2: Fri. 9/7/2012	Mostly light winds are expected except gusty near thunderstorm out flow (20% chance of showers).	+	No significant stagnation is expected.	=	MODERATE
Day 3: Sat. 9/8/2012	Mostly light winds are expected except gusty near thunderstorm out flow (20-30% chance of showers).	+	No significant stagnation is expected.	=	MODERATE
<u>EXTENDED OUTLOOK</u>					
Day 4: Sun. 9/9/2012	Mostly light winds are expected except gusty near thunderstorm out flow (30-40% chance of showers).	+	No significant stagnation is expected.	=	LOW

Day 5: Mon. 9/10/2012



The Maricopa County Dust Control Action Forecast is issued to assist in the planning of work activities to help reduce dust pollution. A recorded message of this forecast can be accessed at [602-771-2368](tel:602-771-2368). To review the complete air quality forecast for the Phoenix metropolitan area, as well as the health impacts and reduction methods for different air pollutants, call [602-771-2367](tel:602-771-2367) for recorded forecast information or click on ADEQ's Air Quality Forecast at <http://www.azdeq.gov/enviro/air/ozone/ensemble.pdf>.

JRP 04/28/2011



[*LINK TO 2012 AIR POLLUTION EXCEEDANCE GRAPH*](#)

AIR QUALITY FORECAST FOR Thursday, September 6, 2012, 2012

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 Tue 09/04/2012	TODAY Wed 09/05/2012	TOMORROW Thu 09/06/2012	EXTENDED Fri 09/07/2012
NOTICES (*SEE BELOW FOR DETAILS)	Dust	Dust	Dust	Dust
AIR POLLUTANT	Highest AQI Reading/Site (*Preliminary data only*)			
O3*	48 Queen Valley	51 Moderate	77 Moderate	84 Moderate
CO*	7 West Phoenix	7 Good	7 Good	6 Good
PM-10*	56 West 43rd	72 Moderate	70 Moderate	75 Moderate
PM-2.5*	44 West Phoenix	48 Good	52 Moderate	56 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 Statements	
Wednesday, 09/05/2012	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.
Thursday, 09/06/2012	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

SYNOPSIS AND DISCUSSION

Some impressive lightning was seen around the Valley Tuesday night, particularly to the south. Though no rain made it into the forecast area, the collapsing storms did send some dust north. Five south Valley PM10 monitors snuck into the Moderate range as a result. With each passing day, the local soil continues to dry out. This will make it easier for the top soil to become airborne with outflow from nearby storms. Models suggest an upswing in thunderstorm activity heading into the weekend. We're keeping the forecasted PM10 concentrations in the middle part of the Moderate range as a result.

Ozone concentrations remained in the Good range of the Air Quality Index (AQI) on Tuesday. NOAA's Air Quality model predicts higher concentrations in the east part of the Valley the next few days. This is feasible as high pressure remains overhead. For now, we are keeping the forecasted ozone levels below Health Watch criteria, but that may change if this latest upswing proves to be significant.

Check back tomorrow for the latest. Until then, have a good day! -J.Paul

MONITORING SITE MAPS	
STATIC MAP	http://www.azdeq.gov/envirom/air/monitoring/images/map.jpg
INTERACTIVE MAPS	http://aqwww.maricopa.gov/AirMonitoring/SitePollutionMap.aspx http://156.42.96.39/alert/Google/air.html http://www.airnow.gov/

POLLUTION MONITOR READINGS FOR Tuesday, September 4, 2012

O3 (OZONE)

Info on current 8-hour ozone standard: http://www.epa.gov/air/ozonepollution/pdfs/2008_03_aqi_changes.pdf
 For archived AQI maps go to: <http://www.airnow.gov/index.cfm?action=airnow.maps>

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Alamo Lake	43	36	
Apache Junction	49	42	
Blue Point	56	47	
Buckeye	43	36	
Casa Grande	46	39	
Cave Creek	47	40	
Central Phoenix	50	42	
Dysart	42	36	
Falcon Field	53	45	
Fountain Hills	50	42	
Glendale	43	36	
Humboldt Mountain	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	46	39	
North Phoenix	51	43	
Pinal Air Park	50	42	
Pinnacle Peak	56	47	
Queen Valley	57	48	
Rio Verde	NOT AVBL	NOT AVBL	NOT AVBL
South Phoenix	50	42	

South Scottsdale	53	45	
Tempe	50	42	
Tonto Nat'l Mon.	47	40	
West Chandler	50	42	
West Phoenix	49	42	
Yuma	38	32	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.2	2	
Greenwood	0.4	5	
West Phoenix	0.6	7	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (µg/m3)	MAX AQI	AQI COLOR CODE
Apache Junction	22.2	21	
Buckeye	63.0	55	
Central Phoenix	NOT AVBL	NOT AVBL	NOT AVBL
Combs School (Pinal County)	45.8	42	
Durango	63.8	55	
Dysart	41.2	38	
Glendale	46.8	43	
Greenwood	61.4	54	
Higley	41.7	38	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
North Phoenix	49.2	45	
Phoenix Supersite	51.9	47	
South Phoenix	35.0	32	
Tempe	37.4	34	
West Chandler	31.9	29	
West Forty Third	65.3	56	
West Phoenix	55.9	51	
Zuni Hills	41.8	38	

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 (µg/m3)	MAX AQI	AQI COLOR CODE
Durango	10.3	33	
Dysart	8.5	28	
Estrella Mountain Park	9.5	31	
Glendale	8.5	28	
Phoenix Supersite	7.7	25	
North Phoenix	8.8	29	
South Phoenix	7.5	24	
Tempe	NOT AVBL	NOT AVBL	NOT AVBL
Vehicle Emissions Lab	6.9	22	
West Phoenix	13.4	44	

Statements, Advisories, and Warnings issued by the National Weather Service office in Phoenix, AZ pertaining to this dust storm event:

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
416 PM MST THU SEP 6 2012

AZZ028-070100-
/O.NEW.KPSR.DS.W.0016.120906T2316Z-120907T0100Z/
NORTHWEST AND NORTH CENTRAL PINAL COUNTY-
INCLUDING THE CITIES OF...APACHE JUNCTION...CASA GRANDE...
FLORENCE
416 PM MST THU SEP 6 2012

...DUST STORM WARNING IN EFFECT UNTIL 6 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 6 PM MST THIS EVENING.

POWERFUL THUNDERSTORMS SOUTH AND SOUTHWEST OF CASA GRANDE HAVE GENERATED STRONG NORTHWARD MOVING WIND GUSTS THAT HAVE KICKED UP DUST WITH VISIBILITIES BELOW 1/4 MILE AT TIMES.

- * AFFECTED AREA...PORTIONS OF PINAL COUNTY NEAR THE CITIES OF CASA GRANDE...MARICOPA...STANFIELD...COOLIDGE...SACATON...AND NEARBY PORTIONS OF INTERSTATE 10 BETWEEN CASA GRANDE AND PHOENIX.
- * TIMING...DUST STORM WARNING THROUGH 6 PM.
- * WINDS...20 TO 30 MPH WITH GUSTS TO 40 MPH.
- * VISIBILITY...LESS THAN 1/4 MILE AT TIMES.
- * IMPACTS...DANGEROUSLY LOW VISIBILITIES IN DENSE BLOWING DUST.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY TO NEAR ZERO. IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

REMEMBER...PULL ASIDE...STAY ALIVE.

BULLETIN - EAS ACTIVATION REQUESTED
 SEVERE THUNDERSTORM WARNING
 NATIONAL WEATHER SERVICE PHOENIX AZ
 419 PM MST THU SEP 6 2012

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

* SEVERE THUNDERSTORM WARNING FOR...
 WEST CENTRAL PINAL COUNTY IN SOUTH CENTRAL ARIZONA...
 INCLUDING THE AREAS NEAR STANFIELD...WEST CASA GRANDE...
 NORTHWARD TO THE TOWN OF MARICOPA.

* UNTIL 500 PM MST

* AT 412 PM MST...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED
 SEVERE THUNDERSTORMS CAPABLE OF PRODUCING DAMAGING WINDS IN
 EXCESS OF 60 MPH. THIS STORM WAS LOCATED 15 MILES SOUTH OF
 MARICOPA...OR 19 MILES WEST OF CASA GRANDE. THIS STORM WAS
 NEARLY STATIONARY.

* THE SEVERE THUNDERSTORM WILL OTHERWISE REMAIN OVER MAINLY RURAL
 AREAS OF THE INDICATED COUNTY.

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 429 PM MST THU SEP 06 2012

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...	...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
	..REMARKS..		

0410 PM	DUST STORM	CASA GRANDE	32.89N 111.74W
09/06/2012		PINAL	AZ AMATEUR RADIO

0.25 MILE VISIBILITY IN BLOWING DUST

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 431 PM MST THU SEP 06 2012

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...	...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
	..REMARKS..		

0415 PM	DUST STORM	1 WSW COOLIDGE	32.98N 111.54W
09/06/2012		PINAL	AZ TRAINED SPOTTER

VISIBILITY LESS THAN 0.25 MILE IN BLOWING DUST

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE PHOENIX AZ
437 PM MST THU SEP 6 2012

AZZ023-070145-
GREATER PHOENIX AREA-
INCLUDING THE CITIES OF...BUCKEYE...CAREFREE...CAVE CREEK...
CHANDLER...FOUNTAIN HILLS...GILBERT...GLENDALE...MESA...PEORIA...
PHOENIX...SCOTTSDALE...SUN CITY...AND TEMPE
437 PM MST THU SEP 6 2012

.NOW...
GUSTY SOUTH WINDS 25 TO 35 MPH WITH GUSTS 40 MPH...GENERATED FROM
POWERFUL THUNDERSTORMS NEAR CASA GRANDE...WILL MOVE THROUGH THE
AHWATUKEE...CHANDLER...TEMPE...AND PHOENIX AREAS BETWEEN 5 PM AND 7
PM. A DUST STORM WITH VISIBILITIES UNDER 2 MILES AT TIMES WILL ALSO
MOVE THROUGH THE AREA.

GREATER PHOENIX AREA-
INCLUDING THE CITIES OF...MESA...PHOENIX
441 PM MST THU SEP 6 2012

...BLOWING DUST ADVISORY IN FOR PHOENIX EFFECT UNTIL 7 PM MST THIS
EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A BLOWING DUST
ADVISORY FOR THE GREATER PHOENIX AREA...WHICH IS IN EFFECT UNTIL 7 PM
MST THIS EVENING.

* AFFECTED AREA...FIRST AHWATUKEE...CHANDLER...TEMPE...MESA... THE
SPREADING INTO DOWNTOWN PHOENIX NORTHWARD.

* TIMING...BETWEEN 455 PM AND 7 PM.

* WINDS...SOUTH WINDS 25 TO 35 MPH WITH GUSTS TO 40 MPH.

* VISIBILITY...UNDER 1 MILE AT TIMES.

* IMPACTS...DANGEROUSLY LOW VISIBILITIES FOR MOTORISTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY. IF YOU ENCOUNTER
BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT
APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR
VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR
FOOT OFF THE BRAKE PEDAL.

REMEMBER...PULL ASIDE...STAY ALIVE.

URGENT - WEATHER MESSAGE
 NATIONAL WEATHER SERVICE PHOENIX AZ
 452 PM MST THU SEP 6 2012

AZZ023-070200-
 /O.UPG.KPSR.DU.Y.0048.000000T0000Z-120907T0200Z/
 /O.EXB.KPSR.DS.W.0016.000000T0000Z-120907T0200Z/
 GREATER PHOENIX AREA-
 INCLUDING THE CITIES OF...MESA...PHOENIX
 452 PM MST THU SEP 6 2012

...DUST STORM WARNING IN EFFECT UNTIL 7 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING. THE BLOWING DUST ADVISORY ISSUED EARLIER IS NO LONGER IN EFFECT.

- * AFFECTED AREA...FIRST AHWATUKEE...CHANDLER...TEMPE...MESA...THEN SPREADING NORTHWARD INTO PHOENIX.
- * TIMING...THROUGH 7 PM.
- * WINDS...SOUTH WINDS 25 TO 35 MPH WITH GUSTS TO 40 MPH.
- * VISIBILITY...UNDER 1/4 MILE AT TIMES.
- * IMPACTS...DANGEROUSLY LOW VISIBILITIES FOR MOTORISTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY TO NEAR ZERO. IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

REMEMBER...PULL ASIDE...STAY ALIVE.

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 527 PM MST THU SEP 06 2012

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
	..REMARKS..		
0524 PM 09/06/2012	DUST STORM	3 E MESA RIVERVIEW MALL MARICOPA AZ	33.43N 111.82W AZ TRAINED SPOTTER

VSBY LESS THAN 0.25 MI.

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 555 PM MST THU SEP 06 2012

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
	..REMARKS..		
0543 PM 09/06/2012	DUST STORM	4 SW WITTMANN MARICOPA	33.74N 112.58W AZ TRAINED SPOTTER
	LESS THAN 0.25 MI. VSBY		

Appendix D: Affidavit of Public Notice

ADEQ
AIR QUALITY DIVISION

13 JAN 18 PM 12:49

THE ARIZONA REPUBLIC

Request for Public Comments on Exceptional Events in the Greater Phoenix Area

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007. (72 FR 13560). On May 2, 2011, EPA released draft guidance documents on the implementation of the EER to State, tribal and local agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event. If flagged, these data can be excluded from consideration in air quality planning if EPA concurs with the demonstration submitted by the flagging agency. Documenting that all procedural and technical requirements have been met.

Pursuant to 40 CFR 50.14(c)(3)(i), the Arizona Department of Environmental Quality (ADEQ) is soliciting comments on its final demonstrations of events that have caused elevated concentrations of PM10 in the Greater Phoenix area on September 11 & 12, 2011 and June 16; June 27; July 11; August 11; August 14; and September 6, 2012. ADEQ has decided to flag these episodes based on these analyses. Copies of the demonstrations can be viewed online beginning Monday, January 14, 2013, on the ADEQ website at <http://www.azdeq.gov/airquality/index.html> by selecting Air Quality - Public Notices, Meetings and Hearings. Interested parties can submit written comments throughout the comment period which will end at 5:00 p.m. on Tuesday, February 12, 2013. Any comments received will be responded to and forwarded to EPA with the final demonstrations. Written comments should be addressed, faxed, or e-mailed to: Andra Juniel, Air Assessment Section, Arizona Department of Environmental Quality, 1110 W. Washington Street, 3415-A, Phoenix, AZ 85007, PHONE: (602) 771-4417; FAX: (602) 771-2366, E-mail: juniel.andra@azdeq.gov.

In addition to being available on-line, copies of the analyses are available for review, Monday through Friday, 8:30 a.m. to 4:30 p.m., at the ADEQ Records Management Center, 1110 W. Washington St., Phoenix, AZ, 85007, Attn: Records Center, (602) 771-4380, email: recordscenter@azdeq.gov.

Persons with a disability may request reasonable accommodations by contacting Linda Morrison at (602) 771-4793 or 1-800-234-5677 ext. 771-4793. This document is available in alternative formats by contacting ADEQ TDD phone number at (602) 771-4829.

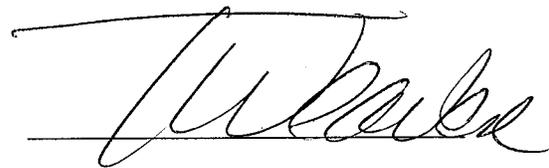
Pub: January 14, 2013.

STATE OF ARIZONA }
 COUNTY OF MARICOPA } SS.

Tabitha Weaver, being first duly sworn, upon oath deposes and says: That she is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

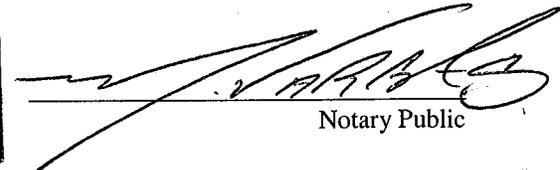
The Arizona Republic

January 14, 2013



Sworn to before me this
 14th day of
 January A.D. 2013

 **MANUEL VARGAS**
 Notary Public - State of Arizona
 MARICOPA COUNTY
 My Commission Expires
 November 30, 2015



Notary Public



PUBLIC NOTICE

Request for Public Comments on Exceptional Events in the Greater Phoenix Area

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