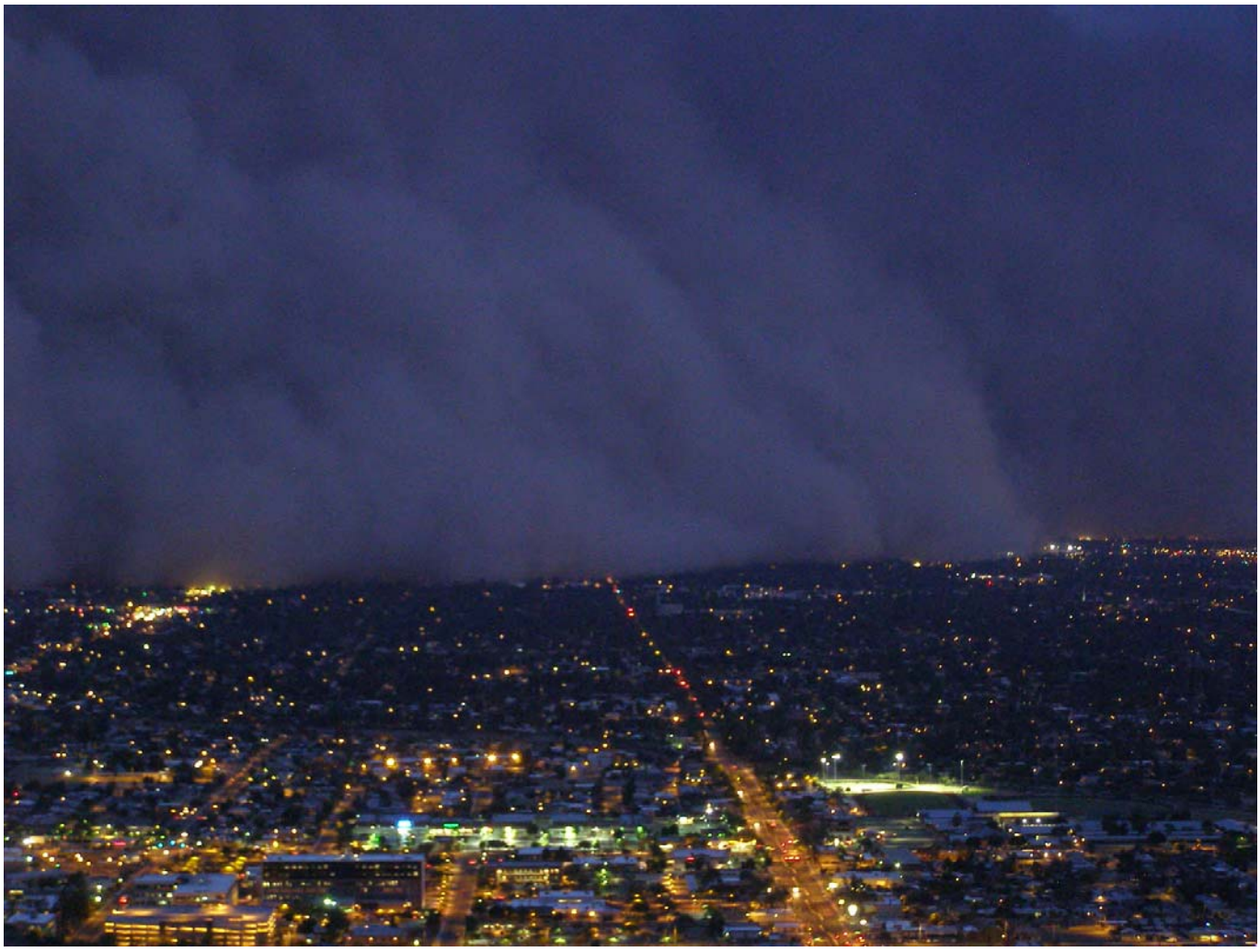
State of Arizona Exceptional Event Documentation for the Events of July 2nd through July 8th 2011, for the Phoenix PM10 Nonattainment Area

Produced by:

Arizona Department of Environmental Quality
Maricopa County Air Quality Department
Maricopa Association of Governments

Final Report
March 8, 2012



EXECUTIVE SUMMARY

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[1] (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 On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the arid nature of the state, Arizona is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the PM10 NAAQS. In the past, the Arizona Department of Environmental Quality (ADEQ) has submitted exceptional event documentation for these events. Due in part to issues within the EER, obtaining concurrence on these events has been a difficult task. The ADEQ is now taking a new approach and focusing exceptional event documentation on events that are believed to be clear-cut exceptional events that are not controllable by human intervention. The ADEQ believes that the dust events that occurred during the monsoon season of 2011 exemplify these types of events. This document contains detailed information about the windblown dust events that affected the Phoenix PM10 nonattainment area during the period July 2 – July 8, 2011. During this time period, 29 exceedances of the PM10 NAAQS occurred within the nonattainment area. Additional exceedances occurred outside of the Phoenix PM10 nonattainment area during this time period and additional documentation may be submitted as a separate package at a later time. ADEQ contends that the exceedances that were measured during July 2-8, 2011, within the Phoenix PM10 nonattainment area were the result of natural events that were not reasonable controllable or preventable. This assessment report of the July 2-8, 2011 dust events was a collaborative effort involving staff from the Arizona Department of Environmental Quality, Maricopa Association of Governments, Maricopa County Air Quality Department, and Pinal County Air Quality Control District. Additionally, ADEQ staff consulted with staff from the National Weather Service office in Phoenix to acquire expert advice and assist with the technical analyses.

Section I of this assessment provides a summary of the exceptional event rules and requirements and lays out how those rules are met within this specific assessment.

Section II of this assessment introduces the conceptual model of the thunderstorm events that transpired during July 2–8, 2011, providing a background narrative of the exceptional events.

Section III of this assessment provides data summaries and time series graphs which help illustrate that the events of July 2–8, 2011 produced PM10 concentrations in excess of normal historical fluctuations.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the events of July 2–8, 2011 were not reasonably controllable or preventable.

[1] Section 319 of the Clear Air Act (CAA), as amended by section 6013 of the Safe Accountable Flexible Efficient-Transportation Equity Act: A Legacy for Users (SAFE-TEA-LU of 2005, required EPA to propose the Federal Exceptional Events Rule (EER) no later than March 1, 2006.

Section V of this assessment establishes a clear causal connection between the natural events of July 2–8, 2011 and the exceedances of the 24-hour PM10 standard at the monitoring stations. The evidence in this section (and the previous section on historical fluctuations) also confirms that the events in question both affected air quality and were the result of natural events.

Section VI of this assessment builds upon the demonstration showing a clear causal connection between the natural event and the exceedances and concludes there would have been no exceedances during July 2–8, 2011 but for the presence of the natural events.

Section VII contains conclusions that summarize the exceptional events that occurred during the week of July 2–8, 2011, and relates the requirements in the EER to the information within this document.

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I. EXCEPTIONAL EVENT RULE (EER) REQUIREMENTS

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

Procedural Requirements

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (*Treatment of Air Quality Monitoring Data Influenced by Exceptional Events*) and explains how ADEQ fulfills them. The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), the notification of EPA of the intent to flag through submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. ADEQ has addressed all of these procedural and documentation requirements.

Public notification that event was occurring (40 CFR 50.14(c)(1(i))
ADEQ issued Dust Control Action Forecasts and Ensemble Forecasts for the Greater Phoenix area advising citizens of the potential for high wind / dust events everyday during the timeframes of July 2nd through July 8th, 2011. More information on ADEQ's forecasting program can be found in Section IV. The forecast products that were issued during the period July 2 – 8, 2011, are included in Appendix B.

Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))
ADEQ and other operating agencies in Arizona submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Arizona are submitted to AQS.

When ADEQ and/or another agency operating monitors in Arizona suspects 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 the operating agency have determined a potential exists that the monitor reading has been influenced by an exceptional event, a preliminary flag is submitted for the measurement in the AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

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 will submit a letter to EPA by July 1, 2012 listing all days from calendar year 2011 that ADEQ intends to analyze under the Exceptional Events Rule. Exceedances that occurred on July 3, 4, 5, 7, and 8, 2011, within the Phoenix PM10 nonattainment area will be included on this list. This assessment report serves as both the initial notification to EPA of ADEQ's intention to flag these data, as well as the demonstration supporting the flagging of these data.

On July 3, 2011, fourteen monitors at thirteen sites within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard during the high wind event that occurred on that day. These were the JLG Supersite TEOM[2] and BAM[3] operated by ADEQ and the Buckeye, Central Phoenix, Durango Complex, Dysart, Glendale, Greenwood, Higley, South Phoenix, West Chandler, West Forty Third, West Phoenix, and Zuni Hills AQD monitors operated by Maricopa County Air Quality Department (MCAQD).

On July 4, 2011, one monitor within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard during the high wind event that occurred on that day. It was the Higley monitor operated by MCAQD.

On July 5, eleven monitors within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard during the high wind event that occurred on that day. These were the JLG Supersite TEOM operated by ADEQ and the Buckeye, Central Phoenix, Durango Complex, Dysart, Glendale, Greenwood, Higley, South Phoenix, West Chandler, and West Phoenix monitors operated by MCAQD.

On July 7, two monitors within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard during the high wind event that occurred on that day. These were the Higley and West Chandler monitors operated by MCAQD.

On July 8, one monitor within the boundaries of the Phoenix PM10 nonattainment area exceeded the 24-hour PM10 standard on that day. That was the filter-based monitor at the Apache Junction Fire Station operated by the Pinal County Air Quality Control District. This monitor is being included in the documentation of the high wind exceptional events because it falls within the boundaries of the Phoenix PM10 nonattainment area.

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 hardcopy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on February 6, 2012. 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.

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))

At the close of the 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 IX headquarters in San Francisco, California. The deadline for the submittal of this demonstration package is September 30, 2014.

[2] TEOM is an acronym for a Tapered Element Oscillating Monitoring system
[3] BAM is an acronym for a Beta Attenuation Monitoring System

Documentation Requirements

Section 50.14(c)(3)(iii) of the EER states that in order to justify excluding air quality monitoring data, evidence must be provided for the following elements:

a. The event satisfies the criteria set forth in 40 CFR 501(j) that:
   (1) the event affected air quality,
   (2) the event was not reasonably controllable or preventable, and
   (3) the event was caused by human activity unlikely to recur in a particular location or was a natural event;
b. There is a clear causal relationship between the measurement under consideration and the event;
c. The event is associated with a measured concentration in excess of normal historical fluctuations; and
d. There would have been no exceedance or violation but for the event.

Section II of this assessment introduces the conceptual model of the thunderstorm events that transpired during July 2–8, 2011, providing a background narrative of the exceptional events and an overall explanation that 'the event affected air quality'. Further evidence that 'the event affected air quality' is provided in Section V. Sections II and V also provide evidence that the event was a natural event.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the events of July 2–8, 2011 were not reasonably controllable or preventable.

Section V of this assessment establishes a clear causal connection between the natural events of July 2–8, 2011 and the exceedances of the 24-hour PM10 standard at the monitoring stations. The evidence in this section (and the previous section on historical fluctuations) also confirms that the events in question both affected air quality and were the result of natural events.

Section III of this assessment provides data summaries and time series graphs which help illustrate that the events of July 2–8, 2011 produced PM10 concentrations in excess of normal historical fluctuations.

Section VI of this assessment builds upon the demonstration showing a clear causal connection between the natural event and the exceedances and concludes there would have been no exceedances during July 2–8, 2011 but for the presence of the natural events.

II. CONCEPTUAL MODEL

Geographic Setting and Climate

This section describes the geographic and climatic setting of the monitors.

Geographic Setting of Monitors

Phoenix is located in the Salt River Valley in south-central Arizona. It lies at a mean 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 msl) to the northeast, the foothills of the Bradshaw (~7,900 ft msl) and Mazataal (~7,900 ft msl) ranges to the north, the White Tank Mountains (~4,500 ft msl) to the west, the Sierra Estrella (~4,450 ft msl) to the southwest, and the Superstition Mountains (~5,000 ft msl) far to the east. Within the City are the Phoenix Mountains (~2,600 ft msl) and South Mountain (~2,600 ft msl). Current development is pushing north, west, and south into Pinal County. The Phoenix metropolitan area contains a fairly dense network of PM10 monitors throughout the area, with a much less dense network of monitors located throughout the rest of the state. Figure 2-1 shows the general geographic setting of Phoenix, as well as the locations of PM10 monitors throughout the state. It should be noted that some of the monitors shown in Figure 2-1 are filter-based monitors; therefore, monitoring data from all locations may only be available for select days (i.e. 1-in-6 run days).

Figure 2-1. Phoenix Geographic Setting and PM10 Monitor Locations (source: EPA AQS DataMart, NASA MODIS Satellite, Google Earth). PM10 monitor locations are indicated by the white markers.

Figure 2-2 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.

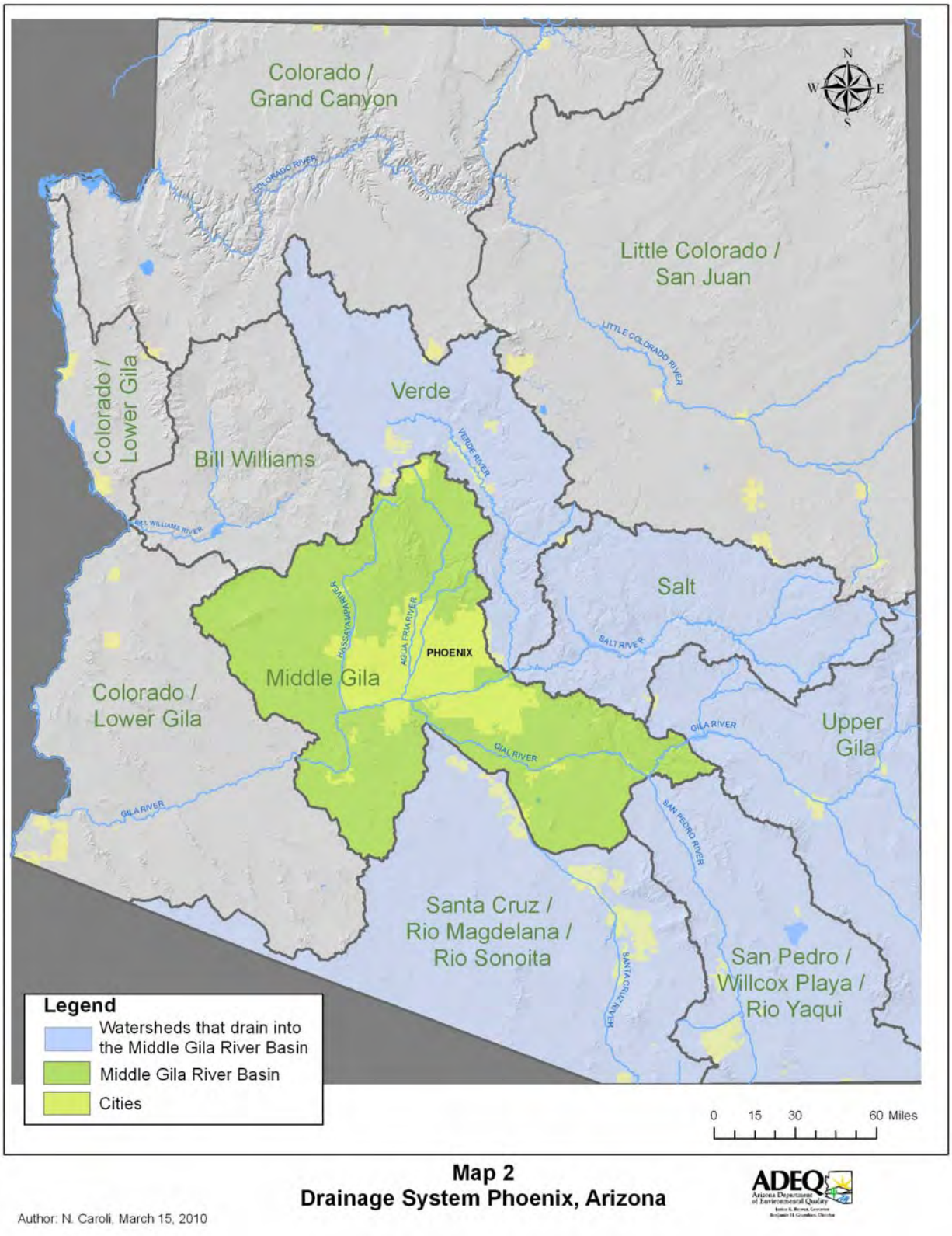


Figure 2-2. Drainage System of Phoenix, Arizona.

Climate

Phoenix has an arid climate, with very hot summers and temperate winters. The average summer high temperature is among the hottest of any populated area in the United States. The temperature reaches or exceeds 100ºF an average of 110 days during the year and highs top 110ºF an average of 18 days during the year. Phoenix receives an average of 7.66 inches of rain per year.

Precipitation is sparse during the first part of the summer, but the influx of monsoonal moisture, which generally begins in early July and lasts until mid-September, raises humidity levels and can cause heavy localized precipitation and flooding. Although thunderstorms are possible at any time of the year, they are most common during the monsoon season from July to mid-September as humid air is advected from the Gulf of California, Gulf of Mexico, and large thunderstorm complexes from the Sierra Madre Occidental Mountains in Mexico. This influx in moisture, combined with intense solar heating, often creates a very unstable environment that is ripe for thunderstorm development. These thunderstorms can bring strong winds and blowing dust, large hail, and heavy rain. Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before soaking rains help keep soil particles bound to one another. However, depending on the amount of precipitation received during the monsoon season, extremely hot temperatures act to dry out the surface quickly, and dust storms can occur at any time. During the December through March period, winter storms moving inland from the Pacific Ocean can produce significant rains throughout Arizona. This December – March time period, and July – August time period are typically the wettest parts of the year. Meanwhile, a distinct dry season occurs during the period April through June for Phoenix and the rest of Arizona. While these weather patterns describe the general climatology for the Phoenix area over a long period of time, Phoenix and the entire state of Arizona is also prone to a high degree of variability in these weather patterns from year to year.

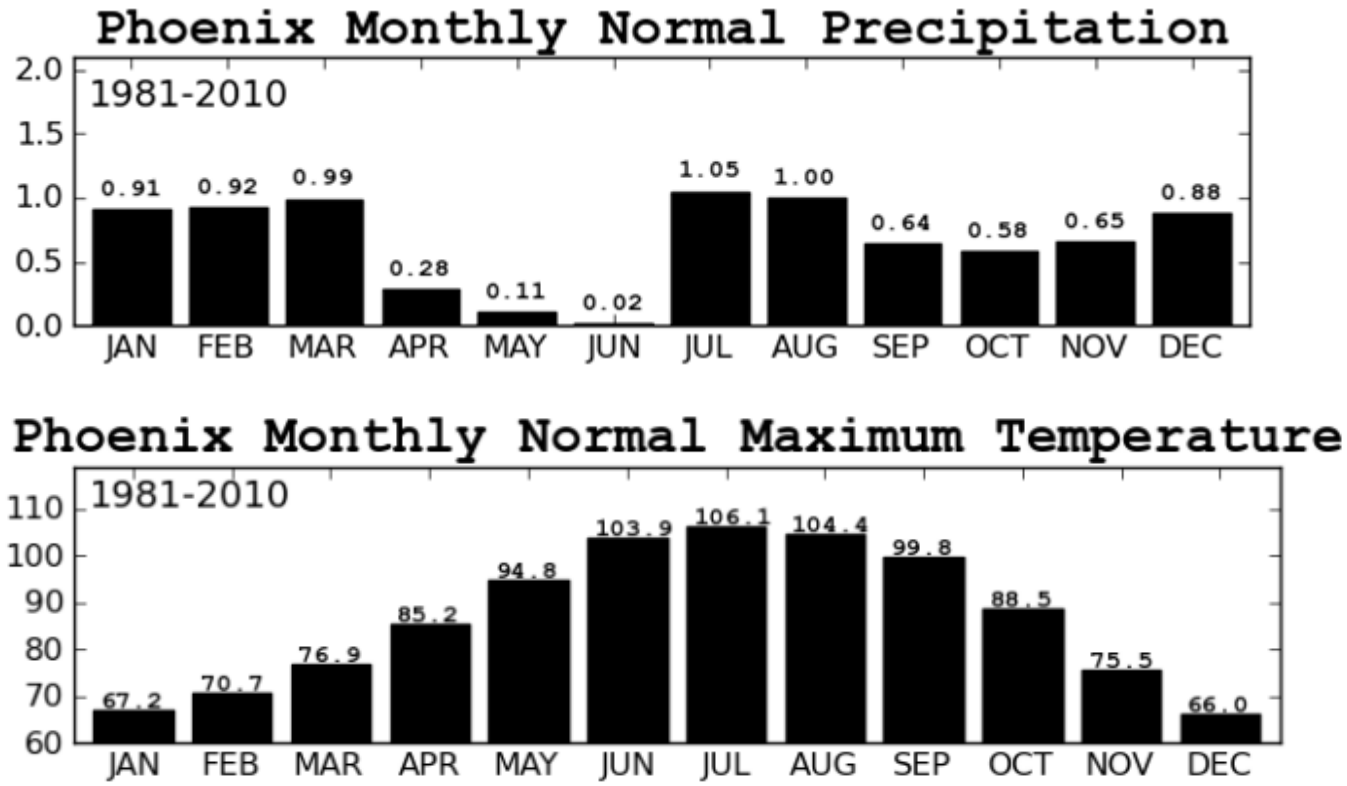


Figure 2-3. Phoenix Monthly Precipitation (top) and Maximum Temperature (bottom) Climatology (source: National Weather Service)

Monsoon Season Description and Event Summaries

The week of July 2–8, 2011, was characterized by a marked increase in monsoonal thunderstorm activity throughout Arizona. The North American Monsoon is a shift in wind patterns in the summer which occurs as Mexico and the southwest U.S. warm under intense solar heating. As this happens, low level moisture is transported primarily from the Gulf of California and eastern Pacific Ocean into the southwestern U.S. The Gulf of California, a narrow body of water surrounded by mountains, is particularly important for low-level moisture transport into Arizona and Sonora. Mid and upper level moisture is also transported into the region, mainly from the Gulf of Mexico by easterly winds aloft. This combination causes a distinct rainy season over large portions of western North America, which develops rather quickly and sometimes dramatically. Rainfall during the monsoon is not continuous, varying considerably, depending on a variety of factors. There are usually distinct "burst" periods of heavy rain during the monsoon, and "break" periods with little or no rain. Even during active monsoon periods, some areas can go without receiving any significant precipitation while other nearby areas experience heavy rains and flooding.

The thunderstorm activity in Arizona during the period of July 2–8 was especially prominent in and around areas of mountainous terrain including the Mogollon Rim in northern Arizona and the Santa Catalina Mountains of southern Arizona. These thunderstorms did not result in much precipitation for the Phoenix area, but many of the storms were severe in nature and caused numerous significant dust carrying outflow boundaries that propagated into the Phoenix area. Downdrafts associated with heavy precipitation from thunderstorms or from collapsing thunderstorms can end up producing what are called downbursts, or sometimes more concentrated and severe microbursts, which are rapidly descending bursts of air that comes through the thunderstorms. These downward bursts of air hit the ground and then disperse away from the storms as areas of outflow. These outflow boundaries from the thunderstorms can kick up large areas of dust, sometimes called haboobs, and transport that dust for long distances from the initiating thunderstorms (see Figure 2-4).

The active monsoon period of July 2–8 led to numerous thunderstorms and thunderstorm outflows that produced and carried both large and moderate areas of blowing dust to many parts of Arizona, including the Phoenix Metropolitan area. A total of six separate windblown dust events were noted during the week, resulting in PM10 exceedances occurring in Maricopa County on four different days. Some events were driven by one large outflow, while others were more complex and were the result of multiple outflow boundaries. Dates experiencing PM10 exceedances in Maricopa County during this time included July 3rd, July 4th, July 5th, and July 7th. One exceedance in Pinal County at Apache Junction on July 8th was also included in the documentation as this monitor is located within the boundary of the Phoenix PM10 nonattainment area. Elevated concentrations were also experienced on July 6th due to lingering and re-entrained dust from the large-scale dust event occurring on July 5th; however, no exceedances occurred in Maricopa County on July 6th. The July 3rd and July 5th events were large-scale and widespread dust events with mostly south-southeasterly winds carrying in the dust on the 3rd, and southeasterly winds carrying a massive dust wall into the Valley on the 5th. The events occurring on July 4th and July 7th were smaller in scale, but were still related to thunderstorm activity and thunderstorm outflow boundary winds. The event occurring during the morning of July 7th was likely associated with a larger scale outflow boundary originating from thunderstorm activity near the Arizona / Mexico border. Further detail on this event can be found later in this section as well as in section V.

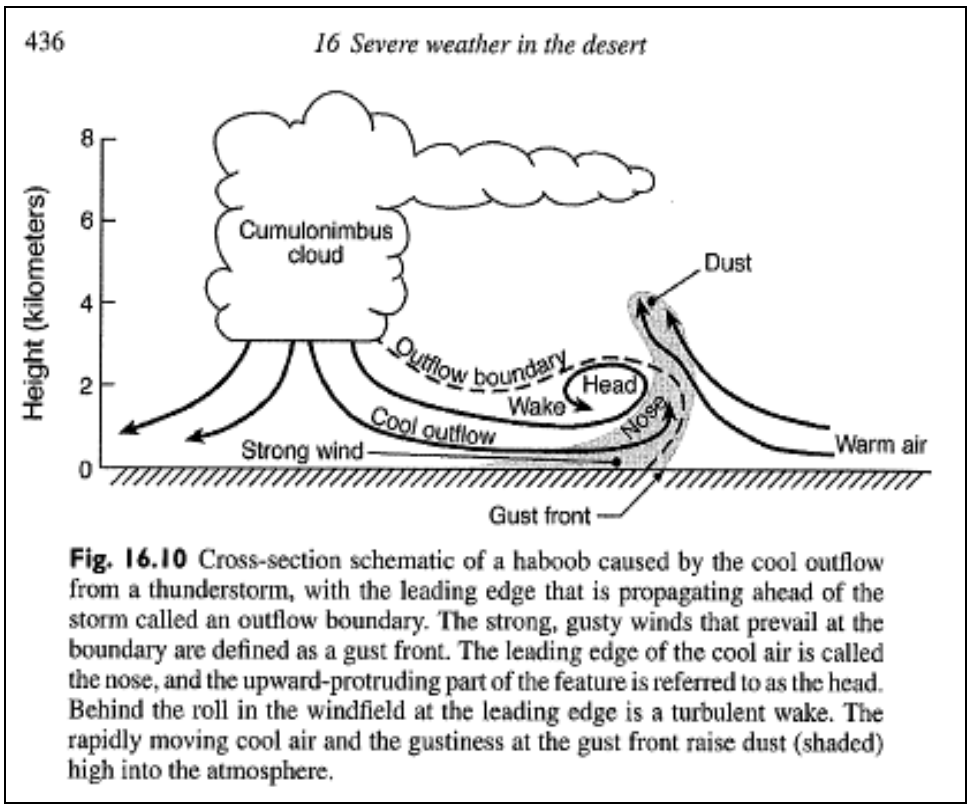


Figure 2-4. Cross-section of a thunderstorm creating an outflow boundary and haboob (Source: Desert Meteorology. Thomas T. Warner. 2004.)

The nature of these monsoonal dust events is such that specific source areas are difficult to determine as outflow from thunderstorms can carry dust over vast distances encompassing many source areas. Because of this, it is more appropriate to speak of general source regions for these monsoonal dust storms which typically are identified based upon the locations of the thunderstorms that are believed to have created the dust generating and carrying outflow winds. A vast majority of the PM10 impacting the Phoenix area from thunderstorm driven high wind events during the period of July 2–8 originated outside of the Phoenix PM10 nonattainment area. The contributing source regions to the dust events were somewhat widespread, but the majority of the PM that was transported into Maricopa County likely came from areas within Pinal County to the south and southeast of Maricopa County. Other potential source contributors to the PM10 events were areas in northern Pima County and southeastern and southern Maricopa County. The exact origin of the PM sources is often difficult to determine due to the holes in the spatial coverage of radar data and less dense monitoring networks in the general source area.

Another important factor that led to these significant dust storms was the on-going drought across the region. The most recent U.S. Drought Monitor placed the area between Tucson and Phoenix in D1 (Moderate) to D3 (Extreme) drought. Rainfall since the end of the summer of 2010 leading up to the July 5th dust event had been less than 50% of normal (see Figure 2-5). For additional information pertaining to the 2011 monsoon season in Arizona, several News Media web links are included below:

2011 Monsoon Season Summary and Review → http://bcove.me/krh3qk29

This video contains information about the monsoon season, the formation of dust storms in Arizona, and the uniqueness of the 2011 monsoon season.

2011 Monsoon Season Review 2 → http://bcove.me/tc6otk0h

This video contains information about the 2011 monsoon season, focusing on the large number of dust storms that occurred, and a discussion of why there were so many dust storms in 2011.

Historic July 5th Dust Event → http://bcove.me/c3189kkd

This video contains images of the historic July 5th dust storm as it moved into the southeastern perimeter of the Phoenix Metropolitan area.

Historic July 5th Dust Event 2 → http://bcove.me/pb5lmh1s

This video provides images and information pertaining to the historic dust storm that occurred on July 5th, 2011.

Additional media coverage related to the 2011 monsoon season and the historic July 5th dust storm can be found in Appendix E.

The abnormally dry conditions that were in place during the early part of the monsoon season (which persisted throughout the duration of the monsoon season) resulted in a large fetch of soils that were vulnerable to particulate suspension. The repeated thunderstorm outflow boundaries that affected Pinal and Maricopa Counties during the July 2-8 period resulted in very little rainfall throughout south-central Arizona, but the high winds associated with the outflows did bring an almost daily occurrence of moderate to extremely high levels of particulate concentrations in the ambient air. A timeline summarizing these events can be seen in Figure 2-6.

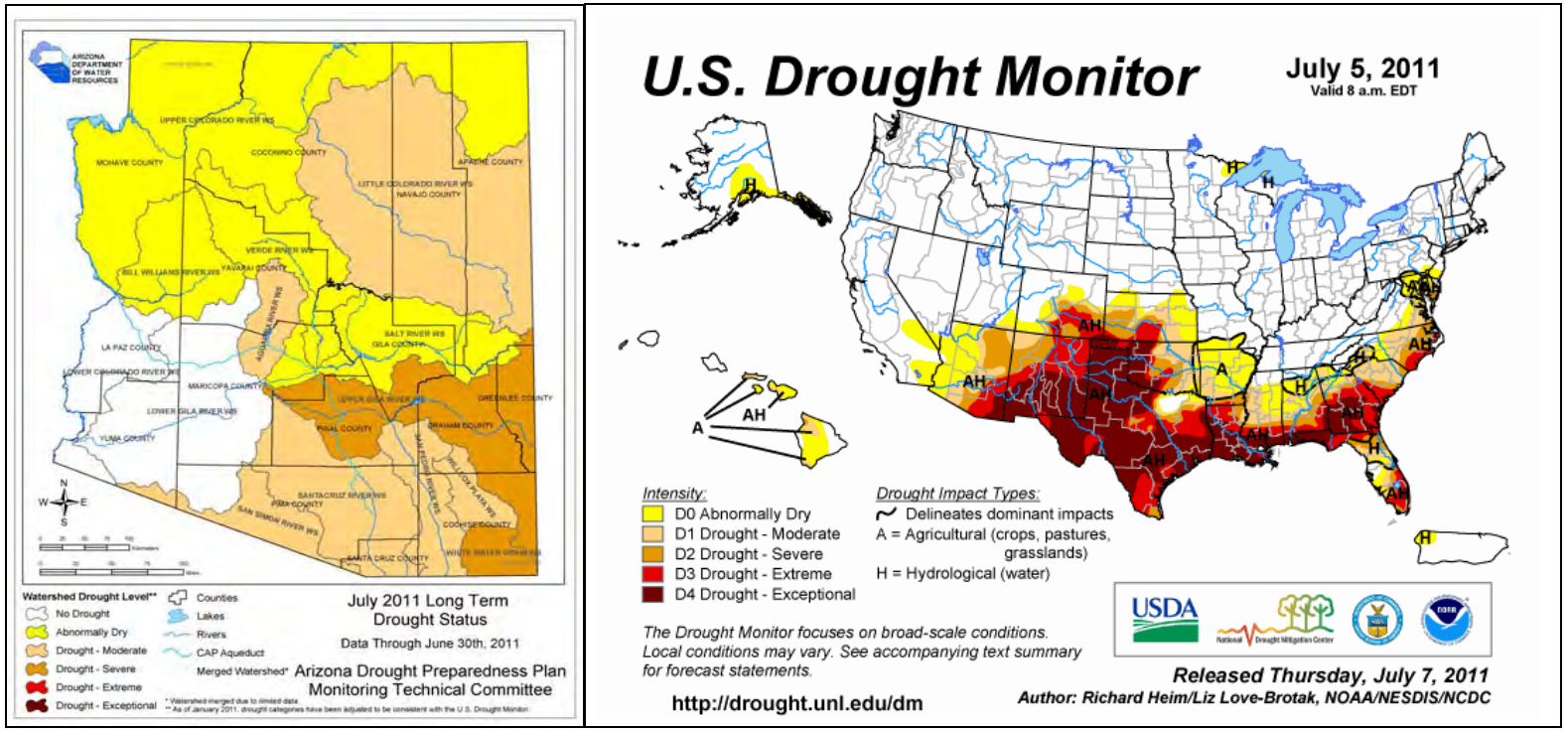


Figure 2-5. Arizona Long-Term Drought Status and U.S. Drought Monitor analyses released around the time period of the exceedances described in this report.

Timeline of Windblown Dust Events for July 2, 2011 - July 8, 2011

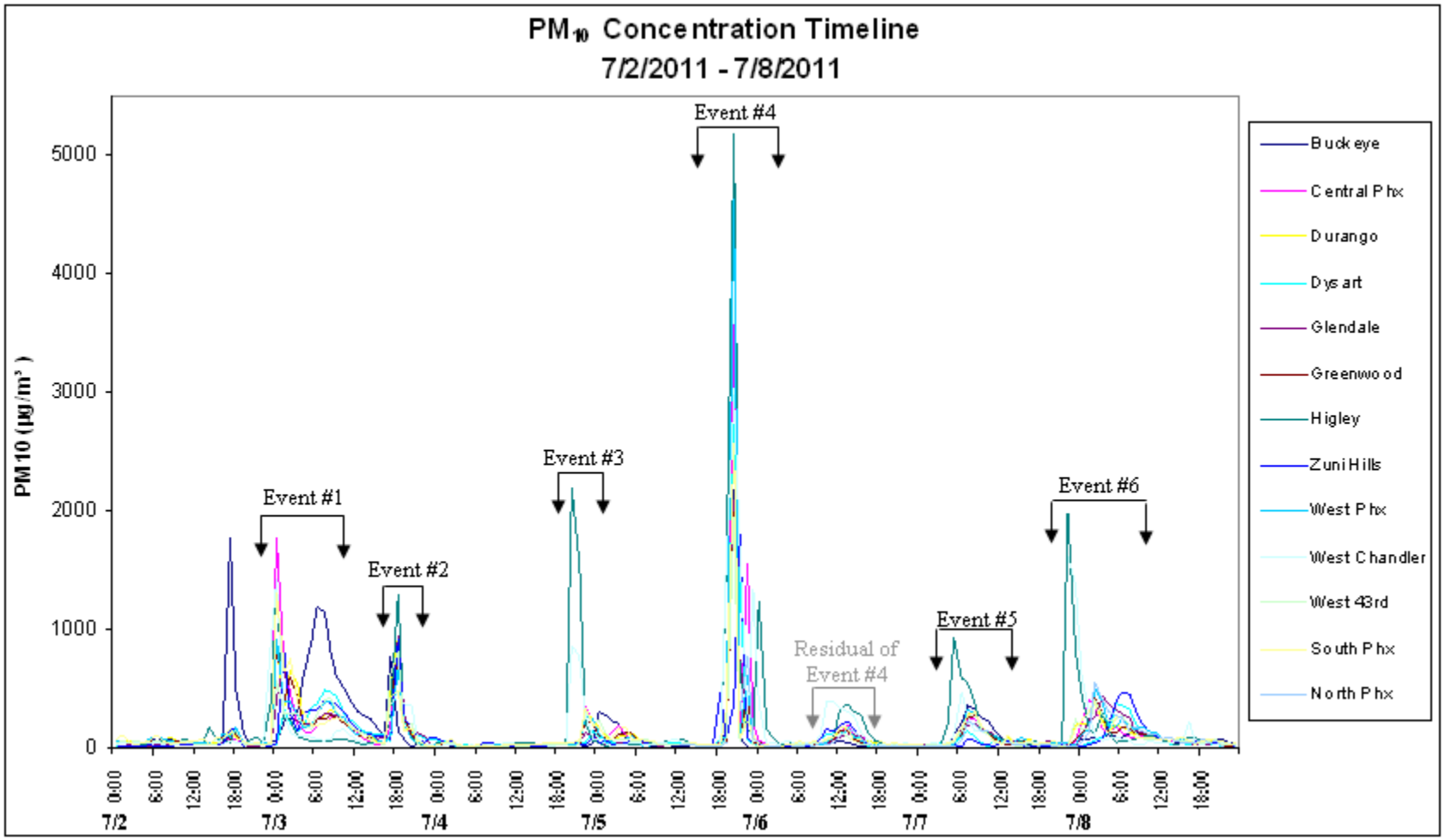


Figure 2-6. Timeline of PM10 concentrations at various monitors throughout the Phoenix Metro area during the period of July 2-8

July 2–3, 2011

Table 2-1. Summary of Statewide PM10 Measurements for July 2, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	25	65	0100	
Cochise County							
Douglas Red Cross	N/A	ADEQ	04-003-1005-81102-1	20	N/A	N/A	
Paul Spur Chemical Lime Plant	N/A	ADEQ	04-003-0011-81102-1	47	N/A	N/A	
Paul Spur Chemical Lime Plant	N/A	ADEQ	04-003-0011-81102-2	47	N/A	N/A	
Coconino County							
Flagstaff Middle School	N/A	ADEQ	04-005-1008-81102-1	N/A	N/A	N/A	
N/A	N/A	NN	04-005-1237-81102-1	27	94	2100	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	73	263	0200	
Payson Well Site	N/A	ADEQ	04-007-0008-81102-1	21	N/A	N/A	
Payson Well Site	N/A	ADEQ	04-007-0008-81102-2	17	N/A	N/A	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	147	1,766	1700	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	49	86	1800	
Durango Complex	TEOM	MC	04-013-9812-81102-1	59	122	1600	
Dysart	TEOM	MC	04-013-4010-81102-1	35	127	1800	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-8112-1	49	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	40	132	1800	
Greenwood	TEOM	MC	04-013-3010-81102-1	54	133	1800	
High School Air Monitoring Station	N/A	SRP-MIC	04-013-7024-81102-1		N/A	N/A	
Higley	TEOM	MC	04-013-4006-81102-1	79	384	2300	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	44	89	1800	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	40	92	0700	
Lehi Air Monitoring Station	N/A	SRP-MIC	04-013-7022-81102-1	N/A	N/A	N/A	
Mesa	FRM	MC	04-013-1003-81102-1	48	N/A	N/A	
North Phoenix	FRM	MC	04-013-1004-81102-1	50	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-1	72	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-2	74	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	66	165	1700	
South Scottsdale	FRM	MC	04-013-3003-81102-1	55	N/A	N/A	
West Chandler	TEOM	MC	04-013-4004-81102-1	80	871	2300	
West Forty Third	TEOM	MC	04-013-4009-81102-1	56	152	1800	
West Phoenix	TEOM	MC	04-013-0019-81102-1	65	183	1800	
Zuni Hills	TEOM	MC	04-013-4016-81102-1	39	160	1700	
Mohave County							
Bullhead City ADEQ	N/A	ADEQ	04-015-1003-81102-1	24	N/A	N/A	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	22	83	1100	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	79	277	2300	
Corona de Tucson	FRM	PCDEQ	04-019-0008-81102-1	35	N/A	N/A	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	38	93	2000	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	34	109	2000	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	36	N/A	N/A	
Prince Road	FRM	PCDEQ	04-019-1009-81102-1	49	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	N/A	N/A	N/A	

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	59	N/A	N/A	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	40	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	32	N/A	N/A	
Pinal County							
Apache Junction Fire Stn.	FRM	PCAQCD	04-021-3002-81102-1	28	N/A	N/A	
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	221	1,533	1800	RJ
Coolidge	FRM	PCAQCD	04-021-3004-81102-1	110	N/A	N/A	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	104	499	2300	
Cowtown	FRM	PCAQCD	04-021-3013-81102-1	359	N/A	N/A	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	478	6,191	2300	RJ
Eloy	FRM	PCAQCD	04-021-3014-81102-1	154	N/A	N/A	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	156	1,184	2300	RJ
Pinal Air Park	N/A	PCAQCD	04-021-3007-81102-1	86	N/A	N/A	
Pinal County Housing	FRM	PCAQCD	04-021-3011-81102-1	212	N/A	N/A	RJ
Pinal County Housing	FRM	PCAQCD	04-021-3011-81102-2	258	N/A	N/A	RJ
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	324	4,387	1800	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	392	4,158	2300	RJ
N/A	N/A	PCAQCD	04-021-7004-81102-1	89	N/A	N/A	
N/A	N/A	PCAQCD	04-021-7004-81102-2	93	N/A	N/A	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-1	29	N/A	N/A	
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	39	109	1900	
Yavapai County							
Prescott Valley	FRM	ADEQ	04-025-2002-81102-1	20	N/A	N/A	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	49	110	0200	

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
NN – Navajo Nation, AZ, NM, UT
PCDEQ – Pima County Department of Environmental Quality
SRP-MIC – Salt River Pima-Maricopa Indian Community of Salt River Reservation, AZ
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Table 2-2. Summary of Statewide PM10 Measurements for July 3, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 ($\mu g/m^3$)	1-hr Max PM10 ($\mu g/m^3$)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	19	N/A	N/A	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	77	963	1700	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	385	1192	0600	RJ
Central Phoenix	TEOM	MC	04-013-3002-81102-4	279	1771	0000	RJ
Durango Complex	TEOM	MC	04-013-9812-81102-1	277	930	1800	RJ
Dysart	TEOM	MC	04-013-4010-81102-1	239	800	1800	RJ
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-81102-1	126	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	242	953	1800	RJ
Greenwood	TEOM	MC	04-013-3010-81102-1	254	868	0000	RJ
Higley	TEOM	MC	04-013-4006-81102-1	196	1339	0000	RJ
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	227	985	0000	RJ
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	228	948	0000	RJ
South Phoenix	TEOM	MC	04-013-4003-81102-1	280	1318	0000	RJ
West Chandler	TEOM	MC	04-013-4004-81102-1	198	1428	0000	RJ
West Forty Third	TEOM	MC	04-013-4009-81102-1	250	814	1800	RJ
West Phoenix	TEOM	MC	04-013-0019-81102-1	243	917	0000	RJ
Zuni Hills	TEOM	MC	04-013-4016-81102-1	260	925	1800	RJ
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	15	N/A	N/A	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	37	176	0000	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	24	131	1500	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	18	51	2200	
Orange Grove	FRM	PCDEQ	04-109-0011-81102-2	20	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	94	N/A	N/A	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	21	N/A	N/A	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	76	523	1500	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	104	586	0000	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	188	1214	1600	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	186	1109	1600	RJ
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	140	1727	1600	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	117	750	1600	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	17	35	1100	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	225	3089	0000	RJ

Operator Abbreviations: MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
PCDEQ – Pima County Department of Environmental Quality
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Event #1:

In the late afternoon and early evening of July 2nd, outflow boundaries from thunderstorms along the Mogollon Rim northeast of Phoenix were detected moving from east and northeast of the Phoenix area toward the west and southwest, passing through Phoenix and then into and through the Buckeye area. Due to mountainous terrain and a general lack of substantial dust sources in areas to the north and northeast of Phoenix, these initial outflow boundaries, though significant in size and strength, did not create a major dust event in the Phoenix metro area. Those same outflow boundaries did pick up dust

from areas between Phoenix and Buckeye, and from areas east of Buckeye in Pinal County, causing a large spike in PM10 concentration in Buckeye at around 6:00 p.m. on July 2nd. While this spike did not cause an exceedance of the NAAQS in Buckeye on July 2nd, it does provide evidence that even outflows from the east and northeast of Phoenix, which typically are not large dust producers for the Phoenix Metro area, can have impacts on portions of southern Maricopa County including the Buckeye area.

During the late evening of July 2, 2011, and continuing into the morning of July 3, 2011, a large dust storm affected portions of south-central Arizona, including the Phoenix area in Maricopa County. Severe thunderstorms starting in northern Mexico and propagating into Pima and Pinal Counties were apparent on radar and satellite imagery during the evening of July 2, 2011, and these thunderstorms created a large, arched outflow boundary that moved towards the north and west into Yuma, Maricopa, Pinal, and Gila Counties. This subsequent outflow boundary approached the Phoenix area from the south-southeast in the late evening of July 2nd. It appears from radar and satellite imagery that this dust generating and carrying outflow boundary may have originated in extreme southern Arizona or even northern Mexico, traveling northward through Pima and Pinal Counties towards Maricopa and Gila Counties. Figure 2-7 shows a series of satellite images that depict the evolution of the storms that are believed to have created this large outflow boundary.

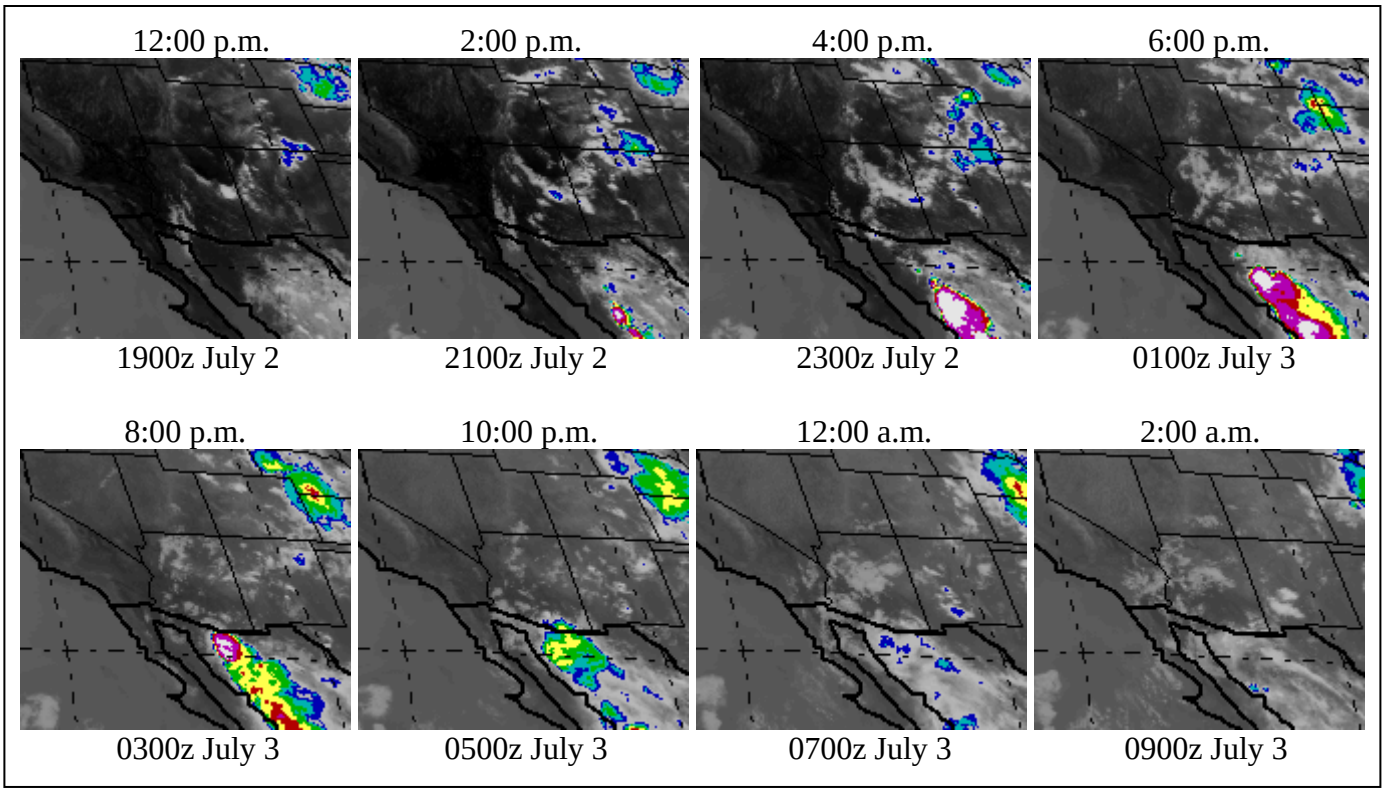


Figure 2-7. Satellite imagery showing strong storms developing and dissipating in northern Mexico. These storms are believed to have been responsible for the thunderstorm outflow boundary that caused PM emissions which resulted in exceedances throughout the state on July 3rd.

The bowed outflow boundary stretched a large distance, spanning from southwestern Maricopa County to eastern Pinal County. The outflow boundary also impacted western Pima County and Yuma County as it impacted the Ajo monitor during the 2300 hour on July 2nd and the Yuma Supersite monitor during the 0000 hour on July 3rd (see Tables 2-1 and 2-2). The outflow boundary was clearly seen on the Yuma Radar as it propagated westward. The boundary was first clearly seen on the Phoenix radar imagery between 10:30 p.m. and 11:00 p.m. and appears to reach the central Phoenix area between 11:30 p.m. and

12:00 a.m. (see Clear Causal Section Detailed Event Analysis for radar imagery). Because of the bowed shape of the outflow boundary and because it approached from the south-southeast, Pinal County and southeastern portions of Maricopa County, including the Higley and West Chandler monitoring sites, were first to experience elevated PM10 concentrations, followed shortly thereafter by southern and southwestern portions of the Valley. Large spikes in PM10 are evident during the midnight hour of July 3rd as can be seen in the July 3rd PM10 concentrations in Figure 2-8 below.

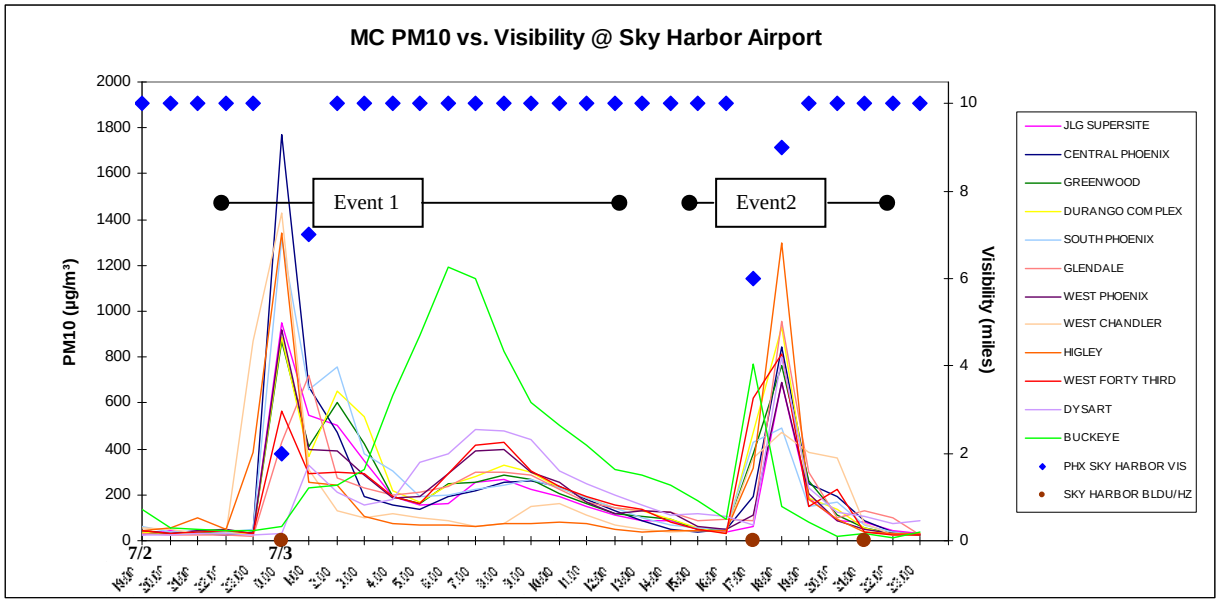


Figure 2-8. Maricopa County PM10 monitor readings and Sky Harbor visibility and blowing dust/haze reports for July 2–3, 2011.

Figure 2-8 depicts the two separate dust events that occurred in Maricopa County impacting the Phoenix area on July 2nd and 3rd. Concentrations at monitors throughout Maricopa County are shown as well as visibility readings (blue diamonds) and reports of blowing dust or haze (brown dots along x-axis) reported at Sky Harbor Airport in Phoenix. Sky Harbor measurements were used due to its central location amongst a number of the monitors that experienced exceedances on July 3rd. As can be seen in the graph, visibility was reduced at Sky Harbor Airport during each of the 2 windblown dust events (to 2 miles during Event #1 and to 6 miles during Event #2) and these visibility reductions coincided with increased PM10 concentrations across Phoenix as well as reports of blowing dust and/or haze at Sky Harbor.

The National Weather Service in Phoenix issued Local Dust Storm Warnings for several areas of south-western Arizona and Southeastern California between 12:00 a.m. and 2:00 a.m. Some of the dust kicked up by storms in these areas made it into the Phoenix Metro area during the late night and early morning hours of July 3rd. Wind speeds associated with this first outflow event that were recorded at Sky Harbor airport in Phoenix were sustained at 20 and 17 mph with gusts of 26 and 30 mph at 11:51 p.m. on July 2nd and 12:12 a.m. on July 3rd respectively. Wind speeds closer to the origination of the thunderstorm outflow and PM10 source area were higher. At Tucson Int'l Airport at 9:53 p.m. winds were sustained at 30 mph and gusting to 36 mph, while in Casa Grande an hour later at 10:55 p.m., sustained winds were measured at 23 mph with gusts as high as 32 mph. Maricopa County PM10 monitor concentrations fell off significantly from their highs recorded during the 12:00 a.m. hour as winds decreased following the outflow passage, but concentrations did remain elevated during the early morning hours at levels generally between 200 µg/m³ and 500 µg/m³.

Monitors across the Valley experienced a secondary spike of PM10 beginning with Buckeye at about 3:00 a.m. and followed by the rest of the Phoenix area monitors beginning at about 5:00 a.m. These secondary spikes occurring in many parts of the Phoenix area through the morning are related to continued impacts of the dust that was carried and deposited into the Valley overnight. Light winds throughout the Phoenix Metro area occurring after the outflow boundary had passed kept much of the dust that was carried into the area from leaving. Clean-up efforts and traffic on dust covered roads were also potential contributors to these morning spikes in PM10.

While all Maricopa County monitors experienced lasting residual impacts from the first wave of dust due to a large area of dust that moved into Maricopa County and then remained in place for an extended period of time, the greatest residual impacts were seen at the Buckeye monitor site. While the timing of the Buckeye residual spike occurred just prior to the rest of the Maricopa County monitors, the concentrations recorded during the first event's residual impact period at the Buckeye site were two to three times greater than those seen at other sites. Figure 2-8 shows that those monitors located furthest west contained the highest PM10 concentrations during the morning hours, indicating that the lingering dust was concentrated over the western portion of the Phoenix Metropolitan area. This is also evident in the relatively low PM10 concentrations that occurred at Higley and West Chandler monitors, which are located furthest east. More detailed information on this event can be found in the Clear Causal Relationship Section of this document.

Event #2:

During the evening of July 3, 2011, another dust event, again caused by thunderstorm outflow winds, brought more dust into the Phoenix area. This outflow boundary differed from the one impacting the Phoenix area during the early morning hours of July 3rd in that it came from the south and southwest and originated from thunderstorms located in the area of and western Pinal County, southern Maricopa County, northern Pima County, and possibly even northeastern Yuma County. During the 5:00 p.m. hour, strong outflow winds sustained above 25 mph and gusting to 36 mph out of the west-southwest were reported at Sky Harbor Airport in Phoenix. Even stronger winds were recorded during the 5:00 and 6:00 p.m. hours at Luke Air Force Base on the west side of the Phoenix Metro area where sustained winds as high as 36 mph and gusts to 40 mph were recorded. These winds likely served to both re-entrain dust that was transported into the Phoenix metropolitan area the night before as well as to transport additional dust into the Valley from sources to the southwest of the Phoenix Metro area. Storms are apparent on radar in southwestern Arizona during the 3:00 p.m. and 4:00 p.m. hours. An outflow boundary can be seen on radar imagery propagating away from those storms southwest of the Phoenix Metro area toward the northeast, arriving first in Buckeye by around 5:00 p.m. and then reaching the central Phoenix area between about 5:30 p.m. and 6:00 p.m.

Due to July 3, 2011 being impacted by two separate windblown dust events, some monitors recorded their maximum hourly concentration during the first of the two events in the very early morning hours (0000 Max Time), and others recorded their maximum concentrations during the second dust event in the early evening hours (1800 Max Time) as can be seen in Table 2-2. Both exceedance contributing dust events are easily discernable in Figure 2-8 and were fairly similar in scale and scope, though the first event saw slightly higher hourly concentrations than did the second. The Central Phoenix monitor recorded the highest concentrations during the first event and the Higley monitor recorded the highest concentration during the second. A visualization of these dust events was created using Phoenix visibility camera images and can be found at:

http://www.phoenixvis.net/videos/640x480/SOMT1_07022011.swf
http://www.phoenixvis.net/videos/640x480/SOMT1_07032011.swf

Because the first event occurred around the midnight hour of July 3, web links to both July 2 and July 3 videos are included above. Videos showing other views across the Valley on these dates are also available (see Visibility Cameras section).

All elevated PM10 concentrations on July 3rd measured during both events are related to thunderstorm activity and outflow winds and should be excluded via the RJ flag for Exceptional Events. In addition to the exceedances that were measured in Maricopa County on July 3rd, PM10 exceedances were also recorded in Pinal County and Yuma County. Additionally, several PM10 exceedances were recorded in Pinal County on July 2nd due to the outflow boundary that propagated northward through Pinal and Maricopa counties during event #1. More detailed information on this event can be found in the Clear Causal Section of this document.

July 4, 2011

Table 2-3. Summary of Statewide Air Quality Measurements for July 4, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	12	37	1900	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	30	72	0400	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	59	606	1900	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	24	51	0100	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	51	362	2200	
Durango Complex	TEOM	MC	04-013-9812-81102-1	50	324	2200	
Dysart	TEOM	MC	04-013-4010-81102-1	37	155	2300	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-1				
Glendale	TEOM	MC	04-013-2001-81102-1	37	133	2200	
Greenwood	TEOM	MC	04-013-3010-81102-1	47	240	2200	
Higley	TEOM	MC	04-013-4006-81102-1	198	2191	2000	RJ
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	51	367	2200	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	41	228	2200	
South Phoenix	TEOM	MC	04-013-4003-81102-1	55	337	2200	
West Chandler	TEOM	MC	04-013-4004-81102-1	109	873	2000	
West Forty Third	TEOM	MC	04-013-4009-81102-1	46	331	2200	
West Phoenix	TEOM	MC	04-013-0019-81102-1	50	272	2200	
Zuni Hills AQD	TEOM	MC	04-013-4016-81102-1	35	96	2300	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	14	N/A	N/A	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	18	25	1900	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	31	226	1600	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	18	45	1700	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	29	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	54	N/A	N/A	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	53	N/A	N/A	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	304	4250	1900	RJ
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	210	3610	2000	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	259	3601	1900	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	118	962	2000	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	311	3982	1900	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	171	2669	1900	RJ
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	28	78	1400	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	27	189	2300	

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
PCDEQ – Pima County Department of Environmental Quality
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Event #3:

During the evening of July 4, 2011, thunderstorms south of Maricopa County in western Pinal County and northern Pima County created a moderate outflow boundary that propagated north towards areas on the east side of Phoenix. As the outflow boundary arrived in the Casa Grande area in west-central Pinal County, it brought maximum sustained winds of 22 mph and gusts as high as 34 mph between 7:00-7:30 p.m. The outflow boundary continued to propagate northward, and it arrived in eastern portions of the Valley between 8:00 p.m. and 9:00 p.m. bringing elevated concentrations of PM10 to the Higley and West Chandler monitors. Wind speeds at the Chandler Municipal Airport were similar to those measured earlier in Casa Grande with sustained measurements at 21 mph and gusts to 32 mph. Higley saw a maximum hourly concentration of PM10 during the 8:00 p.m. hour of over 2191 $\mu g/m^3$ while West Chandler experienced a maximum hourly concentration of 873 $\mu g/m^3$.

It appears as though the thunderstorm outflow winds, and dust carried by the outflow boundary, were more concentrated in areas south and east of the Valley, causing only the Higley and West Chandler monitors to spike significantly during the 8:00 p.m. hour and only the Higley monitor to register an exceedance on this date. Part of the reasoning for this is likely due to winds throughout the Phoenix area that were generally moderate to strong out of the west-southwest. The outflow that brought dust into the Higley and West Chandler areas east of Phoenix weakened as it interacted with the moderate to strong west-southwesterly winds, and those more westerly winds seemed to keep the dust carried by the initial outflow boundary concentrated to the east side of Phoenix.

At the same time the outflow boundary south of Phoenix was headed north towards the eastern portions of the Valley, a line of thunderstorms oriented north to south was located east of Phoenix along the Pinal County and Graham County border and it was slowly moving towards the west into Gila and Pinal Counties. This line of thunderstorms created an outflow boundary as well that propagated towards the west, traveled through Pinal County (at the same time that the initial outflow boundary out of the south arrived in the Higley area) and arrived in the Phoenix Metro area at around 10:00 p.m.

The fact that the second outflow boundary arrived 1-2 hours after the initial outflow boundary had impacted monitors located east of the Phoenix Metro area, and that it carried with it winds out of the east, may have served to push some of the dust that had impacted the Higley area westward towards the rest of Phoenix. This idea is supported by many central and southern Phoenix area monitors that experienced their 1-hour maximum values during the 10:00 p.m. hour. By the time the initial outflow dust was pushed west through the rest of the Phoenix Metro area, the easterly winds had it much more dispersed than when it impacted the eastern Phoenix monitors. While elevated concentrations were seen at central and west Valley monitors, the PM10 values were less than those measured at the Higley and West Chandler monitors approximately 2 hours earlier, showing that the eastern portions of the Valley received the brunt of the impacts from this dust storm.

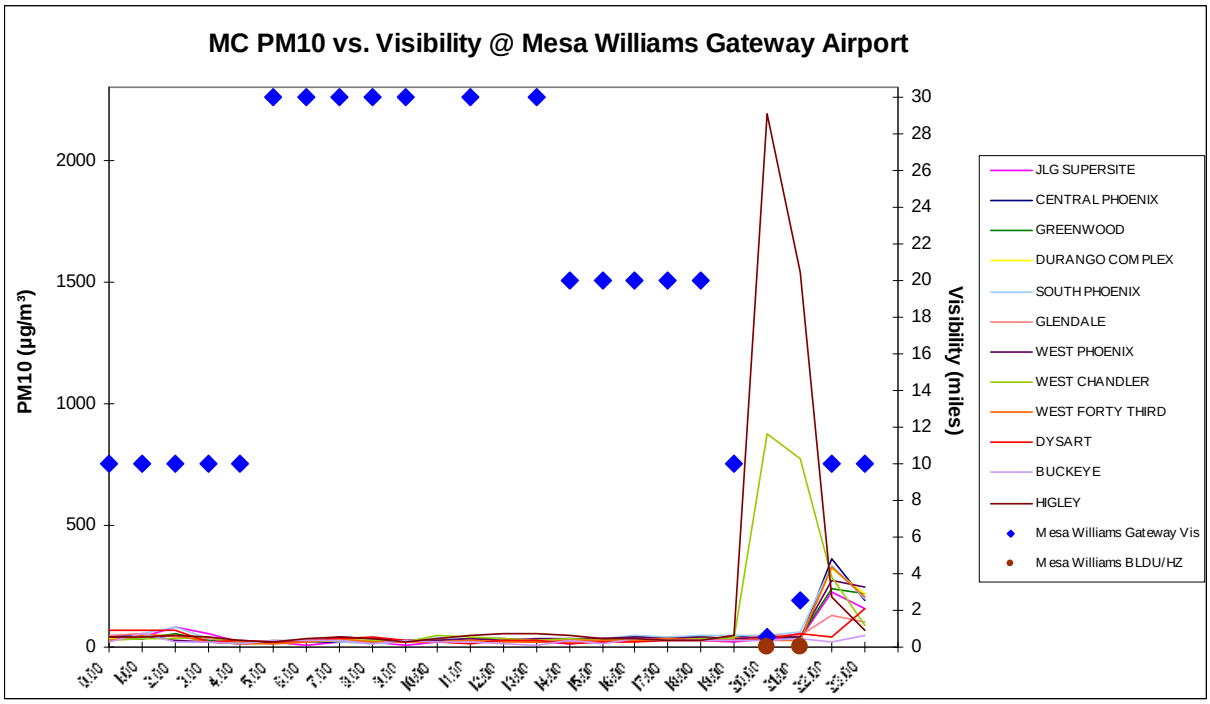


Figure 2-9. Maricopa County PM10 and Mesa Williams Gateway Airport visibility and blowing dust/haze reports for July 4, 2011.

Figure 2-9 shows the concentrations at monitors throughout Maricopa County as well as visibility readings and reports of blowing dust or haze reported at Williams Gateway Airport in Mesa. Williams Gateway data were used for this event due to its proximity to the monitors that were most impacted by the dust event, West Chandler and Higley. Visibility at Williams Gateway Airport drops to ½ mile as PM concentrations at both West Chandler and Higley show large increases between the 8:00 p.m. and 10:00 p.m. hours. These spikes and reductions in visibility coincide with reports of blowing dust and haze at Williams Gateway Airport as well. Wind speeds recorded at Williams Gateway Airport in Mesa around 8:00 p.m. were sustained at 21 mph with gusts to 24 mph out of the south-southwest. Stronger wind speeds were seen there during the 9:00 p.m. hour when the second outflow came from out of the east. At 9:35 p.m. winds had turned out of the east-southeast and were sustained at 29 mph with gusts as high as 34. These easterly winds helped disperse the dust west toward central Phoenix bringing slightly elevated PM10 concentrations to monitors located in that area. A visualization of this dust event was created using Phoenix visibility camera images and can be found at:

http://www.phoenixvis.net/videos/640x480/SUPM1_07042011.swf

Videos showing other views across the Valley on this date are also available (see Visibility Cameras section for details).

All elevated concentrations on July 4th measured during Event #3 are believed to be related to thunderstorm activity and outflow winds, and those values should be excluded via the RJ flag for Exceptional Events. More detailed information on this event can be found in the Clear Causal Relationship Section of this document.

July 5, 2011

Table 2-4. Summary of Statewide Air Quality Measurements for July 5, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	15	49	1200	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	21	54	0400	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	31	91	1600	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	163	2186	2000	RJ
Central Phoenix	TEOM	MC	04-013-3002-81102-4	277	3578	2000	RJ
Durango Complex	TEOM	MC	04-013-9812-81102-1	156	1974	2000	RJ
Dysart	TEOM	MC	04-013-4010-81102-1	219	2731	2000	RJ
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-81102-1	559	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	167	2095	2000	RJ
Greenwood	TEOM	MC	04-013-3010-81102-1	155	1990	2000	RJ
Higley	TEOM	MC	04-013-4006-81102-1	362	5189	2000	RJ
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	118*	985	2000	IJ, EH
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	331	6348	2000	RJ
South Phoenix	TEOM	MC	04-013-4003-81102-1	206	2575	2000	RJ
West Chandler	TEOM	MC	04-013-4004-81102-1	360	2967	2000	RJ
West Forty Third	TEOM	MC	04-013-4009-81102-1	150	1946	2000	
West Phoenix	TEOM	MC	04-013-0019-81102-1	278	4623	2000	RJ
Zuni Hills AQD	TEOM	MC	04-013-4016-81102-1	147	1804	2100	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	14	33	1700	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	21	116	2300	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	25	77	1700	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	30	97	0500	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	28	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	NA	N/A	N/A	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	29	N/A	N/A	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	479	5300	1900	RJ
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	419	8437	1900	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	2316	49377	1900	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	NA	NA	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	2040	41582	1800	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	54*	188	1800	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	23	46	1300	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	71*	850	2200	

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
PCDEQ – Pima County Department of Environmental Quality
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ
*Power failure and/or instrumentation range limitation occurred during expected maximum concentration hour(s) likely resulting in an underestimate of 24-hour average

Event #4:

A very large and historic dust storm moved through a large portion of southern and central Arizona during the late afternoon and evening hours of July 5, 2011. Significant thunderstorm activity in the vicinity of Tucson near the border of Pinal and Pima Counties triggered a large dust wall generating outflow that propagated towards the northwest traveling across Pinal County and into Maricopa County and the Phoenix metro area. Numerous Maricopa County monitor 24-hour PM10 concentration averages exceeded the NAAQS due to incredibly high concentrations measured during the evening hours of July 5th. Hourly concentrations ranging from about 1000 $\mu g/m^3$ to 6000 $\mu g/m^3$ were measured throughout the Phoenix area during the 8:00 p.m. hour.

Strong to severe thunderstorms developed east of Tucson, AZ during the afternoon hours of July 5, 2011. The storms intensified as they progressed west into the Tucson Metropolitan Area, producing downburst winds in excess of 70 mph. Aided by gravity (Tucson is approximately 1500 ft higher than Phoenix) and additional downbursts from the parent storms, these strong outflow winds proceeded to race off to the northwest, with the leading edge moving at 30 to 40 mph. By 6:30 p.m. the first calls came in to NWS Phoenix that a large wall of dust was approaching the Casa Grande/Eloy area, roughly 50 miles southeast of Downtown Phoenix. Widespread reports of near zero visibility and winds gusting over 50 mph were received by the NWS Phoenix office. Based on radar data, it is estimated that this dust storm reached a peak height of at least 5000 ft. The aerial coverage was very expansive, with the leading edge stretching for almost 100 miles. The distance traveled was at least 150 miles starting from southern Pinal County and traveling northwest through Maricopa and Yavapai Counties.

At 6:26 p.m. local time, the NOAA Storm Prediction Center issued a Severe Thunderstorm Watch for Maricopa and Pinal Counties, including the Phoenix Metropolitan Area, effective until 11:00 p.m. local time. The NWS in Phoenix issued a Local Dust Storm Warning at 6:32 p.m. for the areas southeast of Phoenix, expanding the warning for the East Valley of Phoenix at 6:55 p.m. and for nearly all of the Phoenix area at 7:21 p.m. Additional Local Dust Storm Warnings were issued as the dust cloud rolled north and west of the Phoenix area. At about 7:00 p.m. the leading edge of the massive dust storm hit the far southeast portions of the Phoenix area. The dust continued to push further north and eventually through the entire metropolitan area over the course of the next two hours. Trained spotters inundated the NWS Phoenix office with reports of zero visibility and winds gusting 30 to 50 mph. Wind gusts in some areas were reported to have approached 70 mph.

Station observations in Pinal County and throughout the Phoenix Metro area of severely reduced visibility, blowing dust, and very strong wind gusts provide validity to the spotter reports received by the National Weather Service in Phoenix. The Sky Harbor Airport weather observation station first saw impacts from the dust storm late in the 7:00 p.m. hour with increased winds and visibility reduction. Early in the 8:00 p.m. hour, visibility was reduced to about a tenth of a mile. Sustained wind speeds up to 31 mph and winds gusts as high as 53 mph were also reported at that time at Sky Harbor. A visualization of this dust event was created using Phoenix visibility camera images and can be found at:

http://www.phoenixvis.net/videos/640x480/SOMT1_07052011.swf
http://www.phoenixvis.net/videos/640x480/SUPM1_07052011.swf

Videos showing other views across the Valley on this date are also available (see Visibility Cameras section for details).

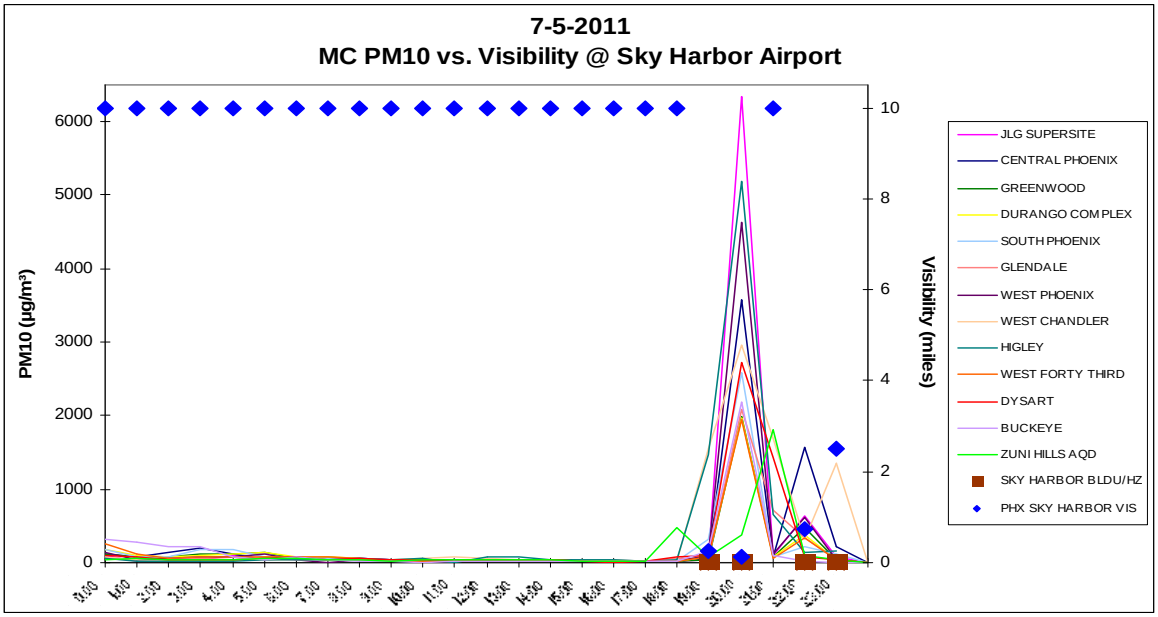


Figure 2-10. Maricopa County PM10 and Sky Harbor visibility and blowing dust/haze reports for July 5, 2011.

Figure 2-10 shows the concentrations at monitors throughout Maricopa County as well as visibility readings and reports of blowing dust or haze reported at Sky Harbor Airport in Phoenix. Sky Harbor measurements were used due to its centralized location relative to a number of the monitors that experienced very high PM10 concentrations on July 5th. As can be seen in the graph, visibility was greatly reduced at Sky Harbor Airport during the windblown dust event (to near zero miles at the peak of the event) and these visibility reductions coincided with increased PM10 concentrations as well as reports of blowing dust and/or haze in Phoenix.

It is clear that the dust storm on July 5, 2011, was driven by thunderstorm activity and strong winds originating southeast of the Phoenix area. All elevated concentrations on July 5th measured during Event #4 are related to thunderstorm activity and outflow winds, and those values should be excluded via the RJ flag for Exceptional Events. It should be mentioned that in addition to the PM10 exceedances that occurred on July 5th, there were also several PM2.5 exceedances in the Phoenix metro area, including Apache Junction, due to the sheer magnitude of the event. More detailed information on this event can be found in the Clear Causal Relationship Section of this document.

July 6, 2011

Table 2-5. Summary of Statewide Air Quality Measurements for July 6, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	16	34	1300	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	19	47	2000	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	205	651	1000	RJ
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	24	58	1200	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	55	204	1300	
Durango Complex	TEOM	MC	04-013-9812-81102-1	53	171	1300	
Dysart	TEOM	MC	04-013-4010-81102-1	47	155	1300	
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-8112-1	401	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	39	122	1400	
Greenwood	TEOM	MC	04-013-3010-81102-1	45	153	1200	
Higley	TEOM	MC	04-013-4006-81102-1	152	1241	0000	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	51	180	1300	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	29	78	1400	
North Phoenix	TEOM	MC	04-013-1004-81102-1	N/A	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	55	181	1200	
West Chandler	TEOM	MC	04-013-4004-81102-1	123	392	1000	
West Forty Third	TEOM	MC	04-013-4009-81102-1	40	134	1200	
West Phoenix	TEOM	MC	04-013-0019-81102-1	50	182	1200	
Zuni Hills AQD	TEOM	MC	04-013-4016-81102-1	56	233	1300	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	20	50	1100	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	39	138	0900	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	42	139	1600	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	39	127	1900	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	52	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	70	249	1500	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	39	N/A	N/A	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	117	413	1100	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	122	399	0100	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	101	279	1100	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	N/A	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	202	1337	1000	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	102	277	1200	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	37	98	2100	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	19	53	2200	

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
PCDEQ – Pima County Department of Environmental Quality
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Continuation of Event #4:

While no PM10 exceedances occurred in Maricopa County on July 6, 2011, PM10 concentrations remained elevated throughout much of the Valley as a result of the previous day's large and historic dust event. Air quality monitors to the north and east of the Phoenix metropolitan area in Yavapai and Gila counties showed significant dust impacts as the outflow boundary from the July 5th event propagated into other areas of the state. The windblown dust event of July 5th also deposited a tremendous amount of PM10 into the Valley. Streets, vehicles, and homes were blanketed in dust the following morning, and as people began their clean up efforts and drove on the dusty roads, much of this dust was re-entrained into the air resulting in continued elevated PM10 concentrations and a general haze across much of Maricopa County. A visualization of this residual dust event was created using Phoenix visibility camera images and can be found at:

http://www.phoenixvis.net/videos/640x480/SOMT1_07062011.swf

July 7–8, 2011

Table 2-6. Summary of Statewide Air Quality Measurements for July 7, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	17	34	2300	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	23	44	2100	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	58	118	2000	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	94	362	0700	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	69	246	0700	
Durango Complex	TEOM	MC	04-013-9812-81102-1	89	310	0800	
Dysart	TEOM	MC	04-013-4010-81102-1	42	146	0700	
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-8112-1	41	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	69	209	0800	
Greenwood	TEOM	MC	04-013-3010-81102-1	70	282	0800	
Higley	TEOM	MC	04-013-4006-81102-1	266	1994	2200	RJ
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	70	279	0700	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	60	238	0700	
North Phoenix	TEOM	MC	04-013-1004-81102-1	N/A	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	85	309	0800	
West Chandler	TEOM	MC	04-013-4004-81102-1	214	1618	2200	RJ
West Forty Third	TEOM	MC	04-013-4009-81102-1	77	290	0800	
West Phoenix	TEOM	MC	04-013-0019-81102-1	77	330	0700	
Zuni Hills AQD	TEOM	MC	04-013-4016-81102-1	31	76	0700	
Navajo County							
N/A	N/A	N/A	04-017-1002-81102-1	19	46	1700	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	106	430	0200	IJ
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	34	79	1800	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	26	95	1800	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	39	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	80	445	1800	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	32	N/A	N/A	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	268	2341	2100	RJ
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	189	1085	2200	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	242	1351	2100	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	N/A	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	237	2518	2100	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	183	1217	2100	RJ
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	28	53	1700	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	127	308	0800	IJ

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
PCDEQ – Pima County Department of Environmental Quality
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Table 2-7. Summary of Statewide Air Quality Measurements for July 8, 2011.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 (µg/m^3)	1-hr Max PM10 (µg/m^3)	Max Time	AQS Qualifier Flag
Apache County							
N/A	N/A	WMAT	04-001-1003-81102-1	15	40	1000	
Cochise County							
Douglas Red Cross	FRM	ADEQ	04-003-1005-81102-1	37	N/A	N/A	
Paul Spur Chemical Lime Plant	FRM	ADEQ	04-003-0011-81102-1	23	N/A	N/A	
Paul Spur Chemical Lime Plant	FRM	ADEQ	04-003-0011-81102-2	25	N/A	N/A	
Coconino County							
Flagstaff Middle School	FRM	ADEQ	04-005-1008-81102-1	10	N/A	N/A	
N/A	N/A	NN	04-005-1237-81102-1	24	49	12	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	48	80	0000	
Payson Well Site	FRM	ADEQ	04-007-1008-81102-1	N/A	N/A	N/A	
Payson Well Site	FRM	ADEQ	04-007-1008-81102-2	N/A	N/A	N/A	
Maricopa County							
Buckeye	TEOM	MC	04-013-4011-81102-1	79	135	0800	
Central Phoenix	TEOM	MC	04-013-3002-81102-4	114	404	0100	
Durango Complex	TEOM	MC	04-013-9812-81102-1	118	421	0200	
Dysart	TEOM	MC	04-013-4010-81102-1	99	373	0500	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-8112-1	329	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	139	437	0300	
Greenwood	TEOM	MC	04-013-3010-81102-1	116	426	0200	
High School Air Monitoring Station	N/A	SRP-MIC	04-013-7024-81102-1	N/A	N/A	N/A	
Higley	TEOM	MC	04-013-4006-81102-1	101	474	0000	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	133	566	0600	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	120	487	0200	
Lehi Air Monitoring Station	N/A	SRP-MIC	04-013-7022-81102-1	167	N/A	N/A	
Mesa	FRM	MC	04-013-1003-81102-1	127	N/A	N/A	
North Phoenix	FRM	MC	04-013-1004-81102-1	132	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-1	163	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	128	398	0200	
South Scottsdale	FRM	MC	04-013-3003-81102-1	119	N/A	N/A	
West Chandler	TEOM	MC	04-013-4004-81102-1	96	635	0000	
West Forty Third	TEOM	MC	04-013-4009-81102-1	127	410	0200	
West Phoenix	TEOM	MC	04-013-0019-81102-1	139	508	0200	
Zuni Hills	TEOM	MC	04-013-4016-81102-1	133	475	0600	
Mohave County							
Bullhead City ADEQ	N/A	ADEQ	04-015-1003-81102-1	18	N/A	N/A	
Navajo County							
N/A	N/A	WMAT	04-017-1002-81102-1	14	30	19	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	131	361	0400	IJ
Corona de Tucson	FRM	PCDEQ	04-019-0008-81102-1	14	N/A	N/A	
Geronimo	BAM	PCDEQ	04-019-1113-81102-1	28	109	2000	
Green Valley	BAM	PCDEQ	04-019-1030-81102-1	15	38	1700	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	24	N/A	N/A	
Prince Road	FRM	PCDEQ	04-019-1009-81102-1	N/A	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	44	122	2200	
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	40	N/A	N/A	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	40	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	26	N/A	N/A	

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM10 ($\mu g/m^3$)	1-hr Max PM10 ($\mu g/m^3$)	Max Time	AQS Qualifier Flag
Pinal County							
Apache Junction Fire Stn.	FRM	PCAQCD	04-021-3002-81102-1	194	NA	NA	RJ
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	54	125	2200	
Coolidge	FRM	PCAQCD	04-021-3004-81102-1	47	N/A	N/A	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	105	224	0300	
Cowtown	FRM	PCAQCD	04-021-3013-81102-1	129	N/A	N/A	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	134	460	2000	
Eloy	FRM	PCAQCD	04-021-3014-81102-1	51	N/A	N/A	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	NA	NA	NA	
Pinal Air Park	FRM	PCAQCD	04-021-3007-81102-1	37	N/A	N/A	
Pinal County Housing	FRM	PCAQCD	04-021-3011-81102-1	N/A	N/A	N/A	
Pinal County Housing	FRM	PCAQCD	04-021-3011-81102-2	64	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	74	171	1900	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	76	185	1500	
N/A	N/A	PCAQCD	04-021-7004-81102-1	54	N/A	N/A	
N/A	N/A	PCAQCD	04-021-7004-81102-2	56	N/A	N/A	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-1	19	N/A	N/A	
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	27	51	0600	
Yavapai County							
Prescott Valley	FRM	ADEQ	04-025-2002-81102-1	20	N/A	N/A	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	44	72	0100	

Operator Abbreviations:
MC – Maricopa County Air Quality Department
PCAQCD – Pinal County Air Quality Control District
ADEQ – Arizona Department of Environmental Quality
FMIR – Fort McDowell Indian Reservation
NN – Navajo Nation, AZ, NM, UT
PCDEQ – Pima County Department of Environmental Quality
SRP-MIC – Salt River Pima-Maricopa Indian Community of Salt River Reservation, AZ
WMAT – White Mountain Apache Tribe of Fort Apache Reservation, AZ

Event #5:

Two separate dust events affected central Arizona on July 7–8th, with the areas of Pinal County, eastern Maricopa County, and western Gila County being the most impacted. The first wave of dust was likely generated by thunderstorm activity in northern Mexico during the late afternoon and evening of July 6th that carried into southern Arizona in the early morning hours of July 7th. While this dust was created by thunderstorm outflow winds, by the time the dust propagated into Maricopa County, the winds had died down considerably, leading to a weaker depositional sort of dust event that first impacted monitors in Pinal County, then the West Chandler and Higley monitors, and finally impacted the rest of the Maricopa County monitors to the west, though to a lesser extent than the West Chandler and Higley monitors. Satellite imagery indicates that some large thunderstorms occurred in the late afternoon and throughout the evening of July 6th and morning of July 7th in areas of Mexico just south of the Arizona border. Wind data show a weak outflow moving from the southwest towards the northeast affecting Pinal County monitors around 3:30 a.m. and then southeastern Maricopa monitors between 5:00-6:00 a.m. While winds recorded in Pinal and Maricopa County during the early morning hours of July 7th were only somewhat moderate, it is possible that the large-scale windblown dust event that occurred on July 5th had conditioned soils and deposited large amounts of loose dust such that stronger winds were not needed to entrain or re-entrain dust into the air. Figure 2-11 shows a series of satellite images that depicts the thunderstorm complex in northern Mexico which are believed to have been responsible for the weak thunderstorm outflow boundary that affected central Arizona on the morning of July 7th. In addition to the

dust impacts in Pinal and Maricopa County, the Ajo and Yuma monitoring sites recorded similar elevated PM10 concentrations during the morning hours (see Table 2-6).

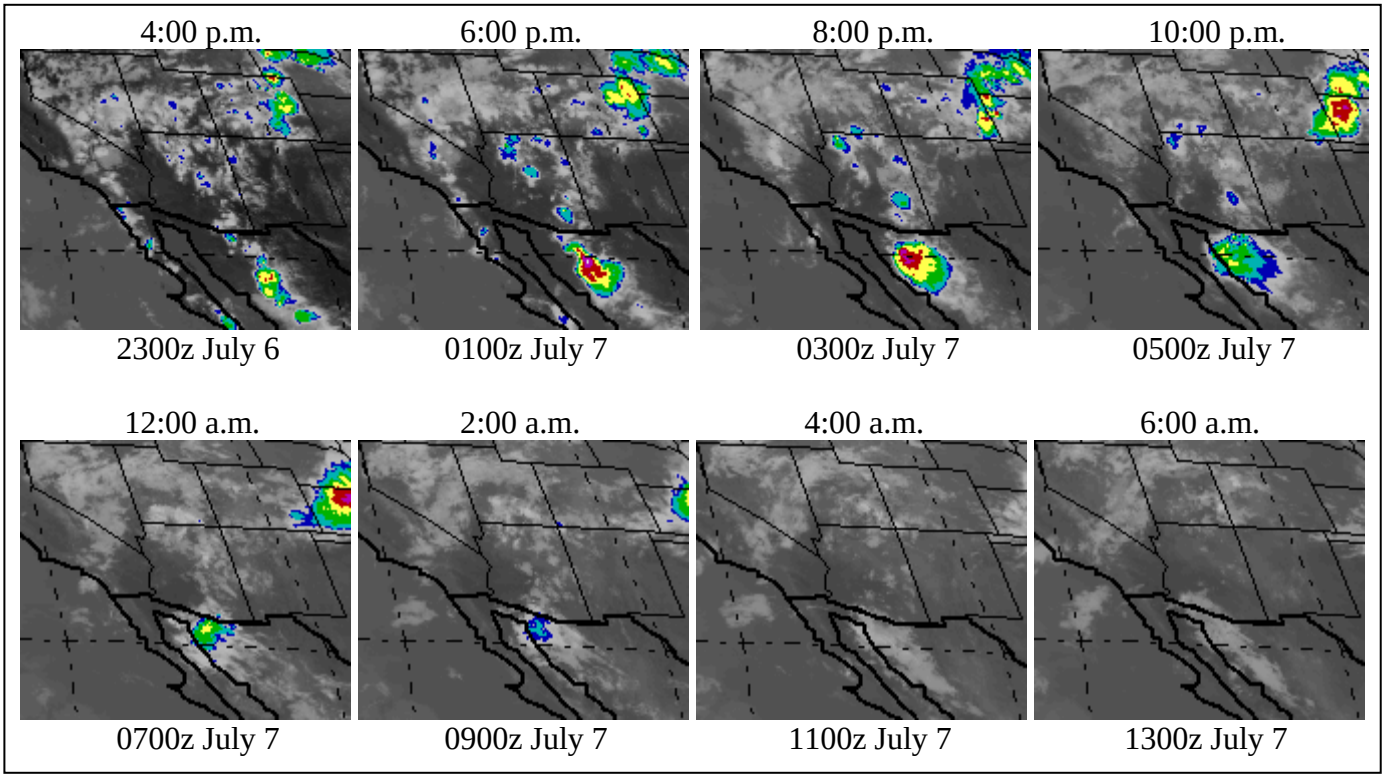


Figure 2-11. Satellite imagery showing strong storms developing and dissipating in northern Mexico. These storms are believed to have been responsible for the thunderstorm outflow boundary that caused PM emissions which resulted in exceedances throughout the state on July 7th.

Event #6

A second wave of dust came during the late evening and early morning hours of July 7–8, as a strong dust carrying outflow boundary impacted the far eastern portions of the Phoenix Metro area. This outflow boundary is apparent on radar imagery and can be seen originating somewhere in Pinal County south of Casa Grande and north of Tucson in Pima County. The outflow boundary traveled northward towards Maricopa County. The winds within this outflow boundary that were measured throughout Pinal and Maricopa counties were not as strong as some of the previous events. This could be an indication that the outflow boundary may have been losing forward speed as it propagated through Pinal and Maricopa counties. Sustained wind speeds in Casa Grande were measured at 17 mph as the dust was blown through the area at approximately 9:35 p.m. and sustained winds at Williams Gateway Airport in Mesa were measured at 18 mph as the dust arrived on the eastern portions of Phoenix at approximately 10:35 p.m.).

The thunderstorms in Pinal County not only sent outflow winds northwest toward Phoenix, but also sent strong winds southeast towards Tucson. Wind speeds at the Tucson International Airport, a location likely south of where the outflow and dust storm causing thunderstorms originated, but possibly closer in proximity to that point than Casa Grande, reported sustained winds as high as 20 mph and gusts from 25 to 31 mph from about 6:00-9:00 p.m. These winds in Tucson were generally out of the north and northwest directions, which is consistent with outflow coming from thunderstorms in southern Pinal County. Similarly, wind speed measurements at ADEQ's Rillito site recorded a maximum gust of 33 mph out of the north. While wind speeds in close proximity to the originating point of the dust storm are not known exactly, they are likely to have been stronger than the 20 mph sustained and 31 mph gusts

recorded at the Tucson airport site. The National Weather Service in Tucson issued numerous severe thunderstorm warnings in the late afternoon and early evening hours. One such warning, issued at 6:57 p.m. stated that Doppler radar continued to indicate severe thunderstorms located along a line extending from 9 miles northwest of Mammoth to 9 miles northwest of Oracle Junction to Dove Mountain to 8 miles northwest of Tucson. The warning stated that damaging winds in excess of 60 miles and dense blowing dust were likely with the line of storms. It is likely this line of storms generated the outflow boundary which led to the blowing dust that impacted the Higley and West Chandler monitors in Maricopa County, resulting in exceedances of the 24-hour PM10 standard.

Monitoring locations in central and western portions of Pinal County also saw very high PM10 concentrations with maximum hourly values recorded during the 9:00 p.m. and 10:00 p.m. hours, consistent with the timing of the outflow boundary traveling through that area to the north towards the east Valley. In addition to the Higley and West Chandler monitor exceedances that occurred late on July 7th, a filter-based monitor at the Apache Junction Fire Station site, falling within the Phoenix PM10 nonattainment area boundary but located in northern Pinal County, also was found to have exceeded the 24-hour PM10 standard. That exceedance in Apache Junction was measured on the July 8th run-day, but it appears as though the event that occurred late in the evening on July 7th is what impacted the Apache Junction monitor, located to the northeast of the Higley and West Chandler monitors. The timing of the outflow boundary suggests that the impacts in Apache Junction may have occurred around the midnight hour, leading to the exceedances there being measured for July 8th. It should be mentioned that in addition to the PM10 exceedances that occurred on July 7th and 8th, there was also one PM2.5 exceedance that occurred at the Apache Junction Fire Station site. The PM2.5 exceedance in Apache Junction was also due to the windblown and suspended dust event that caused PM10 exceedances in eastern portions of the Phoenix PM10 nonattainment area and elevated PM10 concentrations throughout the Valley on July 7th and 8th.

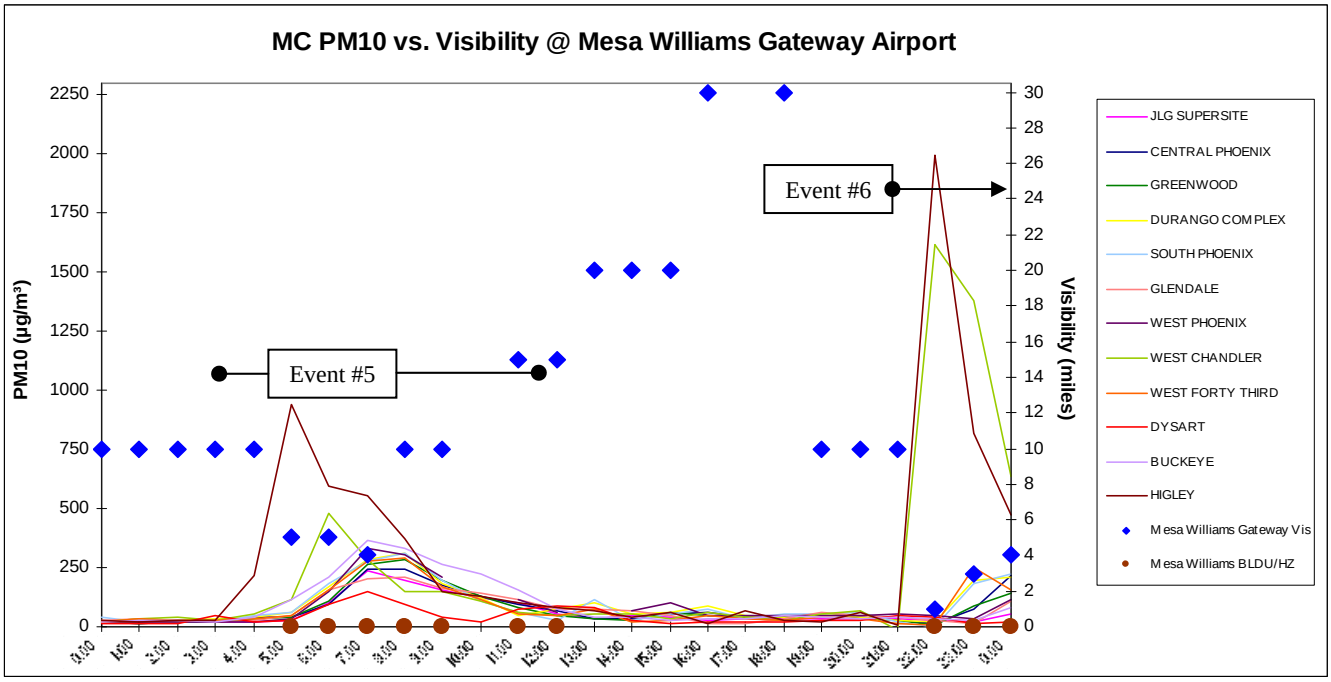


Figure 2-12. Maricopa County PM10 and Mesa Williams Gateway Airport visibility and blowing dust/haze reports for July 7, 2011.

Figure 2-12 above shows the concentrations at monitors throughout Maricopa County as well as visibility readings and reports of blowing dust or haze reported at Williams Gateway Airport in Mesa. Williams

Gateway data were used for this event due to its proximity to the monitors that were most impacted by the dust event, West Chandler and Higley. As can be seen in the graph, visibility was greatly reduced at Williams Gateway Airport at approximately 11:00 p.m. when maximum PM10 concentrations were recorded at the Higley and West Chandler monitors. Williams Gateway Airport also reported several hours of haze during the late evening of July 7th into the early morning of July 8th. As evident in Table 2-7, elevated PM10 concentrations occurred throughout much of the Valley during the morning hours of July 8th. The greatest 24-hour concentrations occurred in the east and northeast portion of the Valley, with several monitors on tribal lands recording exceedances of the PM10 NAAQS, in addition to the exceedance measured at Apache Junction. Visualizations of this dust event were created using Phoenix visibility camera images and can be found at:

http://www.phoenixvis.net/videos/640x480/SUPM1_07072011.swf
http://www.phoenixvis.net/videos/640x480/SOMT1_07082011.swf

Videos showing other views across the Valley on this date are also available (see Visibility Cameras section for details).

All elevated concentrations on July 7th measured during Event #5 and 6 are believed to be related to thunderstorm activity and outflow winds, and those values should be excluded via the RJ flag for Exceptional Events. More detailed information on this event can be found in the Clear Causal Relationship Section of this document.

Visibility Cameras

Visibility camera images were complied into time lapse photography videos in order to visually show the dust impacts on portions of Maricopa County from July 2nd through July 8th. There are two resolutions (640x480 and 1600x1200) available online for viewing for each event and for each of the visibility camera sites in Maricopa County. These views can be accessed using the site codes CAME1, SOMT1, SUPM1, ESMO1, and WHTM1. It should be noted that these time lapse photography videos may take some time to load. Also, the videos may perform better using Mozilla Firefox web browser.

The video files can be accessed as follows:

640x480:
http://www.phoenixvis.net/videos/640x480/xxxxx_mmddyyyy.swf

1600x1200:
http://www.phoenixvis.net/videos/1600x1200/xxxxx_mmddyyyy_1600x1200.swf

xxxxx = 5-character site code (ie. CAME1)
mm = 2-character month (ie. 07)
dd = 2-character day (ie. 02)
yyyy = 4 character year (ie. 2011)

Conclusions

This Conceptual Model was created to provide a basic description of the weather set-up that led to this active thunderstorm period from July 2–8 which resulted in frequent dust storms and numerous PM10 exceedances in Maricopa County. A more detailed analysis of each windblown dust event is included in Section V, where a demonstration of the clear causal connection between uncontrollable natural events and PM10 exceedance days is presented.

III. HISTORICAL FLUCTUATIONS

The PM10 concentrations measured throughout Maricopa County during the period July 2–8, 2011 were some of the highest hourly and 24-hour averages measured over the last five to six years. Time series plots of the 24-hour PM10 concentrations for the period January 1, 2006 through September 30, 2011 were created for all exceeding monitors in Maricopa County. Additionally, time series plots of the daily maximum hourly average PM10 concentrations were created for two monitors in Maricopa County. These two additional plots were created to provide a deeper understanding of the frequency with which short-term particulate concentrations affect the Phoenix PM10 nonattainment area. Time series plots for two sites (Higley and Central Phoenix) are included within this section, while the remaining plots are available in Appendix A. The Higley monitor was selected as it was the monitor most often affected by thunderstorm outflow boundaries during the July 2–8 period and is a good representation of southeastern Maricopa County. Central Phoenix was selected because of its central location in relation to all monitors in Maricopa County. The graphs below show that the July 5th event was one of the most significant events of the last five years, and that the other events during the July 2–8 period were also significant compared to previous data.

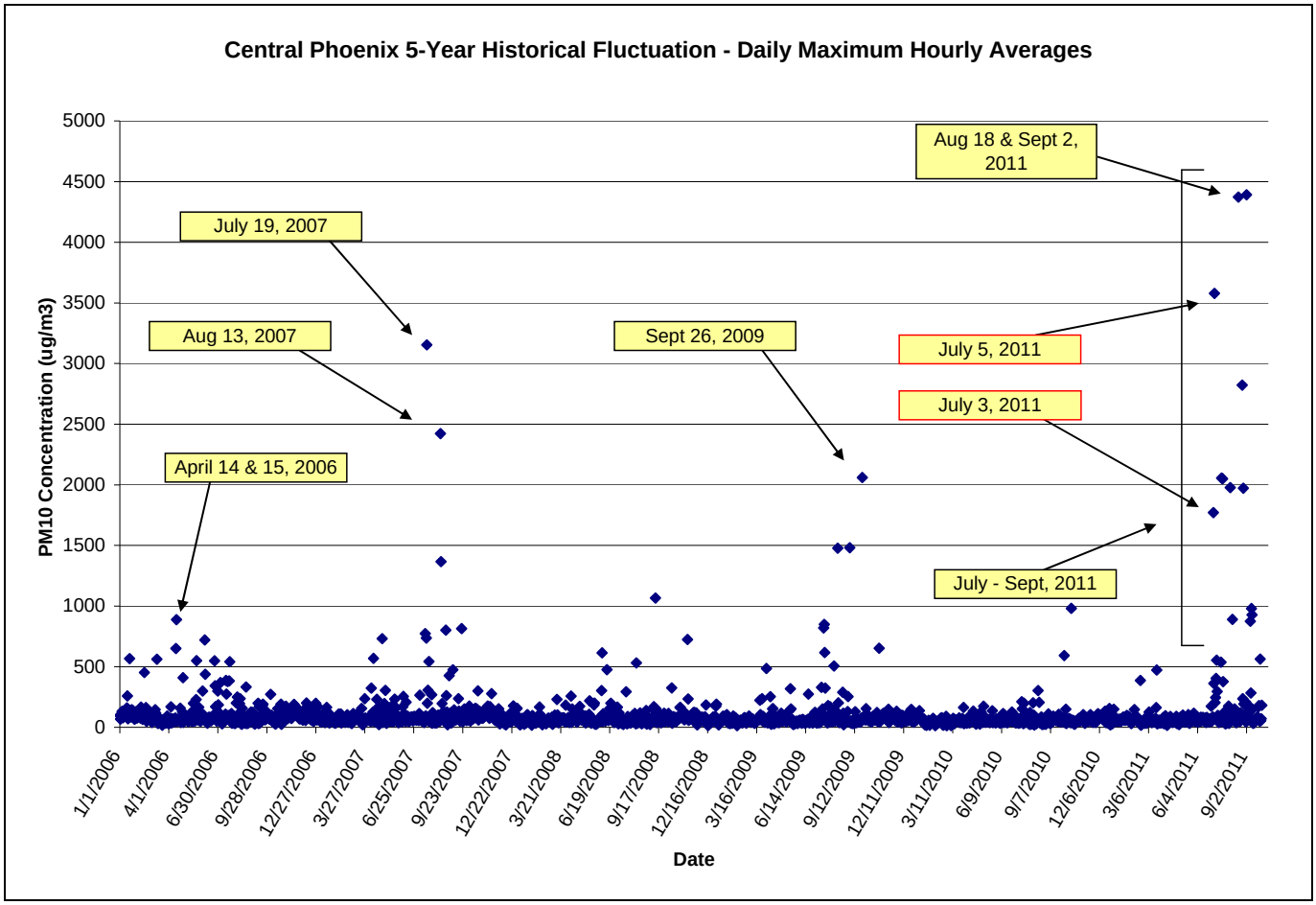


Figure 3-1. Plot of daily hourly maximum PM10 concentrations (2006 – Sept, 2011) in Central Phoenix.

The plot above shows the daily maximum hourly averages from the Central Phoenix PM10 monitor. The plot shows that the July 5th hourly average of 3578 $\mu g/m^3$ was amongst the highest PM10 concentrations recorded in the last five years, and it surpassed a similar haboob event that occurred on July 19th, 2007. The plot also shows that the maximum hourly average from the July 3rd, 2011 event amongst the highest

concentrations recorded in the last five years. The hourly average concentrations from these two events were surpassed by several additional dust storms that occurred later in July, August and September, another indication of the uniqueness of the 2011 monsoon season. One will notice that the most significant hourly average PM10 concentrations at the Central Phoenix monitor typically occur during the July through September time frame, a period for which the monsoon season is most active, and most impacted by haboob events. The plot below shows the daily 24-hour averages from the Central Phoenix PM10 monitor. The plot shows that the July 3rd and July 5th events resulted in the highest 24-hour averaged PM10 concentrations in the last five years. These events involved concentrations greater than a similar haboob event that occurred on July 19th, 2007, but were later surpassed by concentrations recorded during dust events that occurred in August and September of 2011.

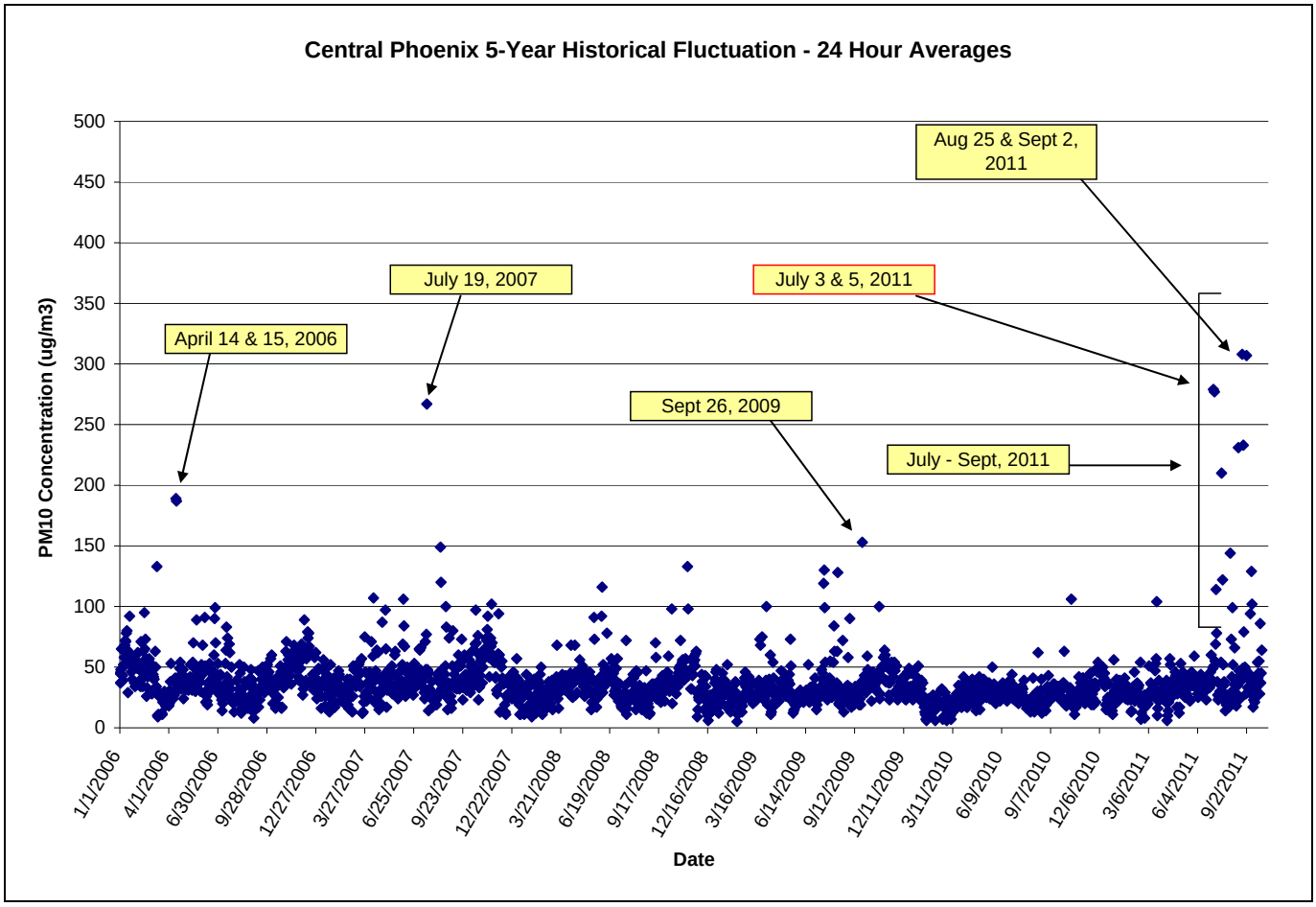


Figure 3-2. Plot of 24-hour average PM10 concentrations (2006 – Sept, 2011) at the Central Phoenix monitoring site.

The two plots below provide a historical look at the daily maximum hourly averages and daily 24-hour averaged PM10 concentrations from the Higley monitor. The plots show that the July 5th event resulted in the highest hourly and 24-hour PM10 concentration within the last five years, beating out a similar haboob event that occurred on July 17th, 2009. The plots also show that the exceedances measured at the Higley monitor on July 3rd, 4th, and 7th were amongst the highest PM10 concentrations measured over the last five years. As was the case for the Central Phoenix time series, the most significant hourly average PM10 concentrations at the Higley monitor typically occur during the July through September time frame, a period for which the monsoon season is most active, and most impacted by haboob events.

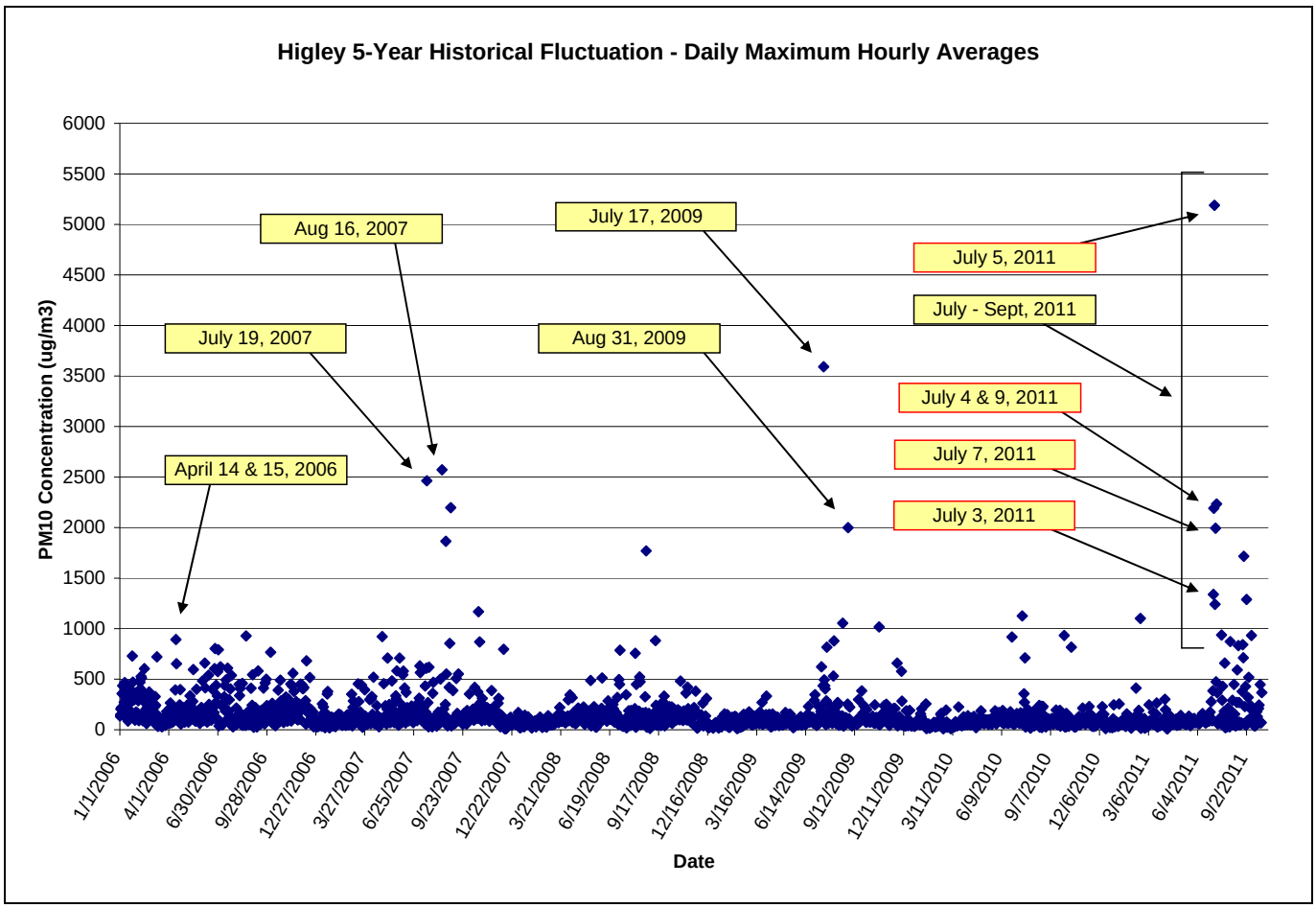


Figure 3-3. Plot of daily hourly maximum PM10 concentrations (2006 – Sept, 2011) at the Higley monitoring site.

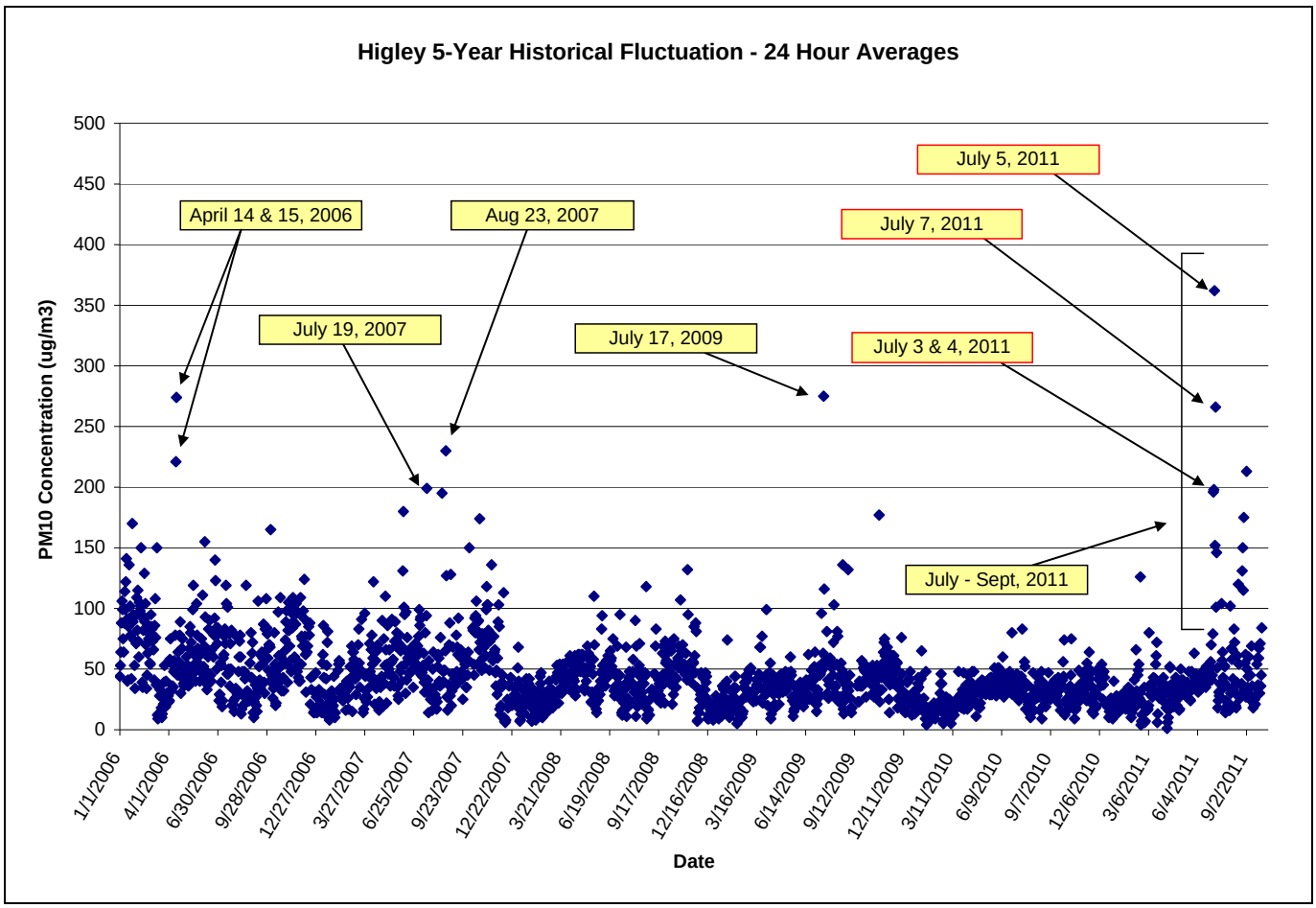


Figure 3-4. Plot of 24-hour average PM10 concentrations (2006 – Sept, 2011) at the Higley monitoring site.

The plots within this section provide a historical perspective of PM10 concentrations over the last five to six years. These plots show that the haboob events that occurred during the July 2–8 period resulted in some of the highest PM10 concentrations seen in the last five years. While the July 5th event contained the greatest PM10 concentrations, the other events in the July 2–8 period were amongst the top ten events in the last five years. This equates to PM10 concentrations in the 99.5th percentile range when compared to historic data. While the PM10 concentrations that were measured during the July 2–8 period were very impressive, the plots also show that similar events are not uncommon during the monsoon season. As documented in several published journals and academic text books, haboobs generated from thunderstorm outflow boundaries are phenomena that Arizonans deal with every year, some years more so than others (most recently 2007 and 2011).

IV. NOT REASONABLY CONTROLLABLE OR PREVENTABLE

Section 50.1(j) of Title 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 and the Phoenix PM10 nonattainment area, high wind conditions overwhelmed all reasonably available controls. The events occurring from July 2-8 were directly related to strong and gusty winds generated by thunderstorm outflow boundaries. The strong winds overwhelmed all reasonably available controls, and were also responsible for transporting PM into the Phoenix PM10 nonattainment area from areas outside of the nonattainment area. As explained in the conceptual model, downdrafts from collapsing thunderstorms produce outflow boundaries that contain gusty, turbulent wakes that raise dust from the desert surfaces that can be as wide as 100 miles in severe cases. As shown in Section V, the source region for all of the dominant thunderstorm outflows and associated transported dust during the week of July 2-8, 2011, came from areas outside of the PM10 nonattainment area; primarily from the deserts of Pinal, Pima and southern Maricopa counties. While it is likely that some dust was generated within the PM10 nonattainment area as gusts from the thunderstorm outflows passed through the area, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to the dust transported in from the source regions of the thunderstorm outflows. Strict controls on local sources of fugitive dust were in place and enforced during all of the events of July 2-8, 2011, but were not capable of controlling transported dust and PM10 raised by the gusty and turbulent thunderstorm outflows on these dates.

The following sections describe the BACM- and MSM-level PM10 control measures in place during the week of July 2-8, 2011, and the robustness of the programs designed to enforce these measures. Pro-active response and analysis of each event as it is occurring verify the uncontrollable nature of each event, while inspections of local sources performed before, during and after the events of July 2-8, 2011, confirmed that no unusual anthropogenic PM10-producing activities occurred in Maricopa County, the Phoenix PM10 nonattainment area, nor the local areas surrounding the exceeding monitors.

Regulatory Measures and Control Programs

The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Air Quality Department (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 (AgBMP)
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 High Risk for the Maricopa County Dust Control Forecast, 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 that are 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 approved into the Arizona Administrative Code as R18-2-610 and R18-2-611 pursuant to Arizona Revised Statutes § 49-457[4]. Maricopa County regulations of PM10 emissions are listed in Table 4-1.

Table 4-1. Rules and Ordinances Regulating Particulate Matter 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.

[4] Updates to the AgBMP program in December, 2011, clarified BMPs for crop 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.

Rule/Ordinance Number & Title	Description
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 brick and structural clay product (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 Woodburning Restriction	Establishes restrictions for residential woodburning.
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.
Arizona Administrative Code R18-2-611 & 610: Agricultural PM10 General permit	Establishes a requirement for commercial farmers to implement best management practices and maintain a record demonstrating compliance

In addition to the rules and regulations listed in the above table, other PM10 reducing control measures (e.g., paving of 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 SIP through PM10 plans such as the Revised MAG 1999 Serious Area Particulate Plan for PM10 for the Maricopa County Nonattainment Area. The Pinal County Air Quality Control District (PCAQCD) also implements regulatory control measures on emissions from existing and new non-point sources within Pinal County (see Table 4-2). Additionally, the PCAQCD implements specific nonattainment rules for that part of the Phoenix PM10 nonattainment area that resides in Pinal County (see Table 4-3).

Table 4-2. 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 4-3. Pinal County Rules Regulating Fugitive Dust in Pinal County Portion of MC PM10 NAA

Article Number & Title	Description
Article 4: Nonattainment Area Rules; Dustproofing for Commercial Parking, Drives and Yards	Establishes rules to avoid violations of the prevailing PM10 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 unstabilized vacant lots

Article Number & Title	Description
Article 7: Construction Sites in Nonattainment Areas – Fugitive Dust	Establishes rules to avoid violations of the prevailing PM10 standard and additionally minimize nuisance impacts by improving control of excessive fugitive dust emissions from activities associated with construction, earthwork, or land development.
Article 8: Nonattainment Area Rules, Requirement for Stabliazation of Disturbed Areas at Vacant Lots	Establishes rules for stabilizing disturbed areas at vacant lots

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 department's obligations under such agreements as the 2005 Revised PM10 State Implementation Plan for the Salt River Area and the Maricopa Association of Governments (MAG) 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, and 73% for Rule 316 sources. The timeline below illustrates the improvements in RE over the last several years, and also points out significant revisions to previous rules, as well as newly adopted rules and ordinances.

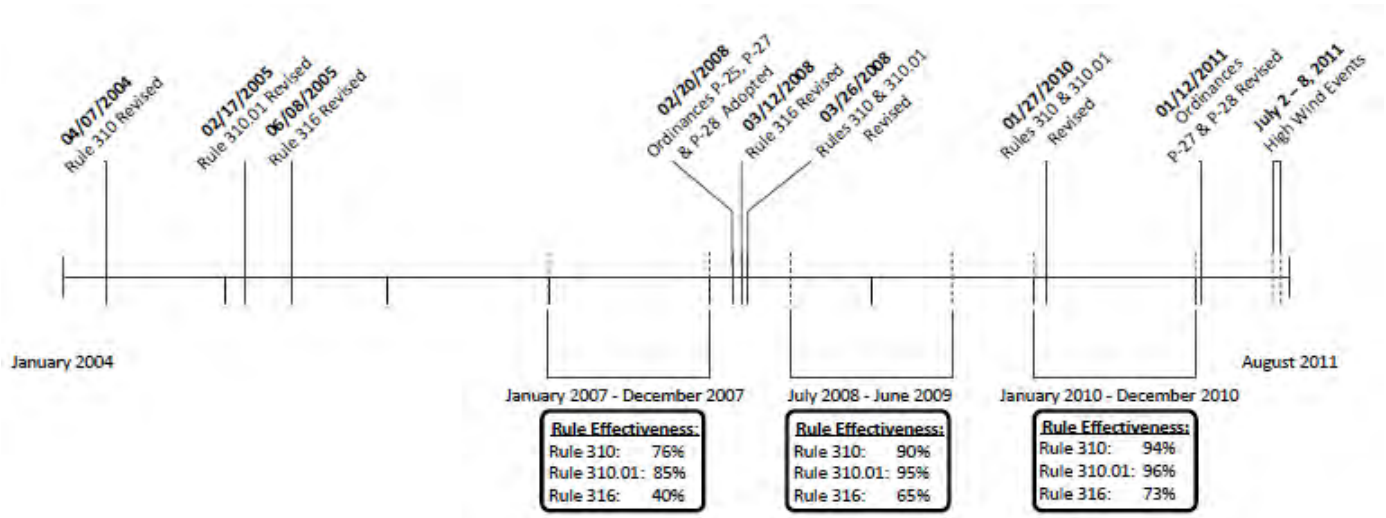


Figure 4-1. Timeline of Maricopa County Fugitive Dust Rules and Ordinances.

Compliance and Enforcement Activities

MCAQD is proactively prepared to respond to high wind events and to protect human health and well-being. MCAQD's approach consists of two primary components: routine proactive inspections, as well as surveillance inspections, conducted both during and after significant events. MCAQD proactively inspects dust control-permitted sites, and increases the frequency for larger sites of 10 acres or more. Rule 316 sources are also proactively inspected multiple times every year. Maricopa County also 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 additional surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities on 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, education 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-inspection of sources that had received violations within two business days, and an internal MCAQD debriefing of event activities.

Recently, a total of twelve MCAQD air monitoring sites have been updated with new equipment that allows the monitoring sites to report automatically monitored readings at 5-minute intervals; where previously only hourly data were available. The real-time monitoring data programming includes threshold triggers that cause the system to send alerts to MCAQD staff that the PM concentrations are elevated. The system allows MCAQD responders to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the 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.

For July 3rd, 4th, 5th, and 7th, 2011, Maricopa County Dust Control Forecasts were issued indicating a moderate risk level for unhealthy PM10. The Dust Control Forecasts also indicated a potential for blowing dust. For the events from July 2– 8, 2011 included in this analysis, MCAQD responders

evaluated each situation when concentrations were elevated. During most of the alerts MCAQD observed weather system activity and noted that many monitors were sequentially impacted by the high winds. In those instances where elevated winds were not present, or only a single monitor was affected, MCAQD issued broadcast alerts to nearby stakeholders and local governments, and also deployed MCAQD inspectors to investigate possible causes of the elevated readings. A survey of inspectors' observations during those events indicates that dust remained suspended in the air in the storm's aftermath or was being re-entrained by traffic and normal everyday activity on dusty surfaces.

An evaluation of inspection reports and compliance records indicate no evidence of unusual anthropogenic-based PM10 emissions. During the time period of June 30 through July 10, 2011, MCAQD inspectors conducted a total of 273 inspections, of which 137 were at fugitive dust sources, and 117 inspections on vacant lots.

During this 11-day period, a total of 15 violations were issued county-wide for PM10 and non-PM10-related violations. Only three violations were issued for PM10 emissions at 2 sources within 4 miles of the exceeding monitors. On June 30, 2011 (just prior to the July 2011 wind events analyzed herein), a violation was issued to an earthmoving site for failure to have a certified water truck driver. This violation occurred within 4 miles of the Higley monitor. On July 6, 2011, two violations were issued to an earthmoving site within 4 miles of the West Chandler monitor: for failure to maintain daily records, and for having an unstable haul access road. The site immediately ordered a water truck to the site, and used a garden hose to stabilize the haul road until a water truck arrived.

MCAQD was prepared for any complaints received due to the high wind event. MCAQD received 42 complaints, of which 33 were windblown dust-related. Each complaint was assigned and investigated by a MCAQD inspector. A review of all records during this period reveals that MCAQD inspectors did not observe any violations of local, state, or federal regulations during their investigations, and thus no violations were issued.

In addition to MCAQD's efforts in pre-event surveillance and proactive inspections, ADEQ's Agricultural Best Management Practice Program (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 forecasted high-wind alert days. Should the PM10 readings at a MCAQD air monitoring site show notable increases, the ADEQ Ag BMP inspector is dispatched to contact the owners and operators of agriculture fields in the area to discern if 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. From June 29 through July 8, 2011, the ADEQ Ag BMP inspector received one complaint, performed site visits at 39 agriculture operations, and conducted outreach via telephone with several facility representatives. The agriculture fields visited had established crops of cotton, alfalfa, and corn, which would not have contributed to PM10 emissions.

Complementary to the regulatory response by both MCAQD and ADEQ, local governments responded to the events during the week of July 2–8, 2011 by deploying extra street sweepers to reduce the effects of residual PM10 emissions from dust deposited during the events. Local governments also contacted businesses within their jurisdiction to inform them about the dust storms and ask them to take extra precautions to stabilize any unpaved surfaces under their control.

Conclusions

The thunderstorm outflow events of July 2–8, 2011 produced strong gusts and turbulent wakes 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 of Pinal, Pima and southern 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-approved control measures 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 thunderstorms and thunderstorm outflows brought high concentrations of PM10 emissions into, and also overwhelmed controls within, the Phoenix PM10 nonattainment area. Numerous strong thunderstorm outflows with sustained winds typically ranging from 20-30 mph, and even greater nearest the source regions, were enough to overwhelm all available efforts to limit PM10 concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM10 emissions into 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 events and exceedances of July 2–8, 2011 recorded within the Phoenix PM10 nonattainment area were not reasonably controllable or preventable.

V. CLEAR CAUSAL RELATIONSHIP

Introduction

A demonstration of the clear causal connection between uncontrollable natural events or uncontrollable emissions associated with thunderstorm outflows and PM10 exceedance days during the time period of July 2–8, 2011 is presented in the following series of time-stamped maps. These maps combine available data on sustained wind speed, wind speed gusts, PM10 concentrations, visibility observations and radar data to visually indentify and track the causal connection between the uncontrollable emissions associated with thunderstorm outflows and elevated PM10 concentrations. A brief synopsis of each event day is included in this introduction, and then explored in detail through the assembled maps. This is followed by an approximation of the emission source flux from the thunderstorm events for two selected storms demonstrating the overwhelming emissions resulting from haboob dust storms.

Exceedances on July 2, 2011
The 13 sites that exceeded the PM10 NAAQS on this day in Maricopa County and the Phoenix PM10 nonattainment area were directly caused by emissions generated by the presence of two thunderstorm outflows. These thunderstorm outflows originated in the deserts of Pinal and Pima counties and progressed northward into Maricopa County, transporting large amounts of PM10. The first thunderstorm outflow occurred in the late evening of July 2, 2011 with the second outflow occurring around 5 pm on July 3, 2011. Without the existence of the emissions generated by these two outflows there would have been no exceedance of the 24-hour PM10 standard in Maricopa County and the Phoenix PM10 nonattainment area.

Exceedances on July 4, 2011
The single exceedance at the Higley monitor on July 4, 2011 was caused by emissions generated from two thunderstorm outflows originating in the deserts of Pinal County. The exceedance was limited to the southeastern-most Higley monitor due to the presence of strong westerly winds throughout the remainder of the nonattainment area that kept the bulk of the PM10 isolated to southeast Maricopa County. Without the existence of the emissions generated by these two outflows there would have been no exceedance of the 24-hour PM10 standard in the Phoenix PM10 nonattainment area.

Exceedances on July 5, 2011
The 11 exceedances on this day in Maricopa County and the Phoenix PM10 nonattainment area were directly caused by the emissions generated by the presence of multiple small thunderstorm outflows and the culmination of one historically large outflow. A massive thunderstorm outflow originating in the deserts of Pinal and Pima counties collided with an outflow from the north of Maricopa County to deposit historic amounts of PM10 in the Phoenix PM10 nonattainment area. Without the existence of the emissions generated by these outflows there would have been no exceedance of the 24-hour PM10 standard in Maricopa County and the Phoenix PM10 nonattainment area.

Exceedances on July 7 and 8, 2011
The exceedance at the Higley and West Chandler monitors on July 7, 2011 was caused by emissions generated from two thunderstorm outflows originating in the deserts of Pima and Pinal Counties. The exceedance of the Apache Junction monitor on July 8, 2011 was caused by the second July 7, 2011 thunderstorm outflow which deposited dust just after midnight on July 8, 2011. These two thunderstorm outflows were weaker (as compared to previous storms during the week) and likely originated in the deserts of Pima and Pinal County. Effects from the thunderstorm outflows were isolated to the southeastern portion of Maricopa County due to the limited strength of the outflows. Without the

existence of the emissions generated by these two outflows there would have been no exceedance of the 24-hour PM10 standard in the Phoenix PM10 nonattainment area.

Description of data displayed in time series maps:

The data displayed in the following maps were gathered from five data sources. All available meteorological and air quality data was used in order to present the most complete story of the event. The table below displays the types of data used from each agency in creating the maps.

Agency	**Data Sets**
Arizona Department of Environmental Quality (ADEQ)	Hourly PM10 Concentrations, Wind Speed, Wind Direction and Wind Gusts
Arizona Meteorological Network (AZMET)	Hourly Wind Speed, Wind Direction and Wind Gusts
Maricopa County Air Quality Department (MCAQD)	5-Minute PM10 Concentrations, Wind Speed, and Wind Direction (hourly data used when 5-minute was unavailable)
Pinal County Air Quality Control District (PCAQCD)	Hourly PM10 Concentrations
National Weather Service (NWS)	Point in Time Wind Speed, Wind Direction, Wind Gust, Base Velocity Radar and Visibility

Detailed Event Analysis

Saturday–Sunday, July 2–3, 2011

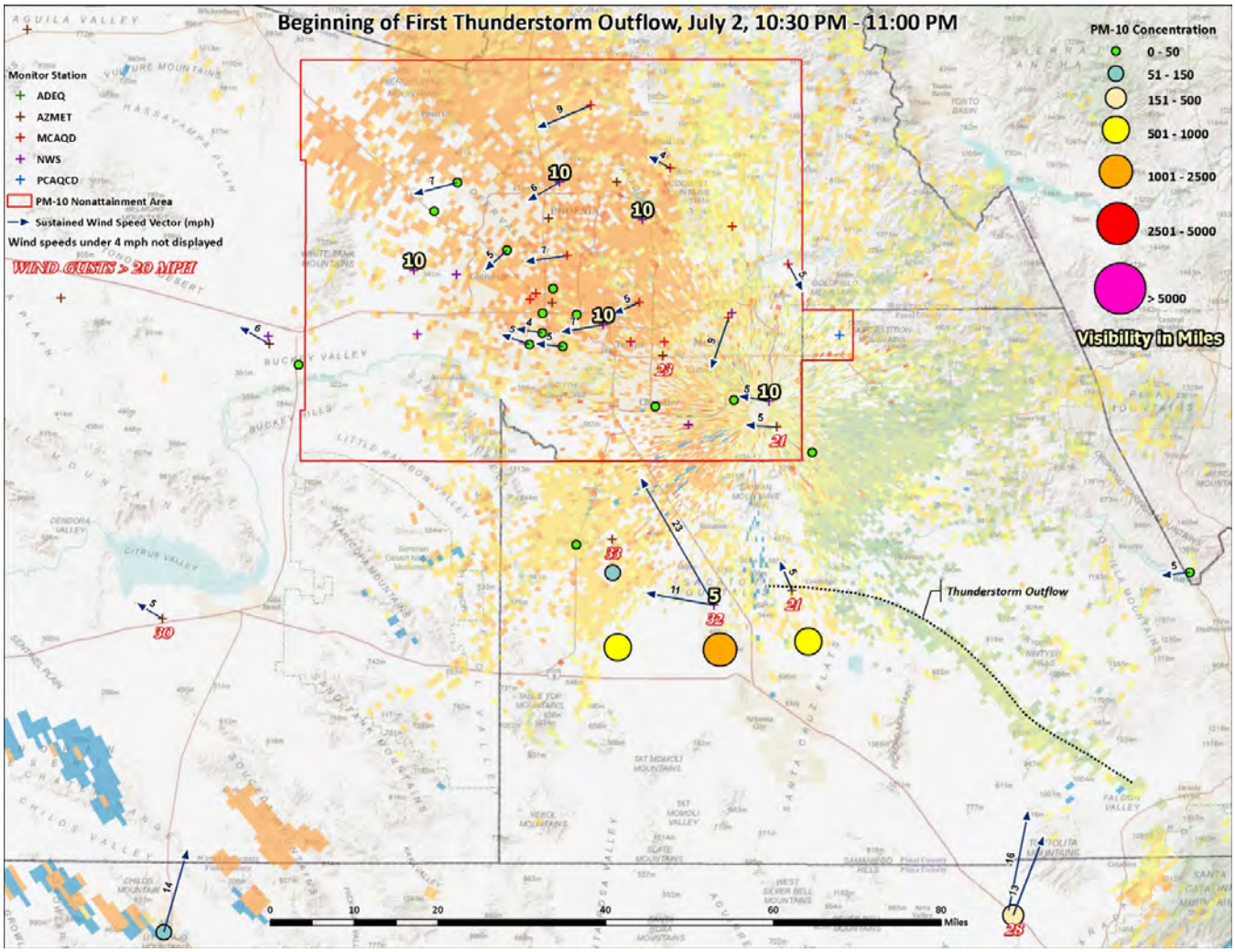


Figure 5-1. Beginning of First Thunderstorm Outflow (July 2, 10:30–11:00 PM).

The elevated PM10 concentrations on July 3, 2011 were the result of 2 thunderstorm outflows. The first outflow began at approximately 10:00 pm on July 2, 2011, and is believed to have originated in the open desert areas of northern Pima County. As indicated in the map above, by 10:30 PM, southern Pinal County monitors were recording elevated PM10 concentrations. Visibility at the Casa Grande airport was limited to 5 miles. Wind direction indicated steady movement of the thunderstorm outflow from the south, with the eastern edge of the thunderstorm outflow visible on base velocity radar images. During this time, effects from the initial thunderstorm outflow had yet to reach the Phoenix PM10 nonattainment area. Wind speeds within Maricopa County were increasing but generally were from the east and not yet influenced by the approaching outflow.

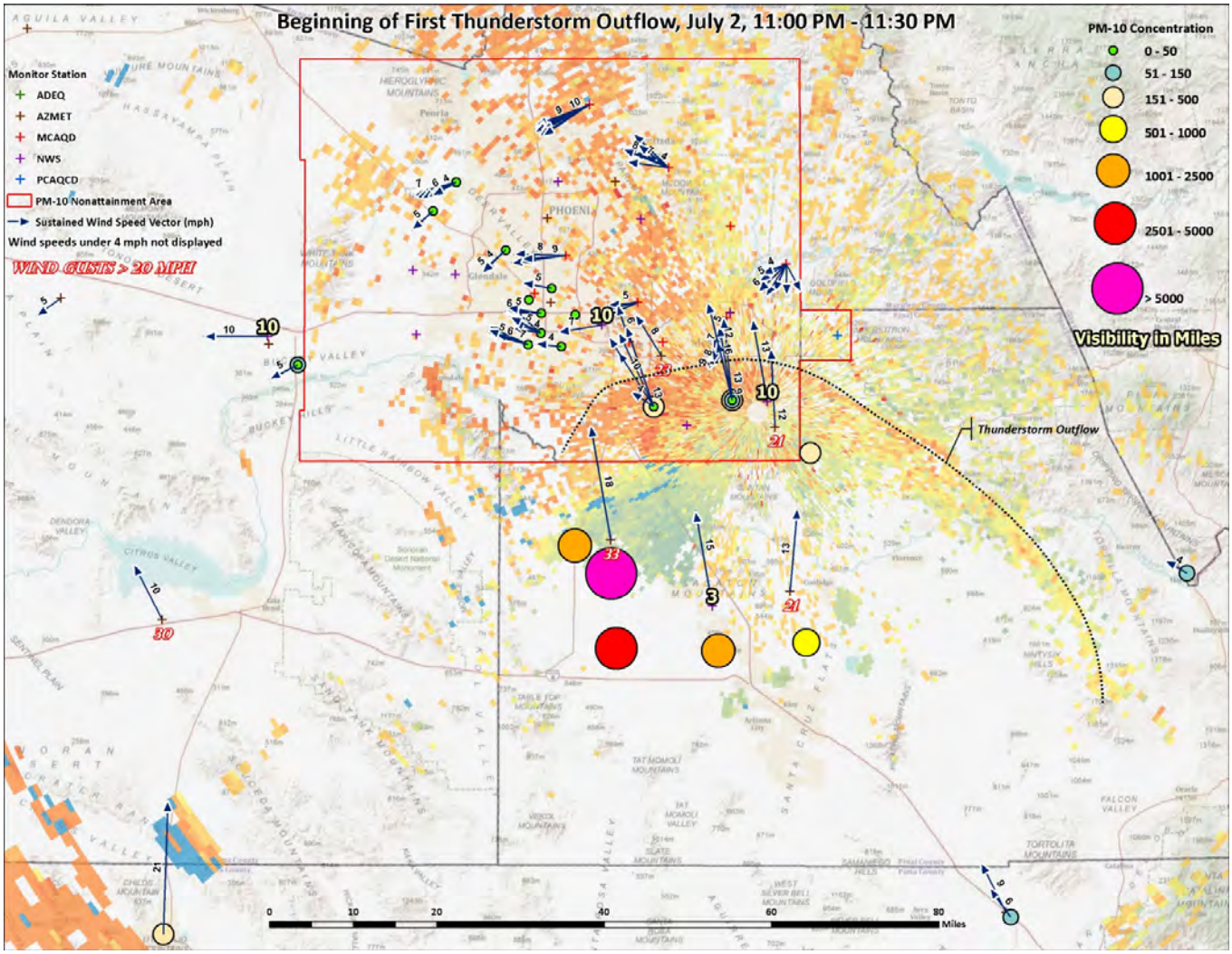


Figure 5-2. Beginning of First Thunderstorm Outflow (July 2, 11:00–11:30 PM).

By 11:15 PM, the first thunderstorm outflow had reached into southeastern Maricopa County, elevating PM10 concentrations at the West Chandler and Higley monitors. All of the Pinal county continuous PM10 monitors were recording very high levels of PM10 as the wall of dust from the outflow slowly moves north into Maricopa County. Visibility at the Casa Grande airport has been reduced from 5 to 3 miles during this period. The thunderstorm outflow visible by base velocity radar has increased and is now approximately 80 miles wide. Wind speed in Maricopa County is increasing with the approaching dust wall. Interestingly, at monitoring stations just north of the advancing outflow, wind direction at this time is blowing directly against the incoming flow, which may contribute to increased PM10 concentrations at the West Chandler and Higley monitors as particles are trapped between competing wind systems.

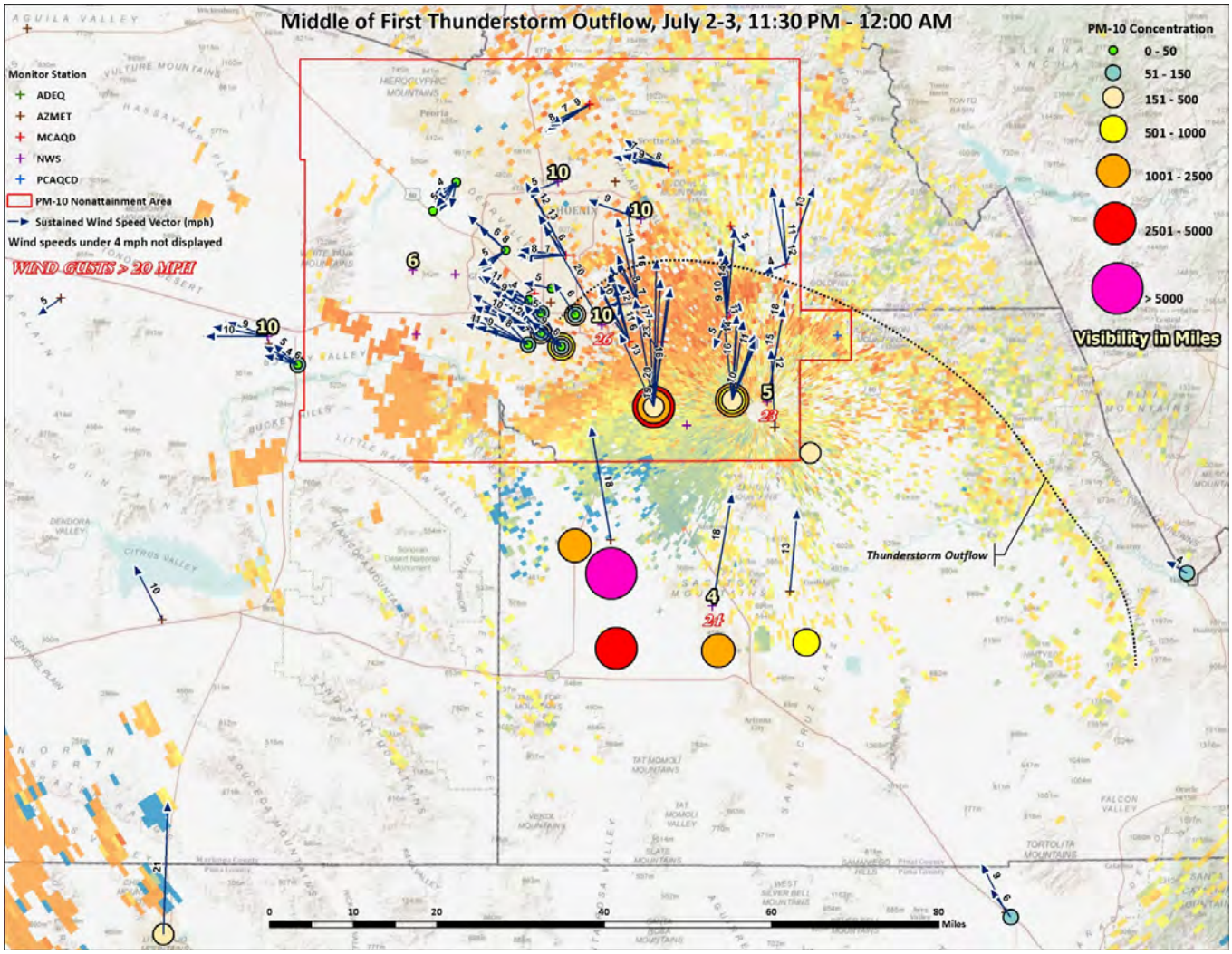


Figure 5-3. Beginning of First Thunderstorm Outflow (July 2, 11:30 PM–12:00 AM).

At 11:45 PM, the outflow has reached into the central part of Maricopa County and begun to elevate PM10 concentrations at central Phoenix area monitors. Wind speeds have increased substantially throughout Maricopa County with a predominant wind direction from the south. The beginnings of the thunderstorm outflow collapse can be seen on the base velocity radar, as the outflow loses energy when running into the eastern mountains of Maricopa and Pinal counties. Visibility at Williams Gateway airport has decreased to 5 miles with the arrival of the dust from the thunderstorm outflow. PM10 concentrations begin to peak at the West Chandler and Higley monitors during this time as the dust wall passes over these monitors.

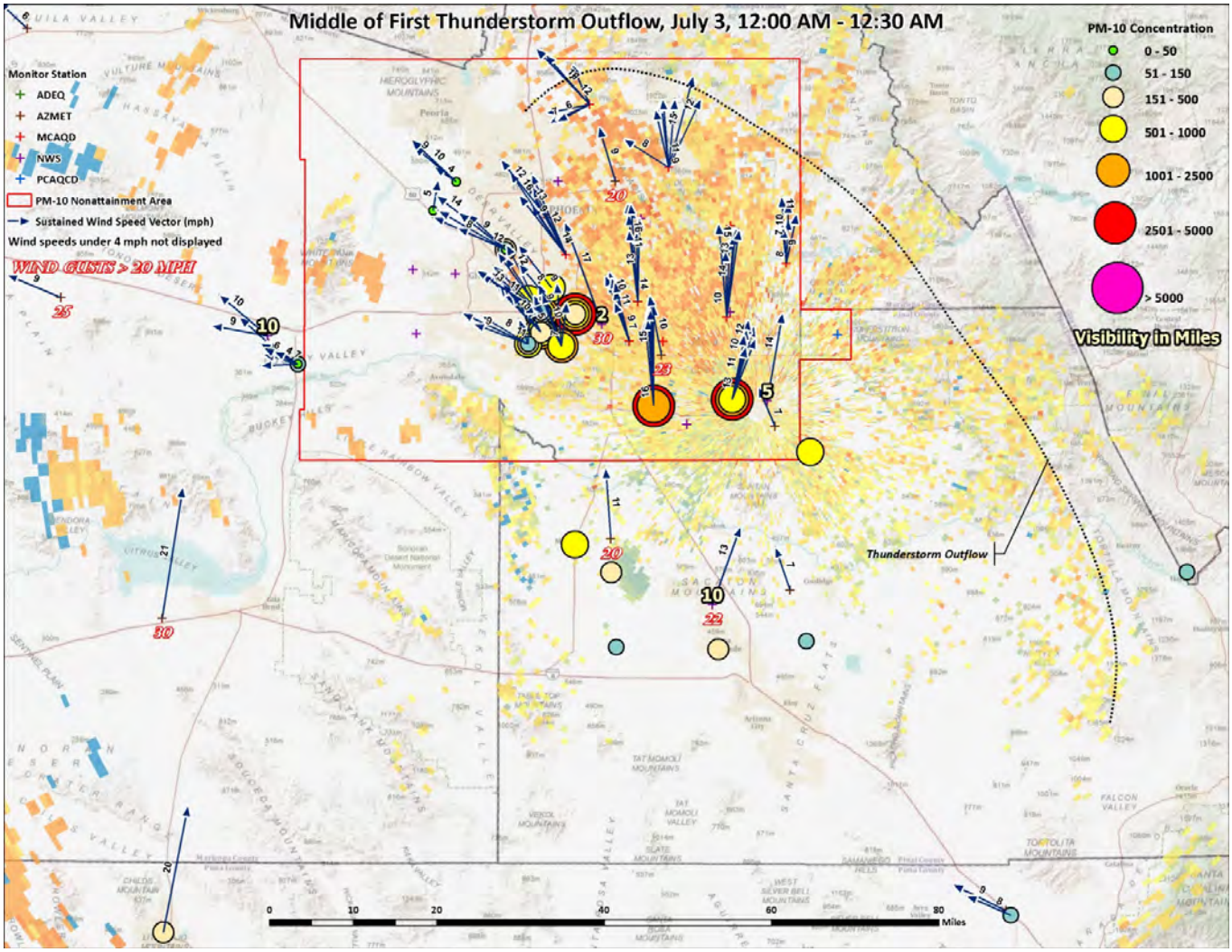


Figure 5-4. Middle of First Thunderstorm Outflow (July 3, 12:00–12:30 AM).

By 12:15 AM, the heart of the dust storm has reached most of the Maricopa County monitors with the exception of Buckeye. Buckeye will not see the effects of the dust storm until approximately 3 AM, when lingering dust in the atmosphere will slowly fall out under light winds in the western portion of Maricopa County. Visibility at Sky Harbor airport in Phoenix has been reduced to 2 miles. The eastern monitors of West Chandler and Higley are still peaking in PM10 concentrations at this time, but the southern Pinal County monitors have started to return to pre-storm levels. The thunderstorm outflow is still visible on radar, but it has been dispersed by its approach into central and western Maricopa County and can no longer advance further up the eastern mountain ranges of Maricopa and Pinal County.

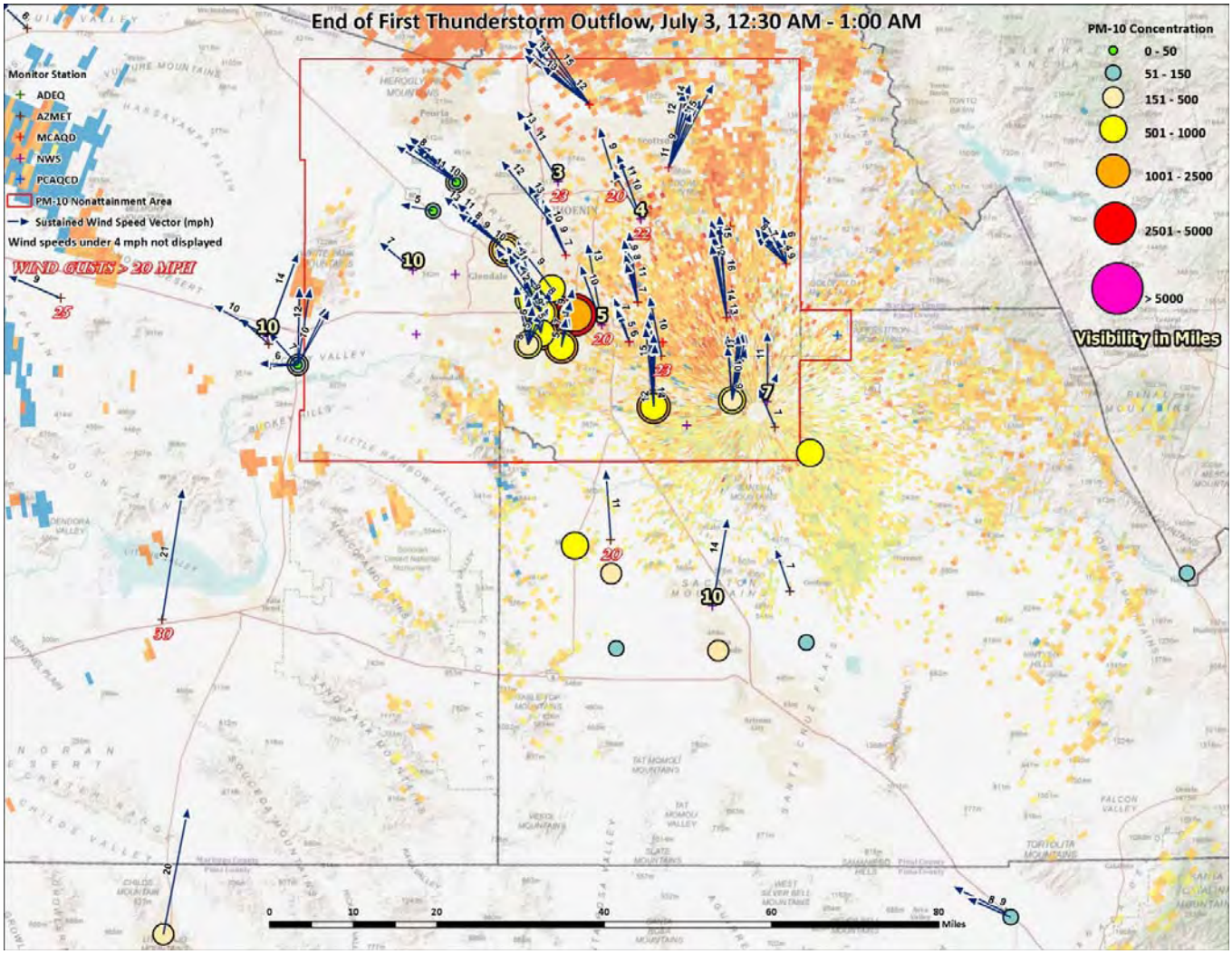


Figure 5-5. End of First Thunderstorm Outflow (July 3, 12:30–1:00 AM).

PM10 concentrations at the southeast valley monitors begin their decline as the bulk of the dust wall from the thunderstorm outflow has moved farther north. The central Phoenix monitors continue to experience high concentrations during this period, but decline is occurring here as well. The outflow is no longer readily identifiable on radar. The winds are still strongly from the south-southeast, pushing the dust wall into the northern portions of the nonattainment area. Visibility is low at both Sky Harbor and Scottsdale airports. The dust is moving at about 10 mph and has just begun to reach the northern most monitor of Zuni Hills. Concentrations have also increased somewhat at the westernmost Buckeye monitor from the thunderstorm outflow. It also appears a smaller, separate thunderstorm outflow has occurred south-southwest of the Buckeye monitor, as elevated winds in that direction are noticeable.

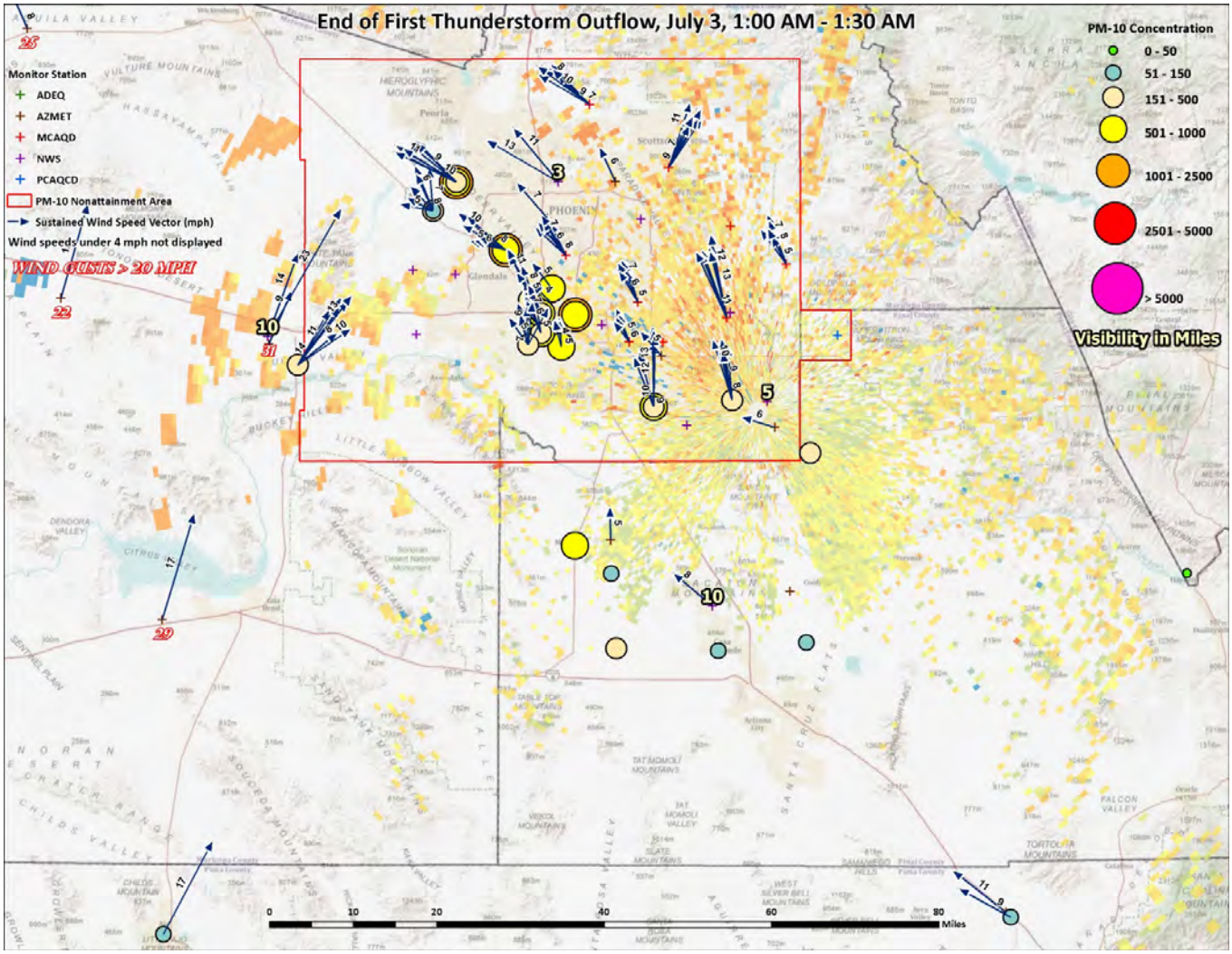


Figure 5-6. End of First Thunderstorm Outflow (July 3, 1:00–1:30 AM).

The dust wall continues to move slowly north and west during this period. Concentrations are declining from their peaks at the central Phoenix monitors, while the northern Zuni Hills monitor records increasing concentrations from the dust wall. Visibility is still poor throughout the valley, with the northern Deer Valley airport reporting 3 miles and the eastern Williams Gateway airport reporting 5 miles. The south-southwest winds from the smaller outflow continue to steadily blow through the 2 AM hour. These winds help to keep the dust from the original, larger outflow located within the PM10 nonattainment area and set up conditions for a slow deposition of PM10 in the west valley during the low wind period of the early morning. This slow fallout of PM10 is captured by the Buckeye monitor and is shown in the next series of maps.

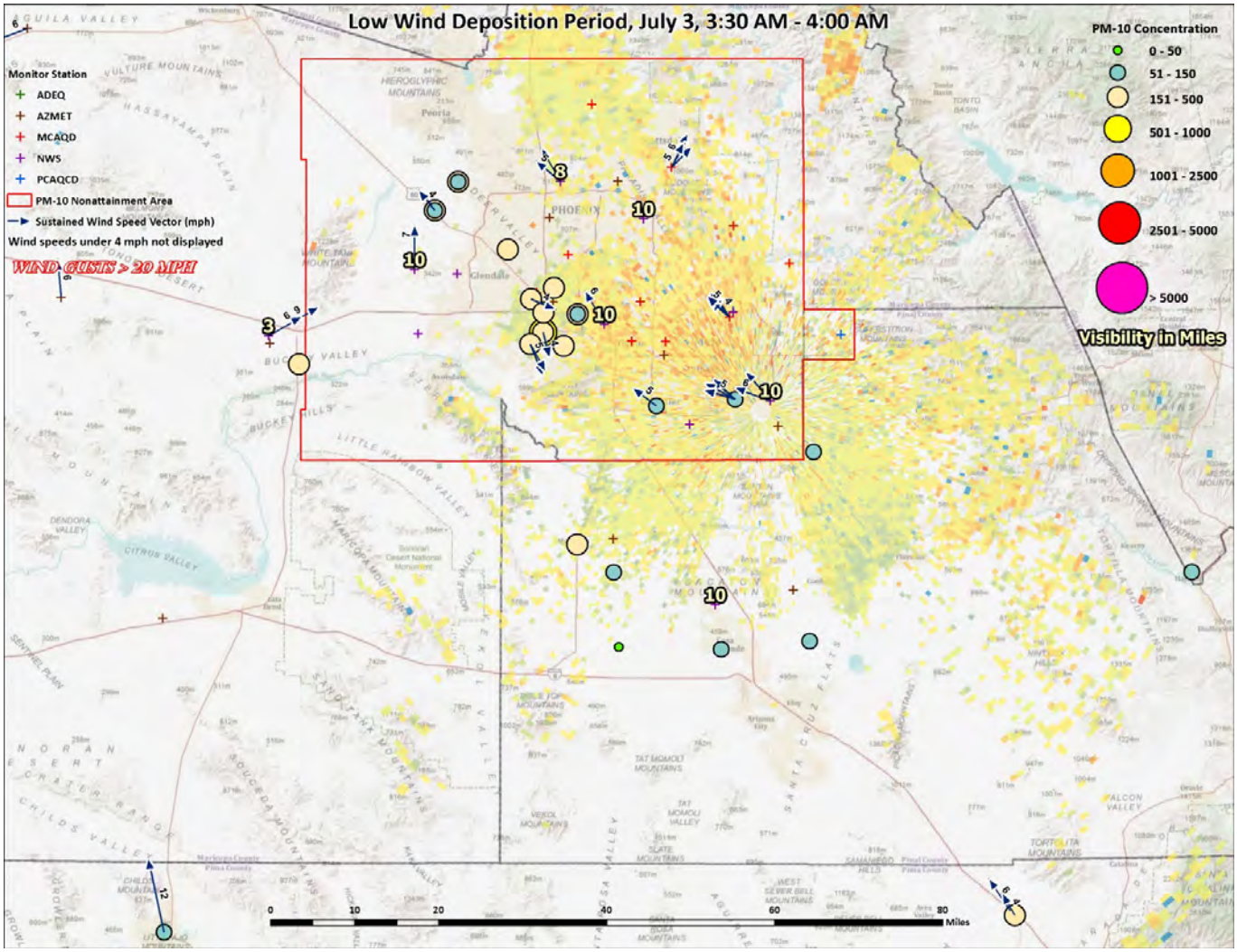


Figure 5-7. Low Wind Deposition Period (July 3, 3:30–4:00 AM).

Through the hours of 3:00 AM to 11:00 AM, dust from the large thunderstorm outflow slowly begins to deposit out in the western portion of the Phoenix PM10 nonattainment area. Most of the nonattainment area will have sustained winds under 4 mph during this period, keeping the dust from the original outflow from leaving the nonattainment area. Signs of decreased visibility are noticed at the Buckeye monitor at this time with a recorded distance of 3 miles. At the start of this period, PM10 concentrations are similar at the central Phoenix and western Buckeye monitors. As the day progresses, the dust will slowly fall out in the areas around the Buckeye monitor, causing the Buckeye monitor to record the highest concentrations during this period. Concentrations will remain elevated at the central Phoenix monitors during this period as well, with only the southeastern monitors returning to pre-storm levels.

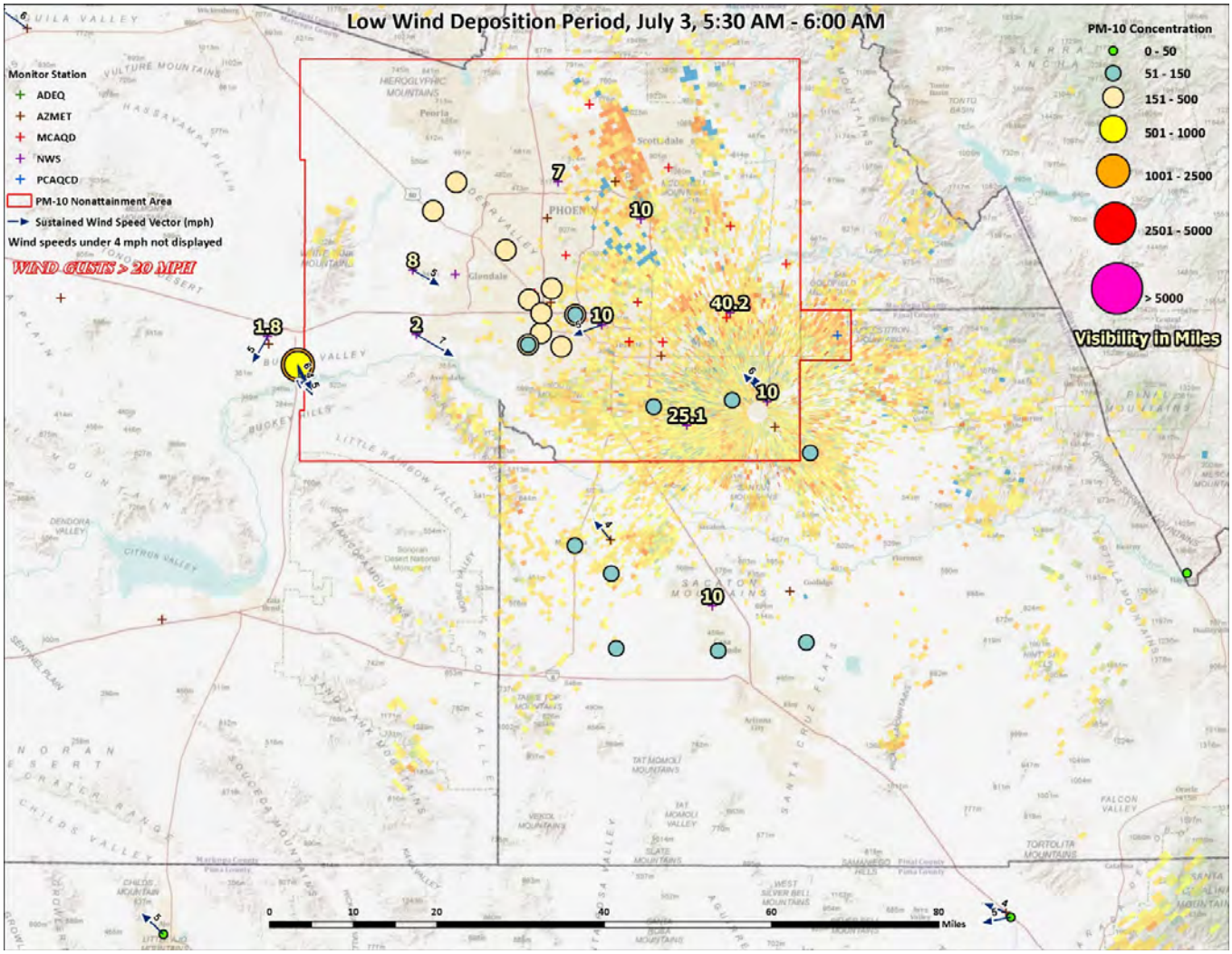


Figure 5-8. Low Wind Deposition Period (July 3, 5:30–6:00 AM).

By 5:30 AM, the Buckeye monitor is recording significantly higher deposition rates than the central Phoenix monitors. Wind speeds throughout the valley are still low and will not increase for a few more hours. Visibility is severely hampered at both the Buckeye and Goodyear airports which report values of 1.8 and 2 miles, respectively. Concentrations at the central Phoenix monitors remain elevated; however most of the deposition is occurring west of these monitors. Base velocity radar is showing almost no activity in the west valley, allowing for a slow, steady deposition rate to occur.

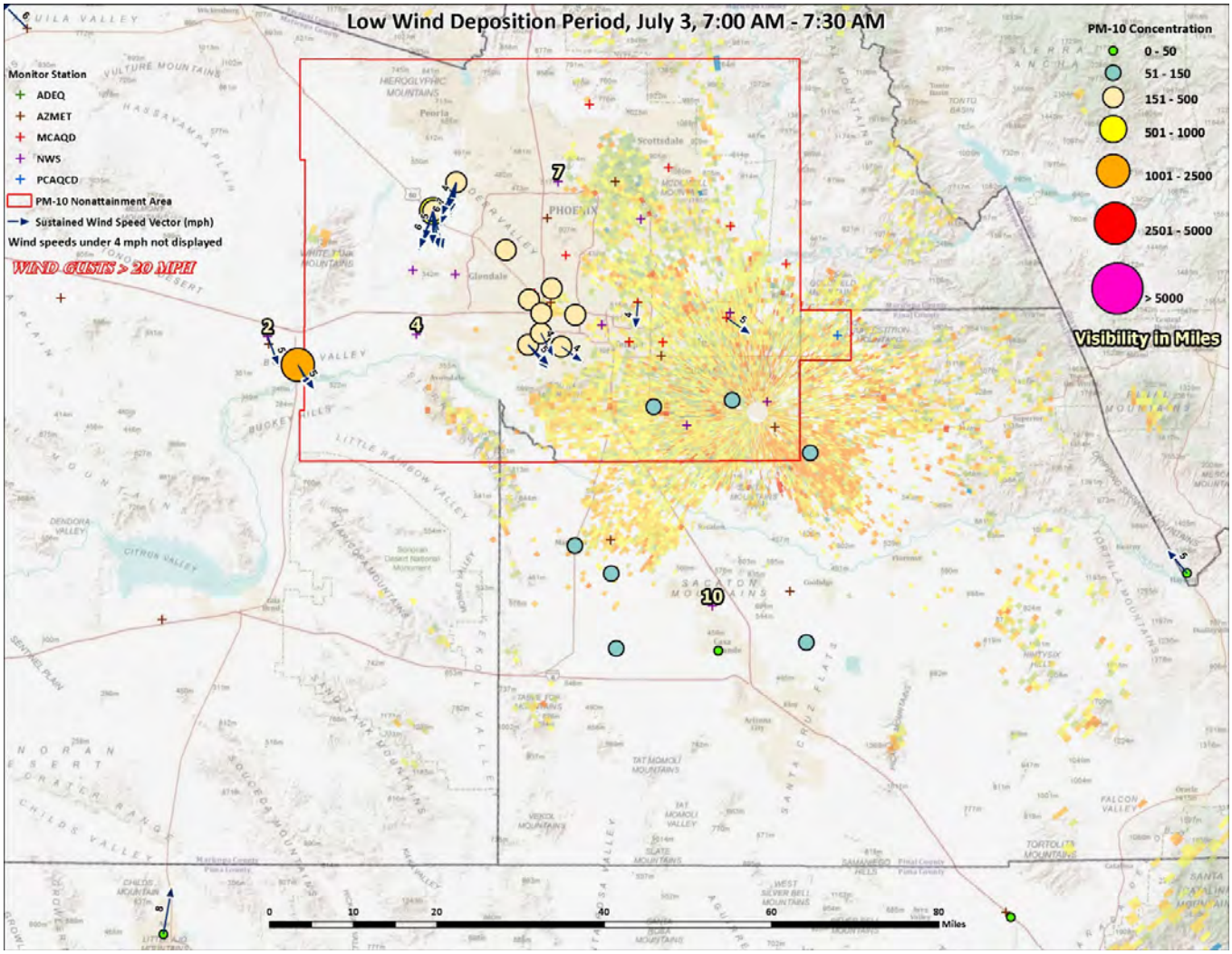


Figure 5-9. Low Wind Deposition Period (July 3, 7:00–7:30 AM).

At approximately 7:30 AM, moderate to low winds from the north push some of the fallout closer to the Zuni Hills monitor, which records increasing concentration levels. The Buckeye monitor is still recording high concentrations as fallout in this low-lying area continues. Visibility is poor throughout the west valley, ranging from 2 to 7 miles. The central Phoenix monitors also remain elevated, unable to return to pre-storm levels as a steady deposition from the earlier thunderstorm outflow (now over 6 hours ago) progresses. Re-entrainment of the dust is likely occurring at this time as well, as vehicles drive over dust deposited from the late evening dust storm.

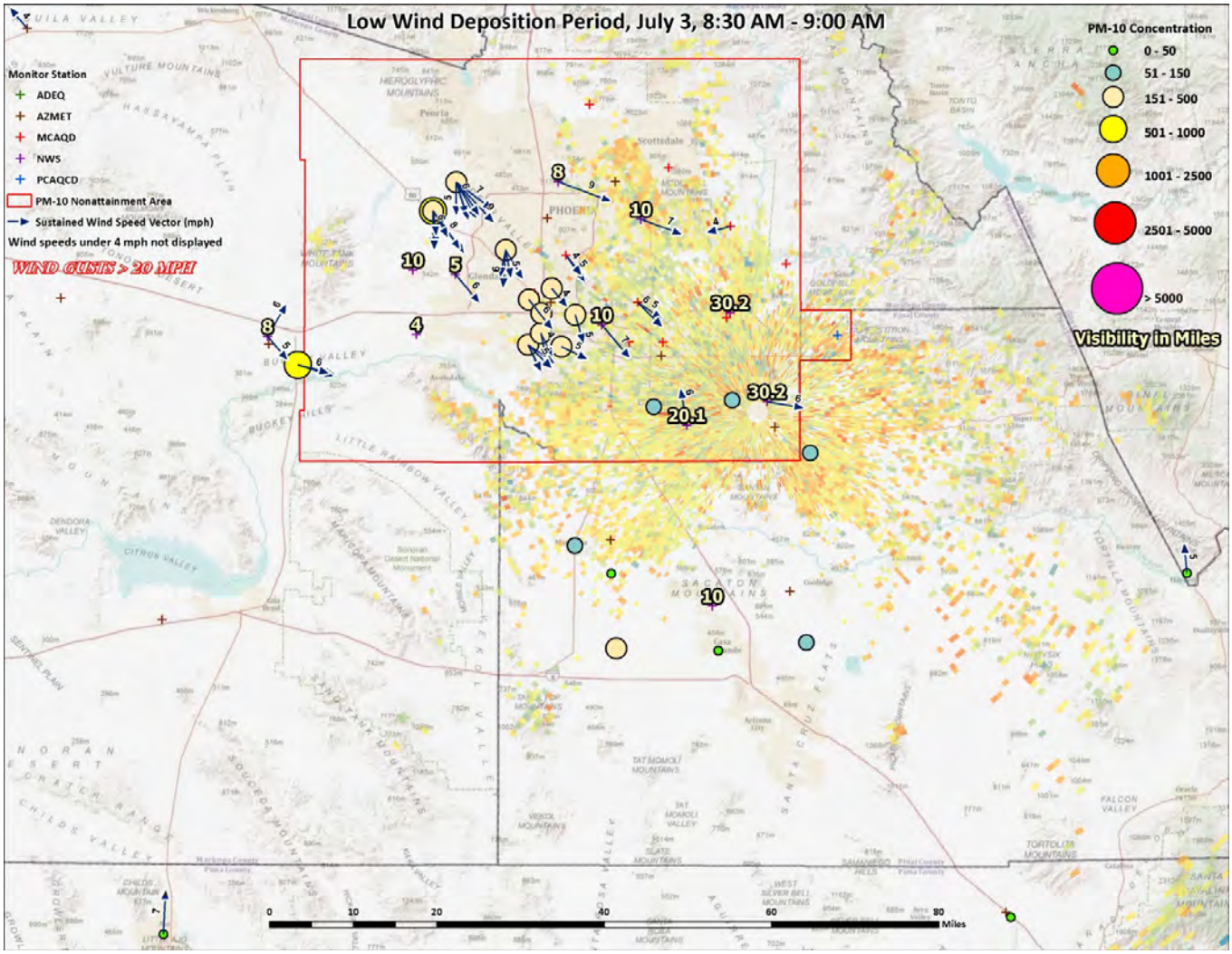


Figure 5-10. Low Wind Deposition Period (July 3, 8:30–9:00 AM).

Beginning at approximately 8:30 AM, light to moderate winds help to disperse the some of the PM10 from the air, as concentrations at the Buckeye and central Phoenix monitors will steadily decline until the arrival of the next large thunderstorm outflow at approximately 4:30 PM. Visibility will begin to improve in the west valley with the arrival of moderate winds, but currently visibility remains impaired with readings in the range of 4 to 8 miles. Fallout from the previous night's storm will continue into the late morning and early afternoon, as mixed winds push the remaining suspended PM10 throughout the Phoenix PM10 nonattainment area.

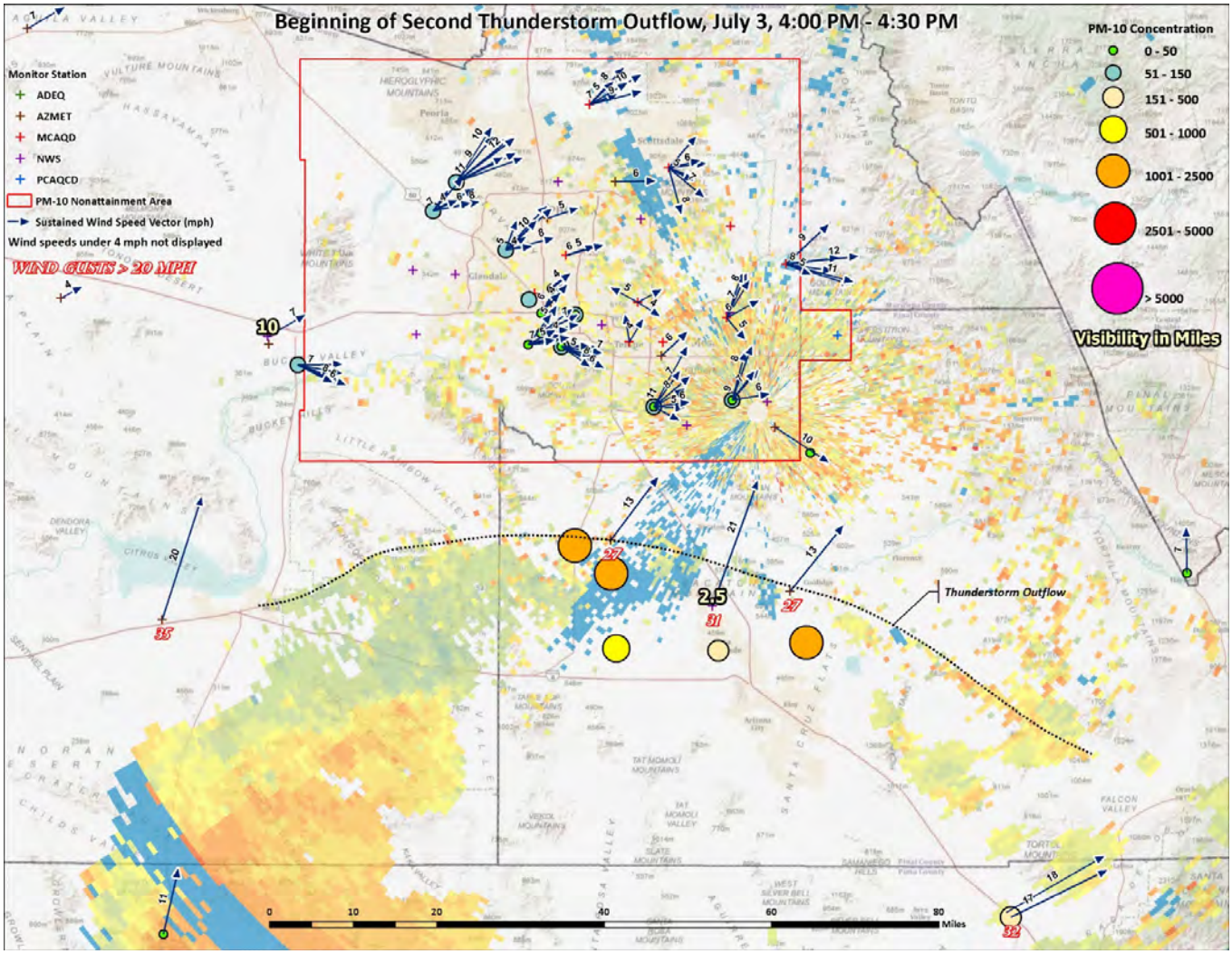


Figure 5-11. Beginning of Second Thunderstorm Outflow (July 3, 4:00–4:30 PM).

A second large thunderstorm outflow originated in the same general area as the first the night before; in the open deserts near the common borders of Maricopa, Pinal and Pima counties. Pinal County monitors began recording very elevated concentrations around 4:00 PM, with visibility at the Casa Grande airport reduced to 2.5 miles. Base velocity radar indicated high winds throughout southern Maricopa and Pinal counties. A defined outflow boundary begins to take shape on the radar and is highlighted in the map above. Wind speeds are higher for this outflow than the July 2nd outflow and the direction of the winds are from the west-southwest, as opposed to from the south-southeast of the early outflow.

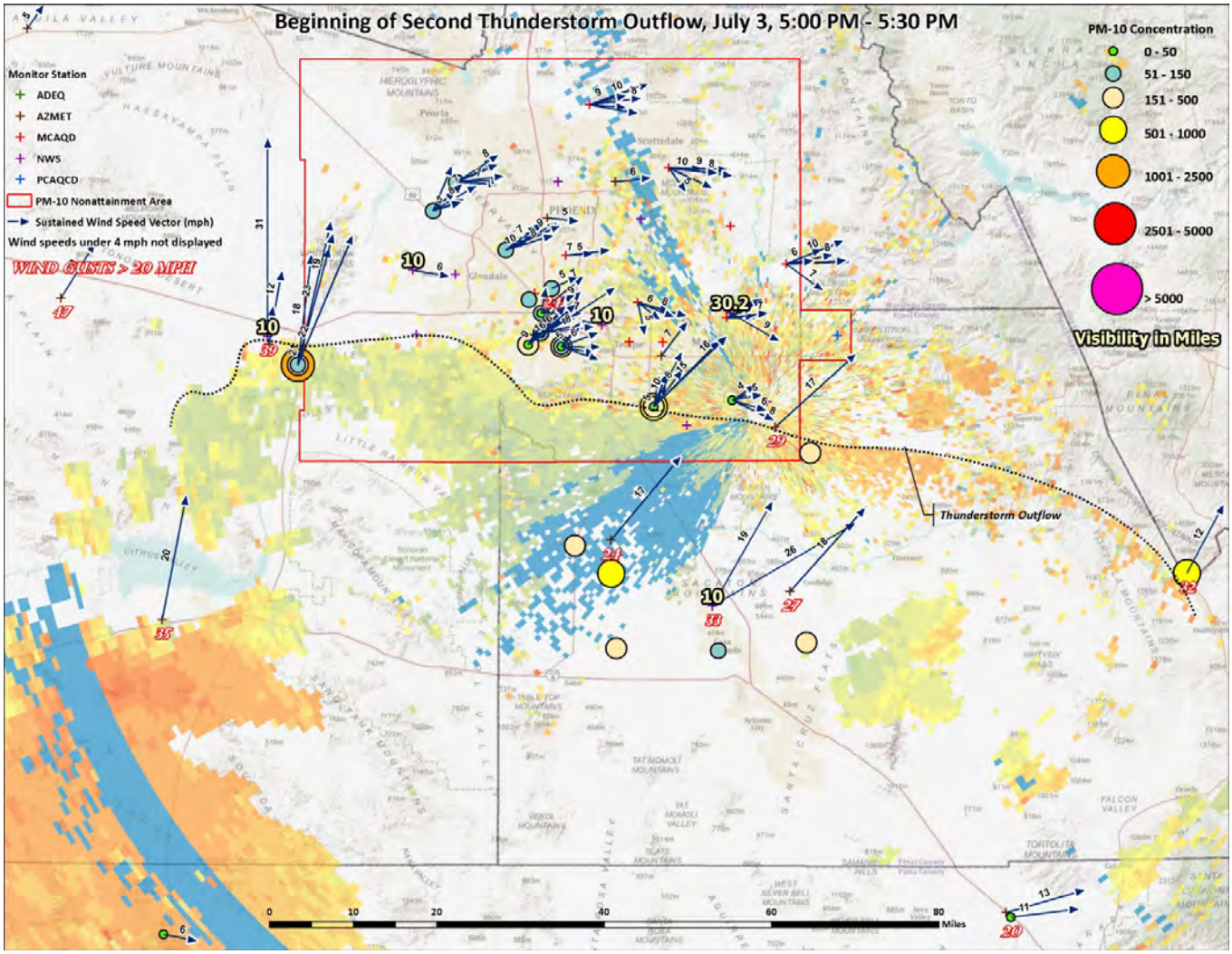


Figure 5-12. Beginning of Second Thunderstorm Outflow (July 3, 5:00–5:30 PM).

By 5:15 PM, the extremely large outflow has reached the western and southern borders of the Phoenix PM10 nonattainment area. The signature of the outflow is visible on radar and is approximately 120 miles long. The storm at this time is simultaneously raising PM10 concentrations at the Buckeye monitor in western Maricopa County all the way to the eastern Pinal County Old Hayden Jail monitor which are over 100 miles apart. The winds from the outflow have begun to blow more from the west than from the south and will continue to do so as the storm passes over the nonattainment area. Additionally, at this time a large thunderstorm outflow from the north is making its way down to Maricopa County. The two thunderstorm outflows will converge in the next few hours.

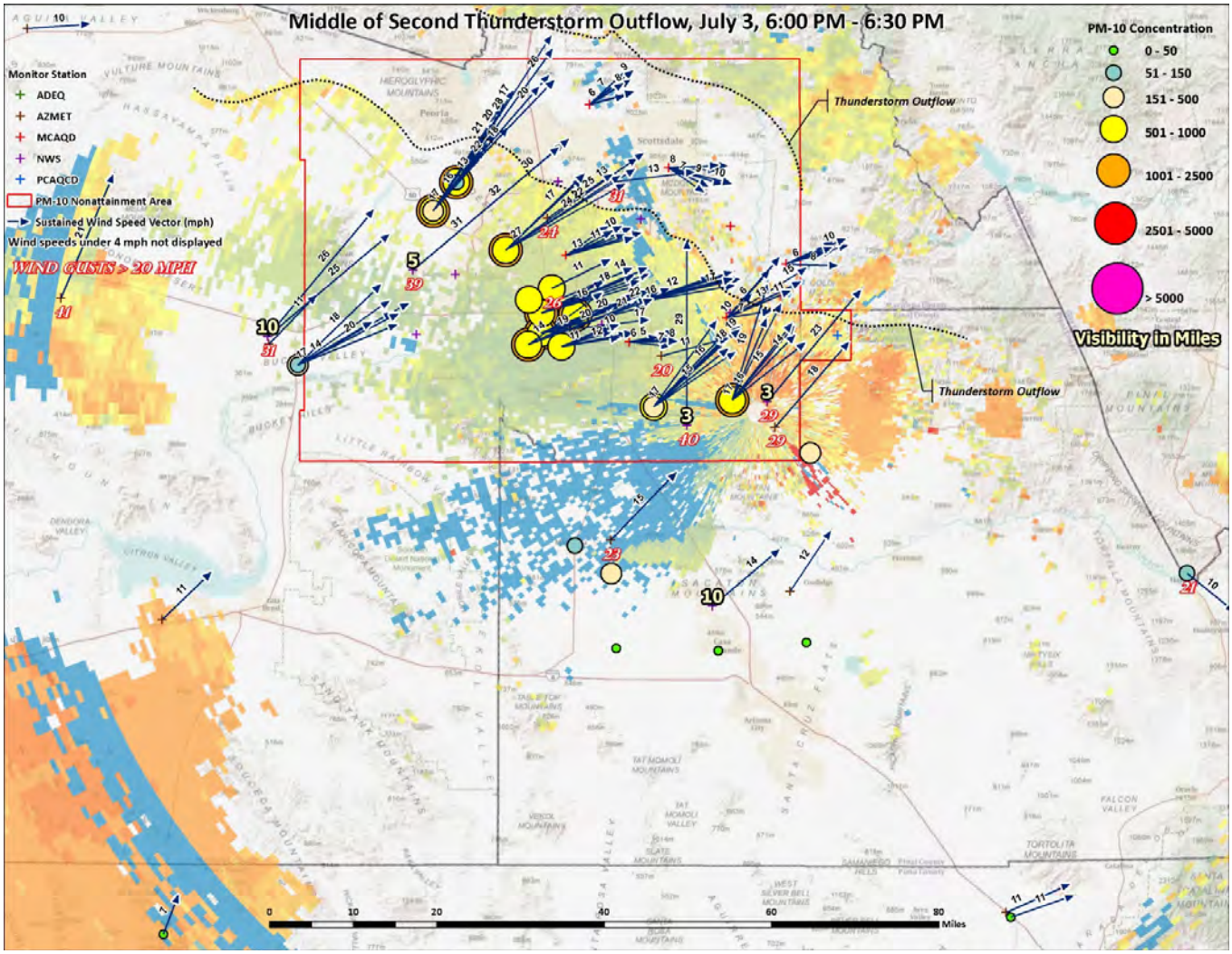


Figure 5-13. Middle of Second Thunderstorm Outflow (July 3, 6:00–6:30 PM).

Sustained winds over 30 mph pushed the thunderstorm outflow through the center of the nonattainment area by 6:15 PM. The outflow boundary is still clearly visible on radar, along with an approaching outflow boundary from the north. All Maricopa county continuous PM10 monitors have recorded high concentrations as the dust wall moves through. Visibility is low throughout the eastern and central portions of the nonattainment areas, with recorded values between 3 and 5 miles. Because this storm has more wind energy associated with it than the earlier storm on July 2, the PM10 concentrations decrease quicker as the dust wall moves rapidly through the area. This leaves less dust to be deposited after the storm moves through. Already, the southern Pinal County monitors have returned to pre-storm levels, along with the Buckeye monitor in western Maricopa County quickly returning to normal concentrations.

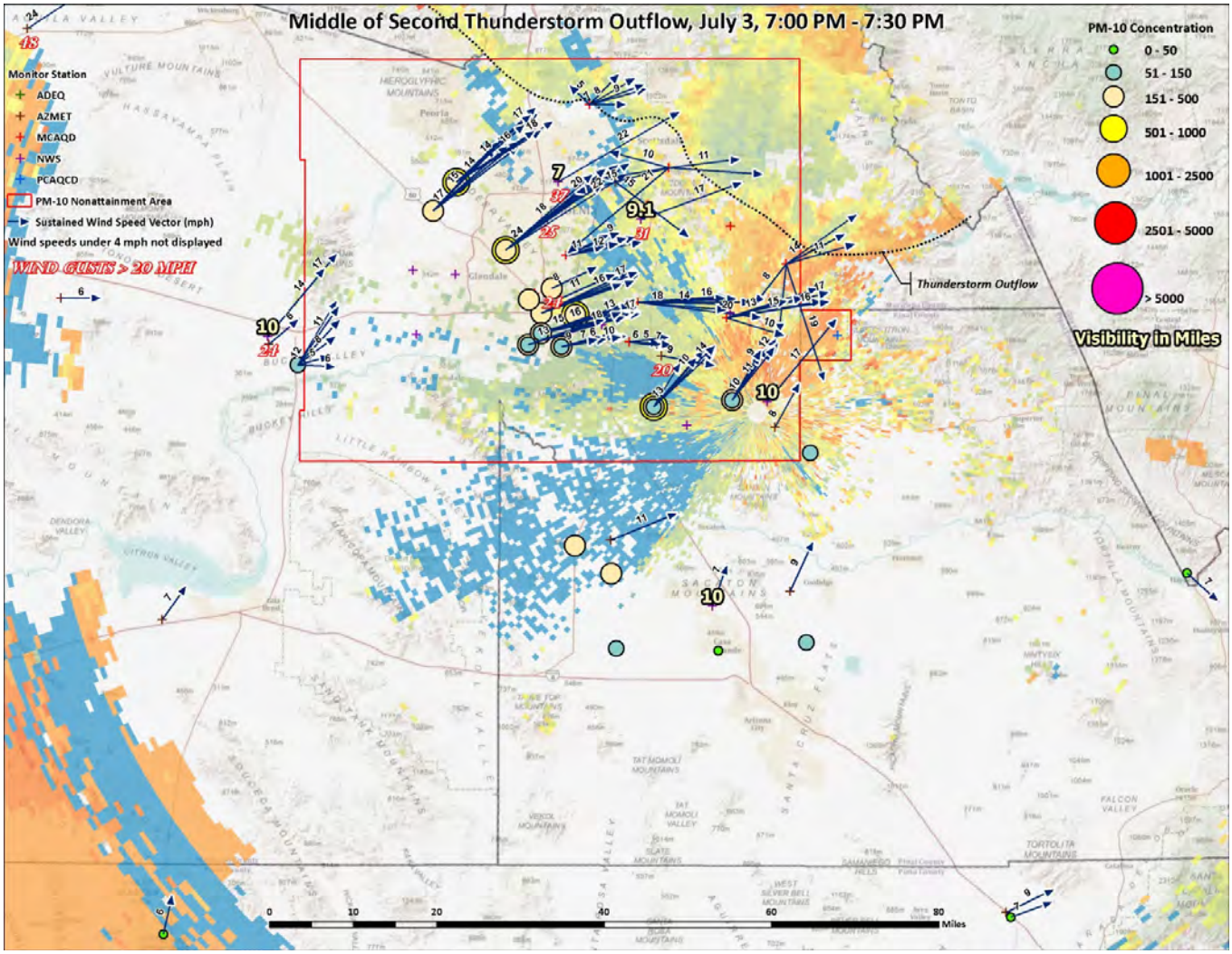


Figure 5-14. Middle of Second Thunderstorm Outflow (July 3, 7:00–7:30 PM).

The thunderstorm outflow from the west-southwest and the north merge at approximately 7 pm. Winds are still strong throughout the Phoenix PM10 nonattainment area, but begin a shift to blowing south, as the second outflow pushes into the valley. Concentrations are still elevated but are declining rapidly as the elevated winds continue to push the dust out of the nonattainment areas and away from the monitors.

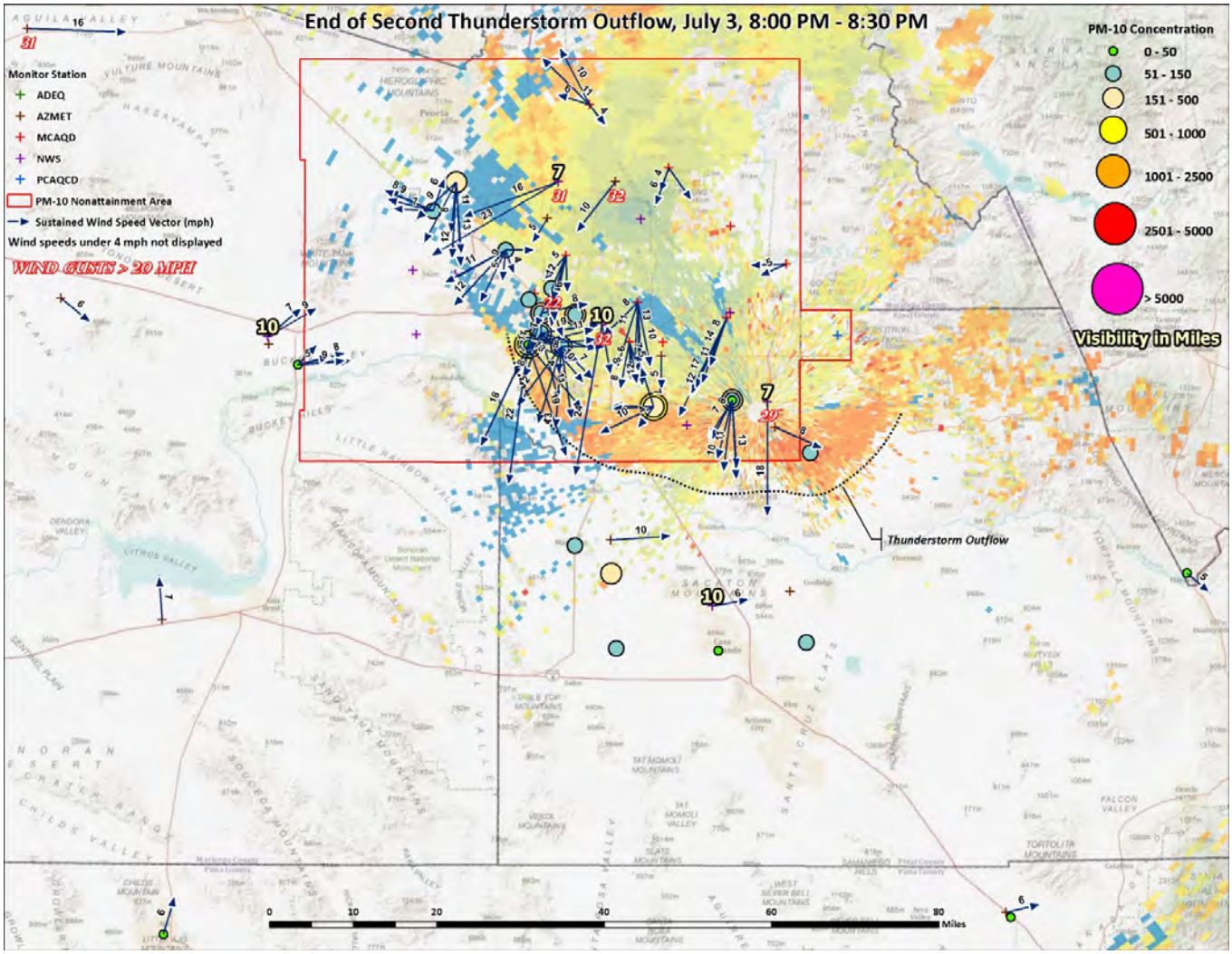


Figure 5-15. End of Second Thunderstorm Outflow (July 3, 8:00–8:30 PM).

The northern thunderstorm outflow now determines the wind direction in the Phoenix PM10 nonattainment area. This pushes some of the previous dust from the southwestern thunderstorm back across the monitors, keeping concentrations in central Phoenix and the southeast monitors relatively high. By 9:30 PM, almost all of the Maricopa County monitors will have concentrations below 150, and by 10:30 PM, concentrations at these monitors will return to pre-storm levels.

Monday, July 4

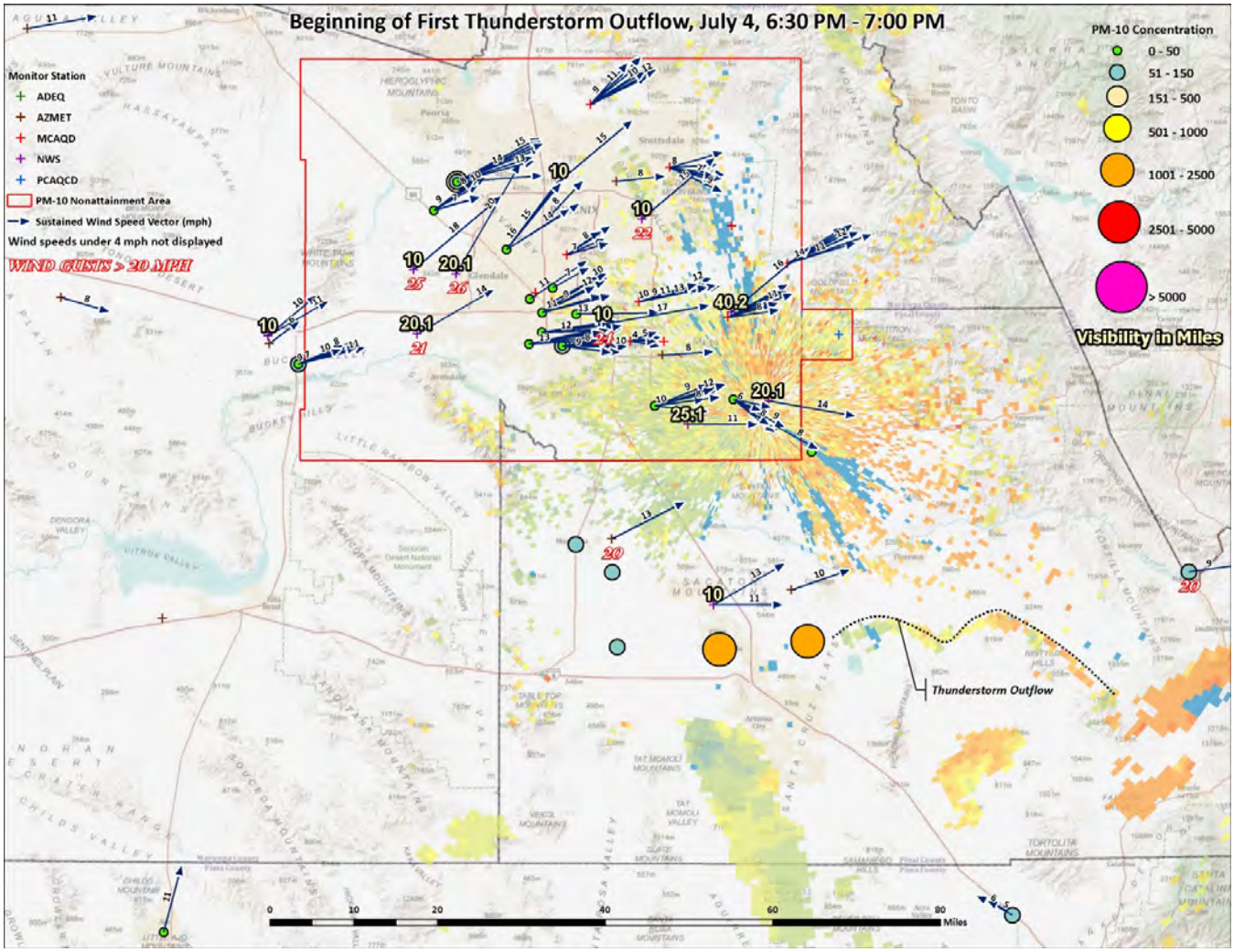


Figure 5-16. Beginning of First Thunderstorm Outflow (July 4, 6:30–7:00 PM).

The elevated PM10 concentrations on July 4, 2011, and the exceedance at the southeast Higley monitor were caused by 2 thunderstorm outflows. The first outflow began between 5 and 6 pm on July 4, 2011, originating in the open desert areas near the borders of Pinal and Pima counties. As indicated in the map above, by 6:30 PM, southeastern Pinal County monitors were affected by the leading edge of the thunderstorm outflow, which is visible on base velocity radar. Throughout most of Maricopa and Pinal counties, strong westerly winds dominated the airflow patterns. This strong airflow will help to keep the north-moving thunderstorm outflow isolated to the eastern portions of Maricopa County and limit the ability of the outflow to gain strength as it enters Maricopa County from the south.

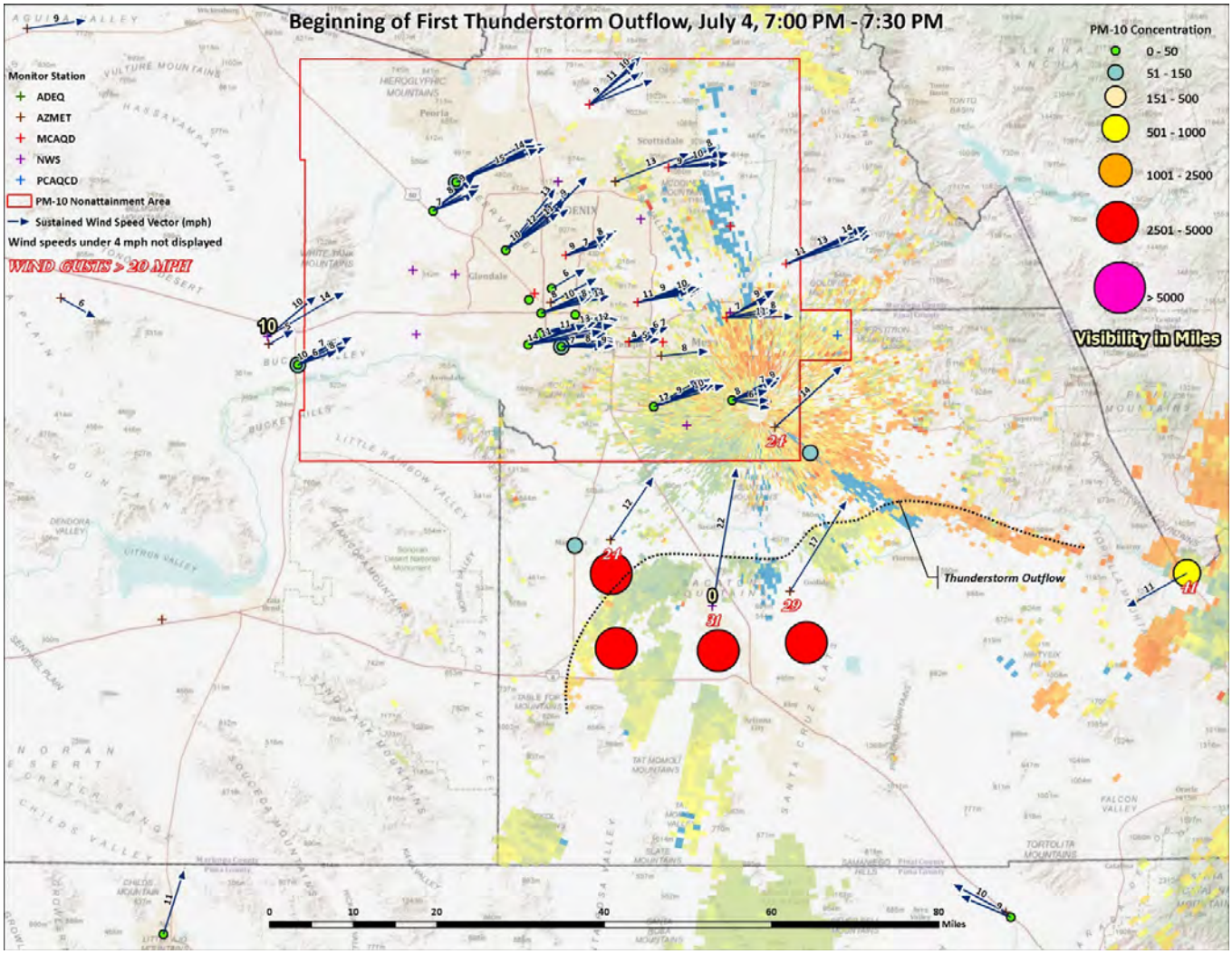


Figure 5-17. Beginning of First Thunderstorm Outflow (July 4, 7:00–7:30 PM).

Between 7:00 and 7:30 pm, the thunderstorm outflow has moved north several miles and produced high levels of PM10 at four Pinal County monitors. Visibility at the Casa Grande airport is extremely low and reported to be zero miles. Strong winds from the west prevent the thunderstorm front from expanding westward and focusing the energy of the outflow to the north. The outflow is nearing the southeastern border of Maricopa County at this point but has not reached it.

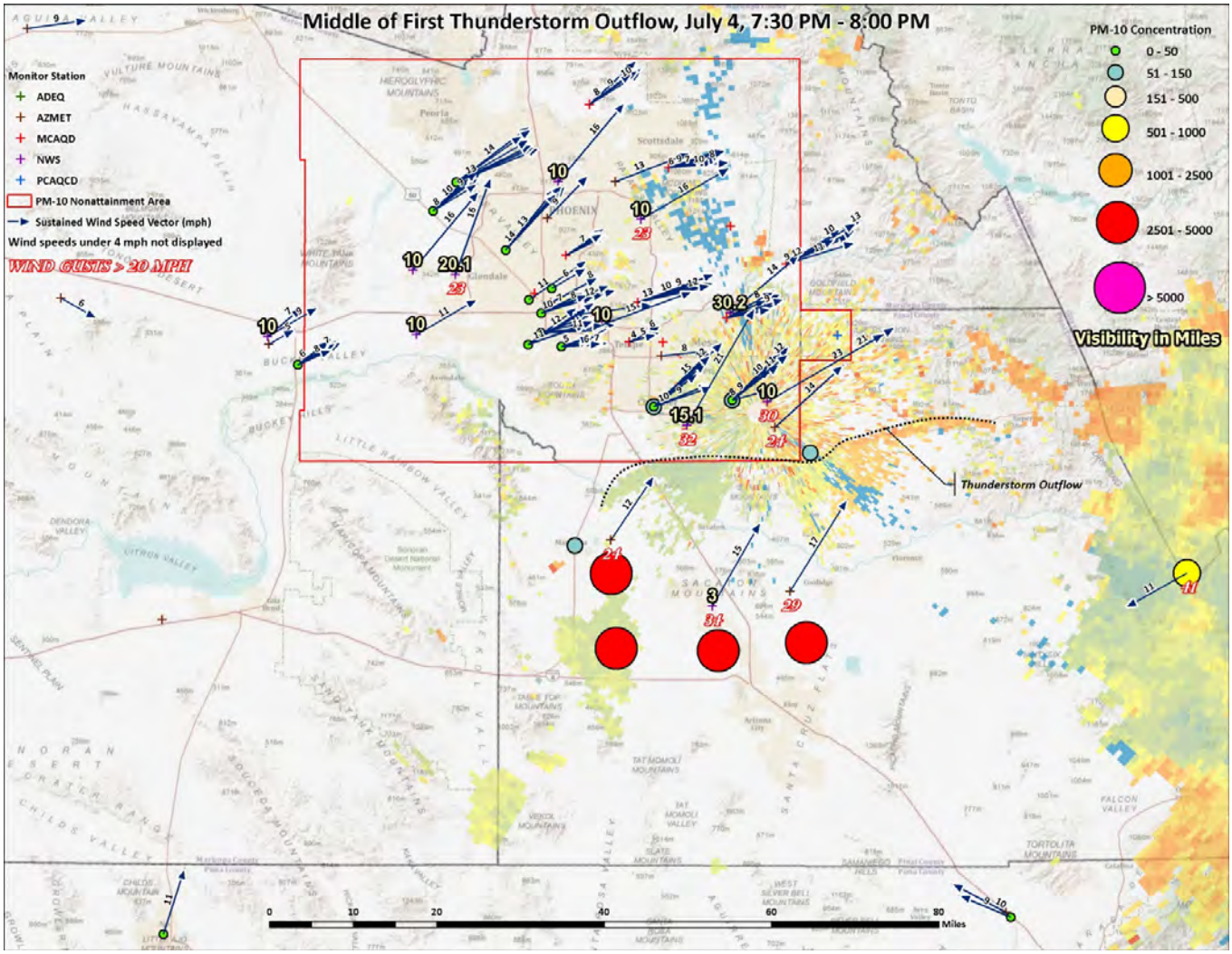


Figure 5-18. Middle of First Thunderstorm Outflow (July 4, 7:30–8:00 PM).

At approximately 7:45 PM, the outflow has reached the southeastern border of Maricopa County. However, the outflow is beginning to weaken at this point as it battles strong westerly winds, evidenced by a smaller outflow signature on base velocity radar. As the outflow approaches Maricopa County, it is still strong enough to affect the dominant westerly winds by deflecting them northward somewhat. PM10 concentrations are still very high at Pinal County monitors, with visibility improving slightly to 3 miles, as the dust wall from the outflow moves north.

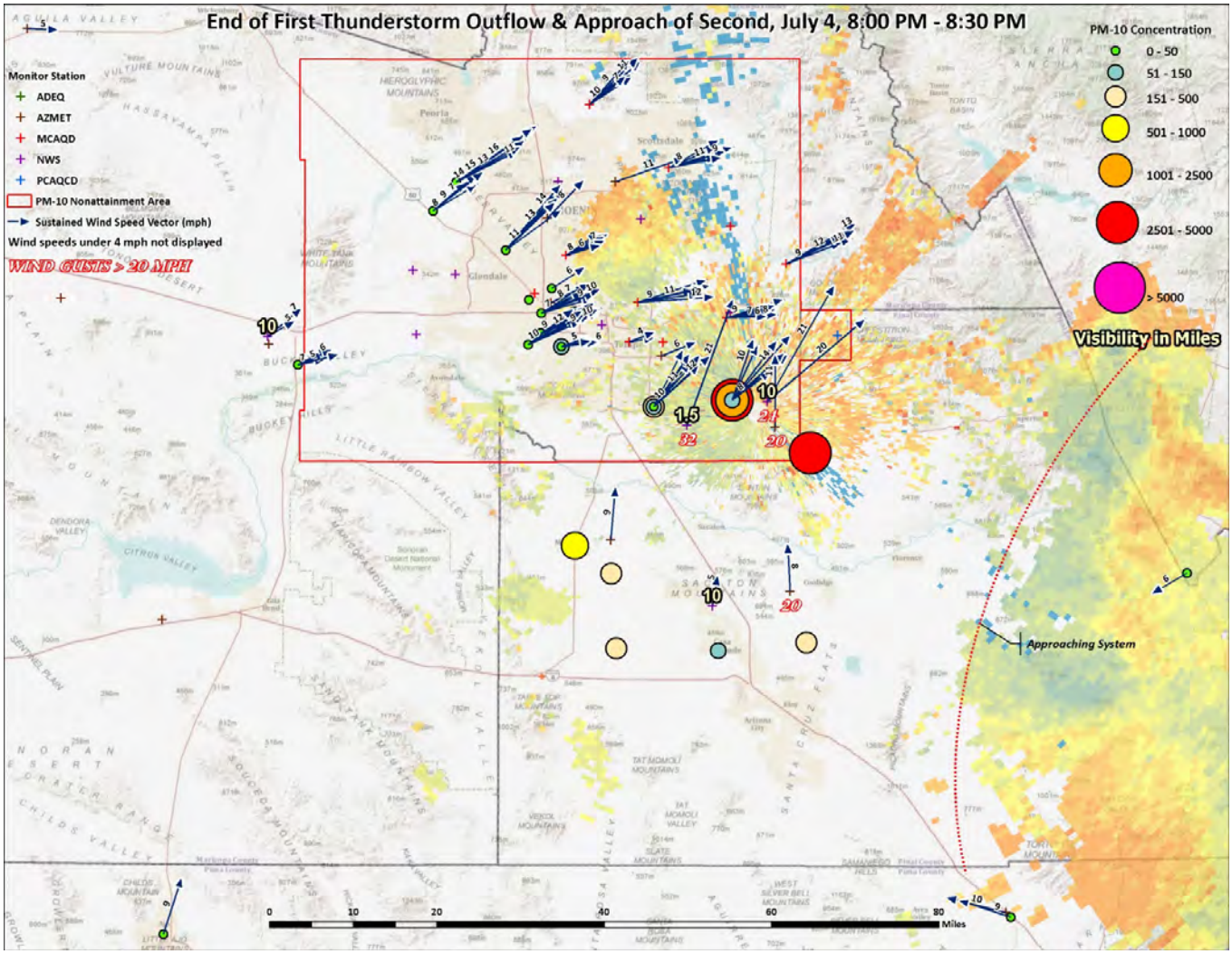


Figure 5-19. End of First Thunderstorm Outflow and Approach of Second (July 4, 8:00–8:30 PM).

By 8:30 pm, the dust wall from the thunderstorm outflow has reached the southeastern Higley and West Chandler Maricopa County monitors. The Pinal County Combs School monitor near the Maricopa County border is also recording high PM10 concentrations from the outflow. Visibility has been reduced to only 1.5 miles at the Chandler Airport. Winds near these affected monitors are from the south-southwest, with sustained speeds recorded up to 21 mph. Strong to moderate west-southwest winds in the rest of Maricopa County keep the dust wall from severely affecting the more northern and western Maricopa County monitors. A large approaching storm system from the east is clearly visible on base velocity radar and will push some of the dust from the original thunderstorm outflow west in the coming hours.

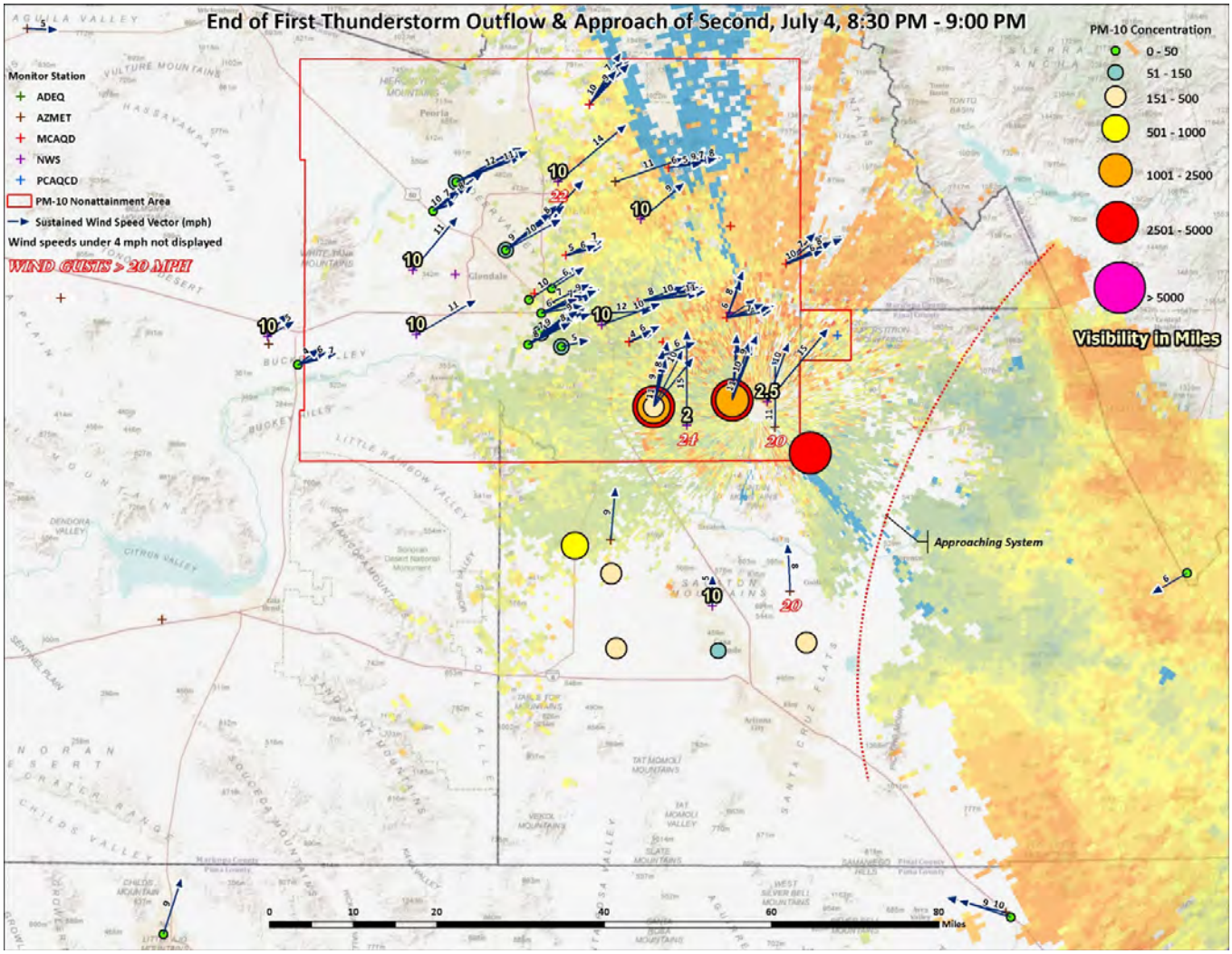


Figure 5-20. End of First Thunderstorm Outflow and Approach of Second (July 4, 8:30–9:00 PM).

At 9:00 pm, the full effect of the initial thunderstorm outflow is now seen at the southeastern Maricopa County monitors. Both the West Chandler and the Higley monitors record their highest concentrations during this period. Winds from the thunderstorm outflow have diminished by this point, with maximum sustained winds around 15 mph. This fact, coupled with the presence of moderate westerly winds throughout the rest of Maricopa County, keeps the dust from traveling much further into Maricopa County, causing only the West Chandler and Higley monitors to receive the brunt of the dust wall. Visibility is poor throughout southeastern Maricopa County with both Chandler and Williams Gateway airports reporting low visibility at 2 and 2.5 miles. This localized nature of the thunderstorm outflow will cause only the Higley monitor to exceed the PM10 standard in Maricopa County, along with 4 Pinal County monitors.

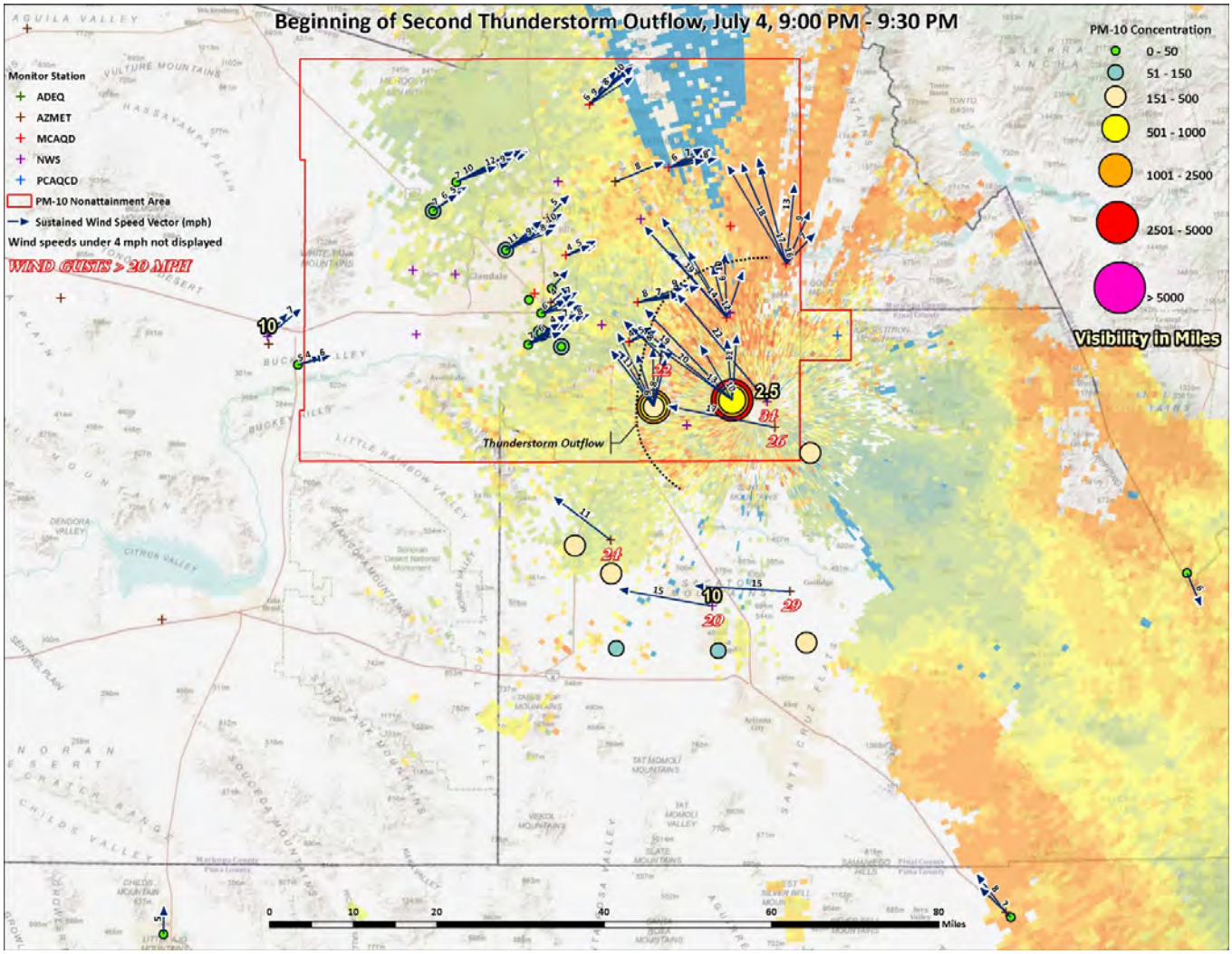


Figure 5-21. Beginning of Second Thunderstorm Outflow (July 4, 9:00–9:30 PM).

By 9:30 pm, the large storm system from the east has entered Maricopa County and begun to dominate the meteorological conditions. A large thunderstorm outflow from this system has originated in south-eastern Maricopa County and is producing the first signatures of the storm on base velocity radar. Sustained winds have increased to 22 mph and now come from the southeast. Dust from the original thunderstorm outflow is still present at the southeastern Maricopa County monitors, (visibility remains poor at the Williams Gateway airport at 2.5 miles) but will soon be pushed into the north and west of Maricopa County with the strong prevailing winds from the large, second thunderstorm outflow.

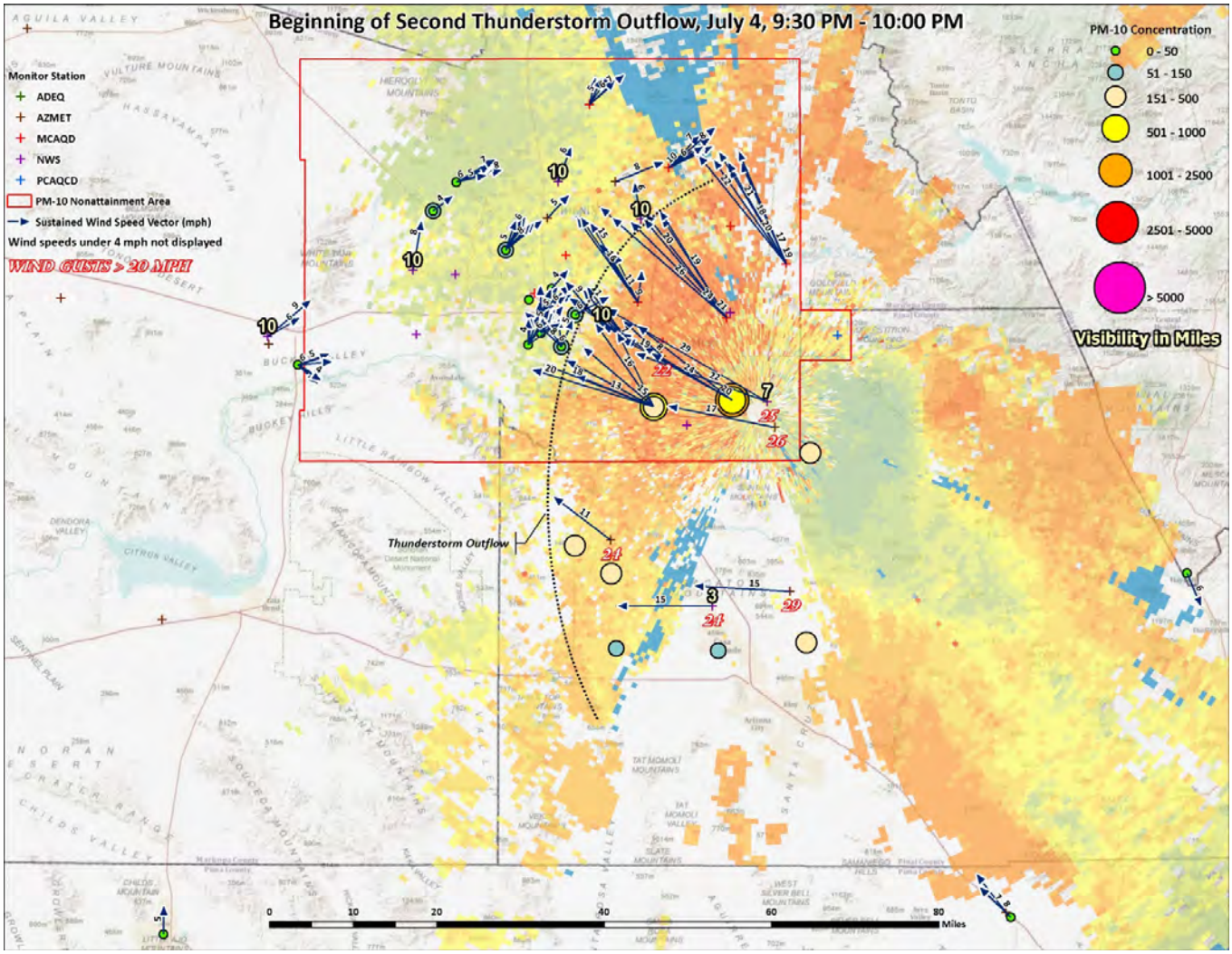


Figure 5-22. Beginning of Second Thunderstorm Outflow (July 4, 9:30–10:00 PM).

At 10:00 pm, Sustained winds from the second thunderstorm outflow increase in strength to 29 mph as the outflow moves north and west across Maricopa County. The strong winds have improved visibility at the Williams Gateway airport to 7 miles and have pushed the remaining dust from the original outflow west and north.

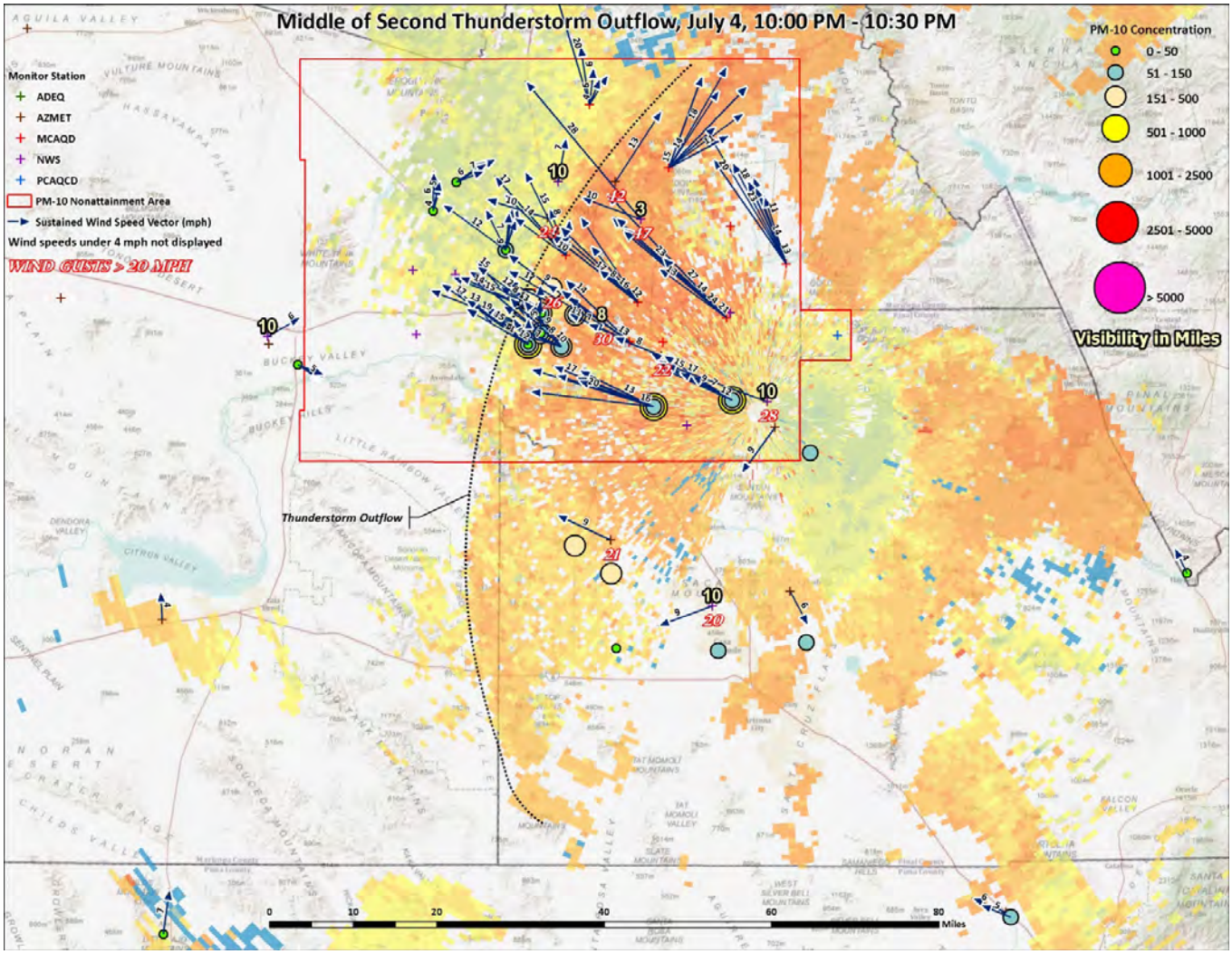


Figure 5-23. Middle of Second Thunderstorm Outflow (July 4, 10:00–10:30 PM).

By 10:30 pm, the central Phoenix monitors have been affected by the arrival of dust from the first thunderstorm outflow as it pushed north and west across Maricopa County. It is likely that the strength of the winds from the second thunderstorm outflow may produce pockets of localized windblown dust as well as transporting dust from the earlier outflow. Visibility has been reduced to 8 miles at Sky Harbor Airport and 3 miles at the more northern Deer Valley Airport. Concentrations have begun to decline at the southeastern Maricopa County monitors as the bulk of the remaining entrained dust has been blown out of the area.

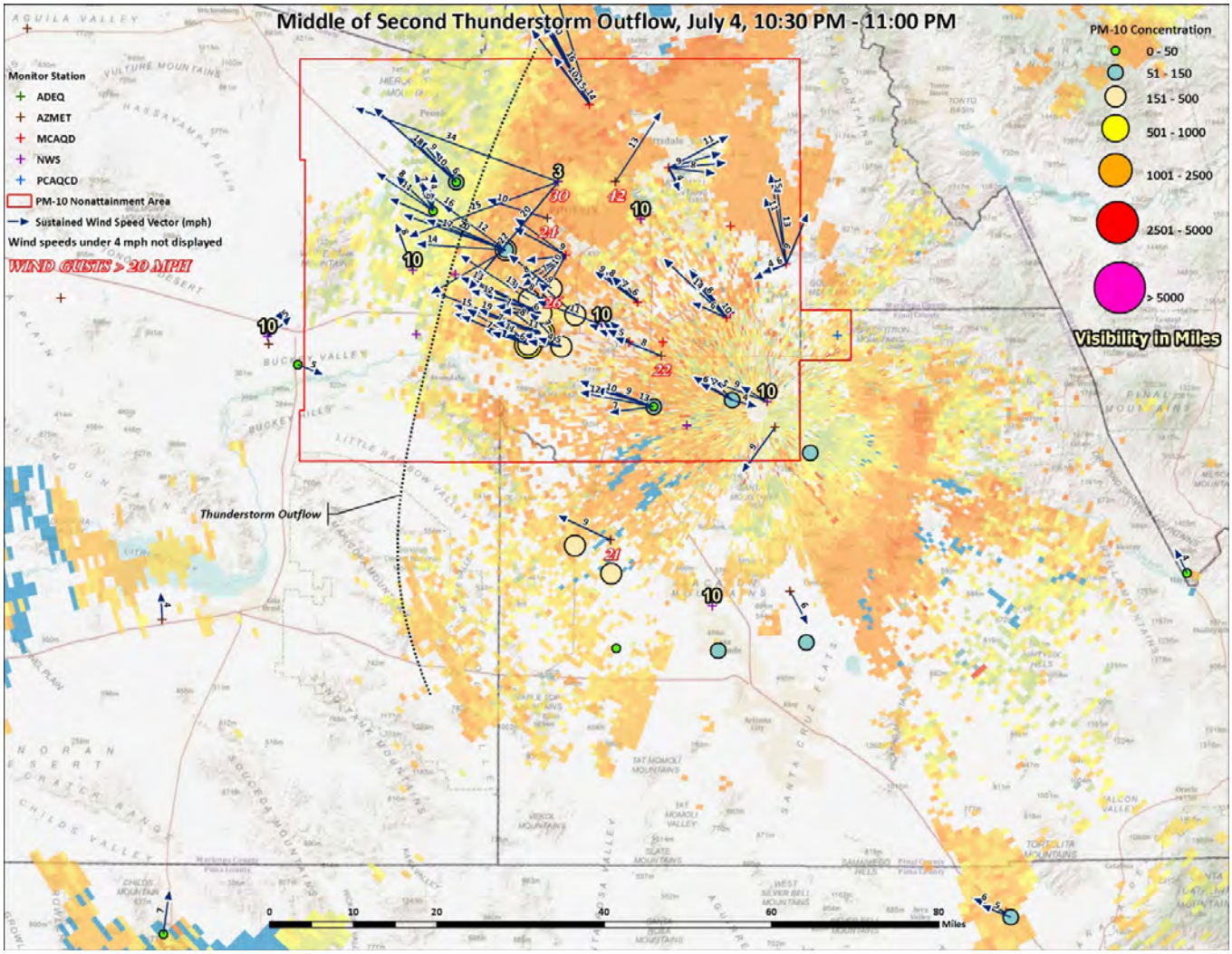


Figure 5-24. Middle of Second Thunderstorm Outflow (July 4, 10:30–11:00 PM).

The second thunderstorm outflow continues to push north and west into 11:00 pm with sustained winds up to 34 mph. Concentrations remain elevated at the central Phoenix monitors, but not at levels that will cause an exceedance, as the bulk of the original thunderstorm outflow dust remained in the southeast portion of Maricopa County. PM10 levels at the southeastern Maricopa County monitors have returned to pre-storm levels, along with pre-storm visibility levels in the area.

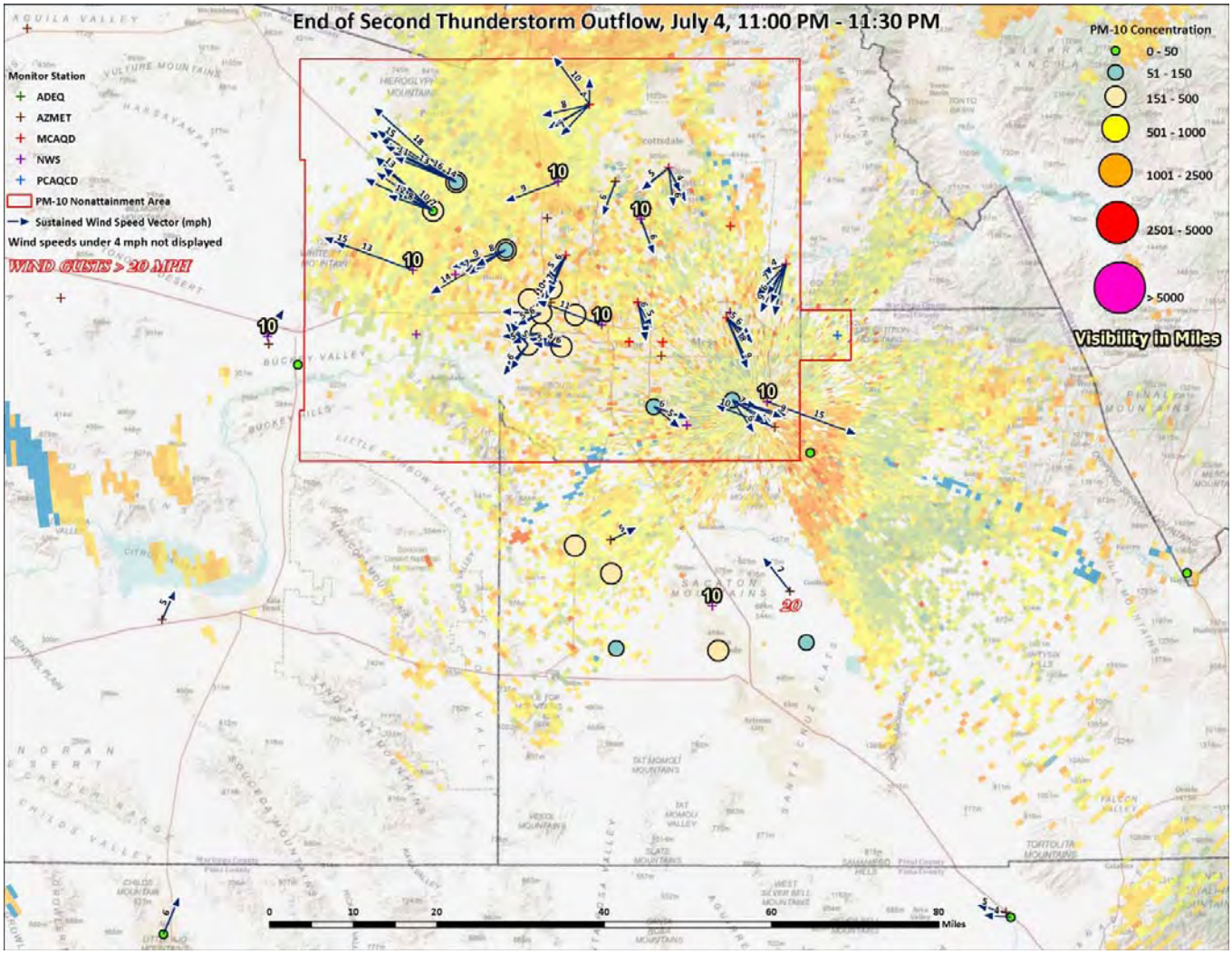


Figure 5-25. End of Second Thunderstorm Outflow (July 4, 11:00–11:30 PM).

By 11:30 pm, a distinct signature of the second thunderstorm outflow is no longer visible on base velocity radar. The outflow from that storm continues to push north and west as evidenced by the elevated winds and PM10 concentrations at the northern monitoring stations. Winds within the central and eastern portions of the nonattainment area are moderate and no longer influenced by the second outflow. Concentrations remain elevated at the central Phoenix monitors as dust from the outflows remains entrained.

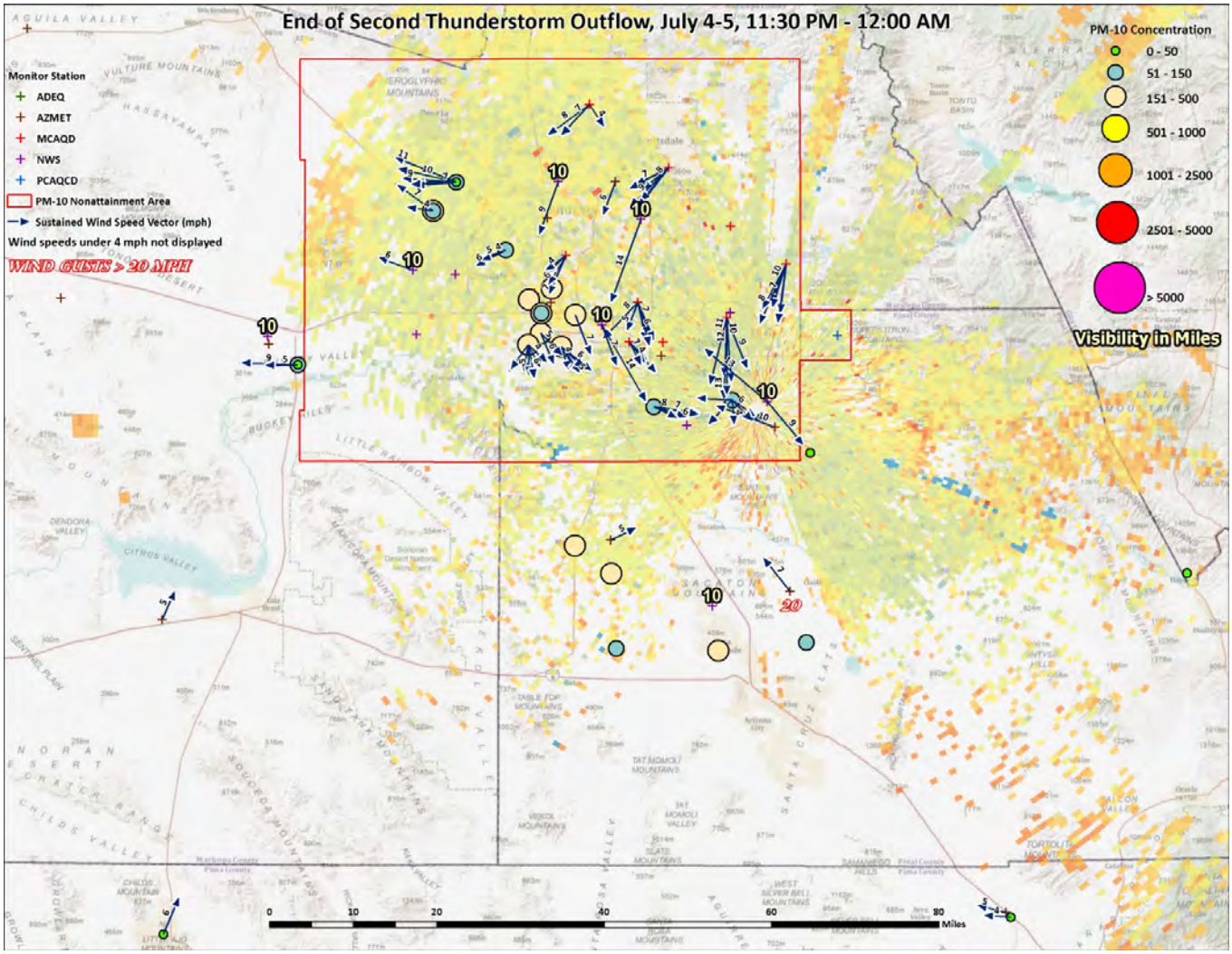


Figure 5-26. End of Second Thunderstorm Outflow (July 4, 11:30 PM–12:00 AM).

By 12:00 am on July 5, the winds within the nonattainment area are no longer associated with any thunderstorm outflows. Entrained dust from the July 4 outflows will remain in the atmosphere for a few more hours, and will swirl around the nonattainment area with the prevailing, moderate winds. Visibility has largely returned to normal levels throughout the nonattainment area as concentrations begin their return to pre-storm levels.

Tuesday, July 5

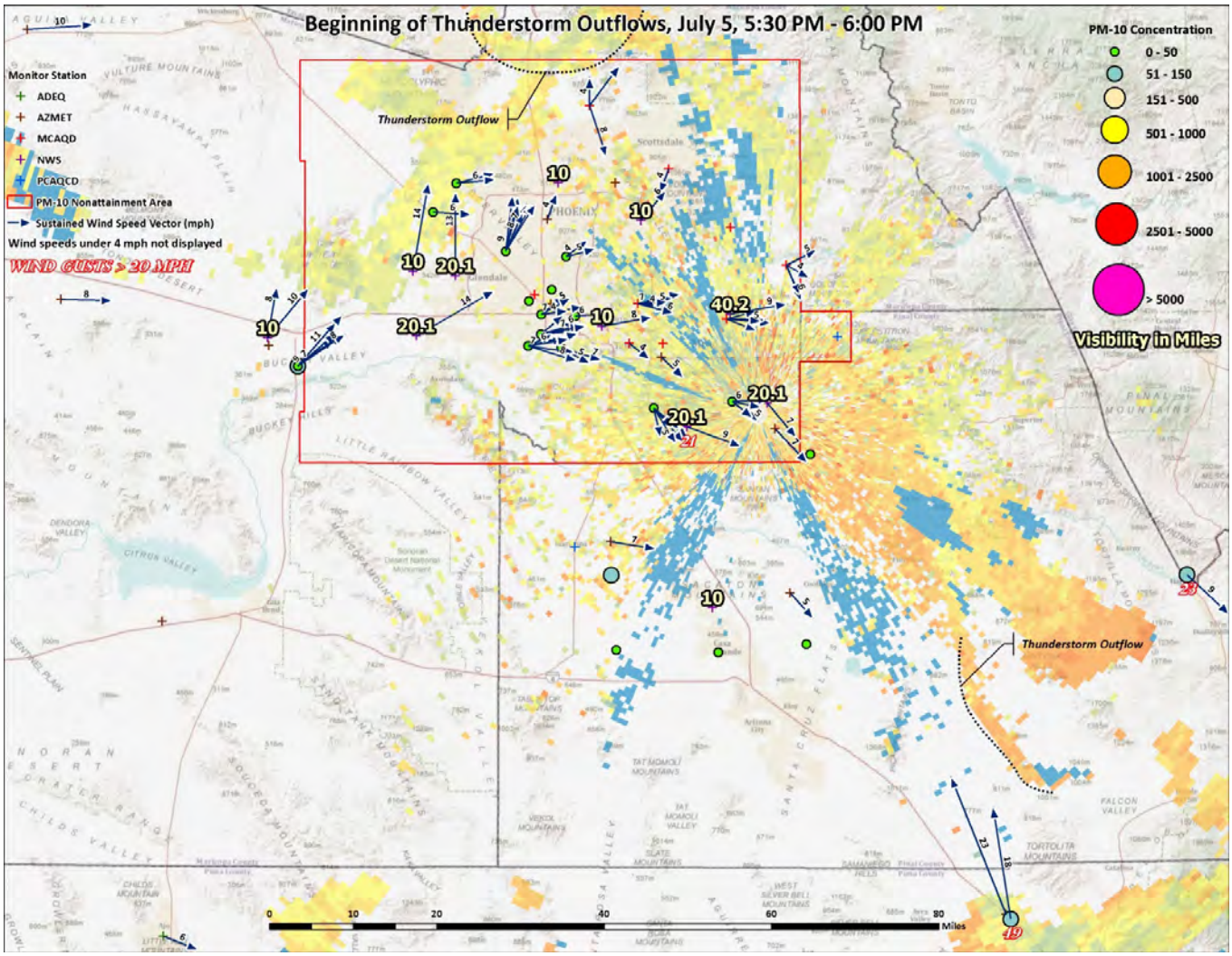


Figure 5-27. Beginning of Thunderstorm Outflows (July 5, 5:30–6:00 PM).

The exceedances on July 5, 2011 were the result of severe thunderstorm activity throughout the region, culminated by one historic thunderstorm outflow. A moist, unstable air mass provided the possibility for multiple events. As can be seen in the map above, meteorological conditions produced two thunderstorm outflows visible on base velocity radar during this snapshot in time. These conditions will contribute to the creation of a massive thunderstorm outflow centered in the deserts of Pinal and Pima counties that will carry immense amounts of dust into Maricopa County, causing all but one of the Maricopa County continuous PM10 monitors to exceed the 24-hour PM10 standard.

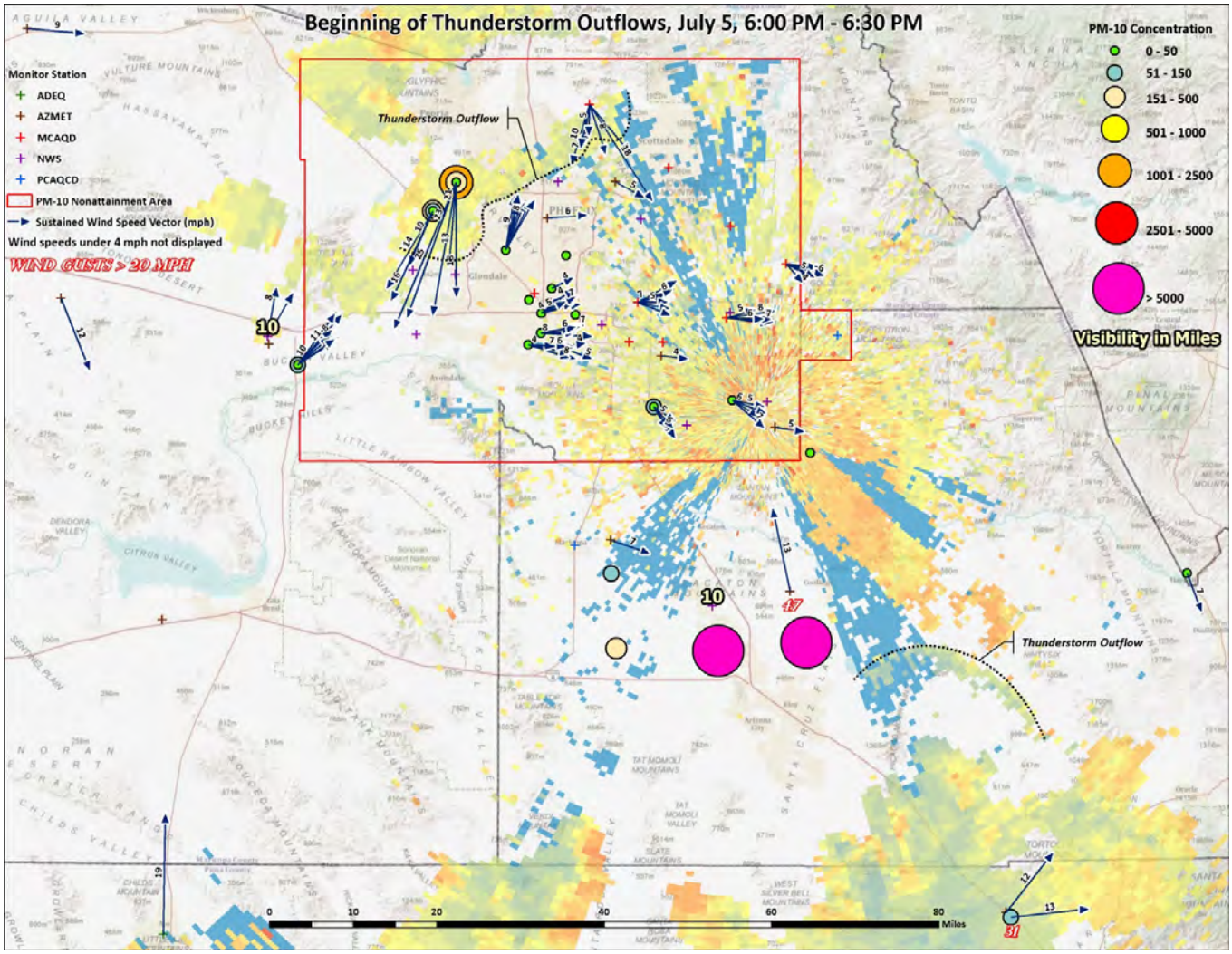


Figure 5-28. Beginning of Thunderstorm Outflows (July 5, 6:00–6:30 PM).

Around 6:00 pm, the outflow from the large outflow can first be seen on base velocity radar. This outflow is already carrying enormous quantities of dust, causing two Pinal County monitors to have hourly average PM10 concentrations over 5000 µg/m^3. Visibility at Casa Grande airport has yet to be impacted but will rapidly drop to zero miles in the next 30 – 60 minutes. A significant localized outflow from the north is making its way into Maricopa County, causing elevated PM10 readings at the northern Maricopa County monitors. This outflow will eventually be consumed by the strength of the approaching outflow from the south.

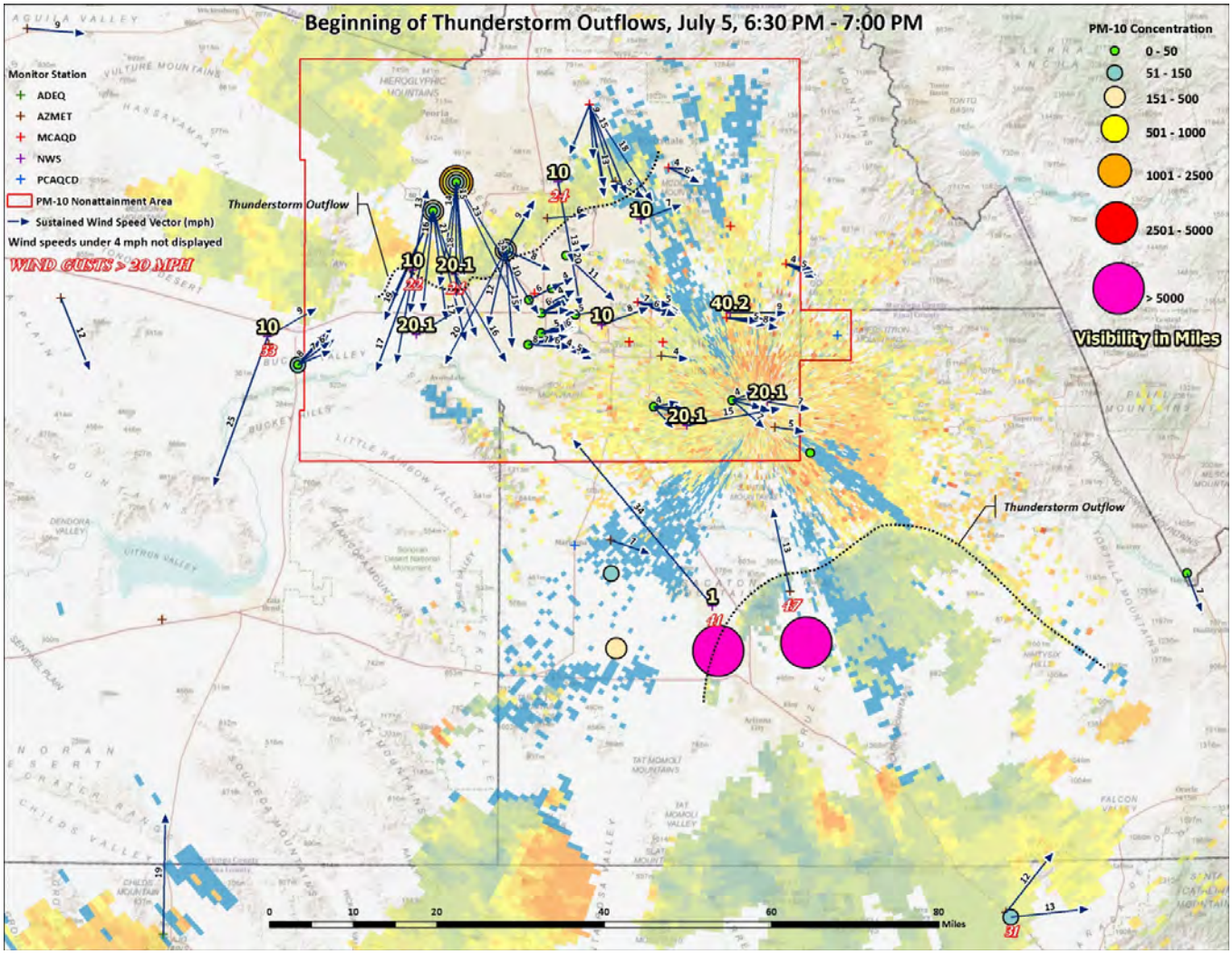


Figure 5-29. Beginning of Thunderstorm Outflows (July 5, 6:30–7:00 PM).

By 6:45 pm, the southern thunderstorm outflow has doubled in size on radar and continues to push north. Sustained winds at the Casa Grande airport are reported at 34 miles an hour with visibility reduced to 1 mile. The northern outflow has pushed further south into Maricopa County, elevating PM10 concentrations at 3 monitoring stations and providing sustained winds around 20 miles an hour. Visibility near the northern monitoring stations is not affected by the northern outflow at this point.

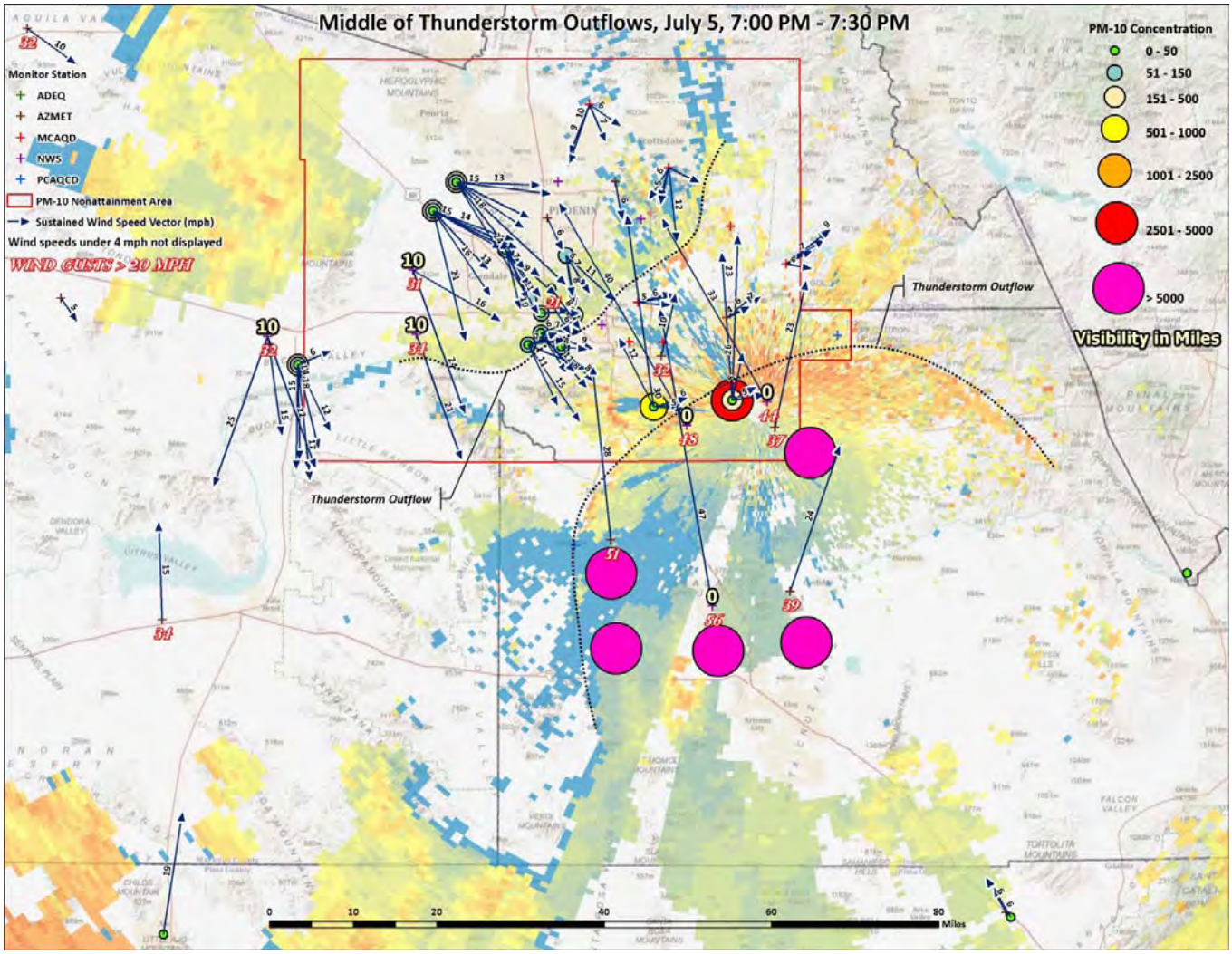


Figure 5-30. Middle of Thunderstorm Outflows (July 5, 7:00–7:30 PM).

By 7:15 pm, the southern outflow has reached into the southeastern portion of Maricopa County. The dust wall associated with the outflow is at least 50 miles wide by this point. All five continuous monitoring stations in Pinal County record concentrations greater than 5000 µg/m^3. Visibility is simultaneously reported to be zero miles by 3 National Weather Service Stations over 20 miles apart. Sustained winds at the Casa Grande airport reach as high as 47 miles an hour. The northern thunderstorm outflow has also grown in size, affecting the western Buckeye monitor and the central Phoenix area monitors.

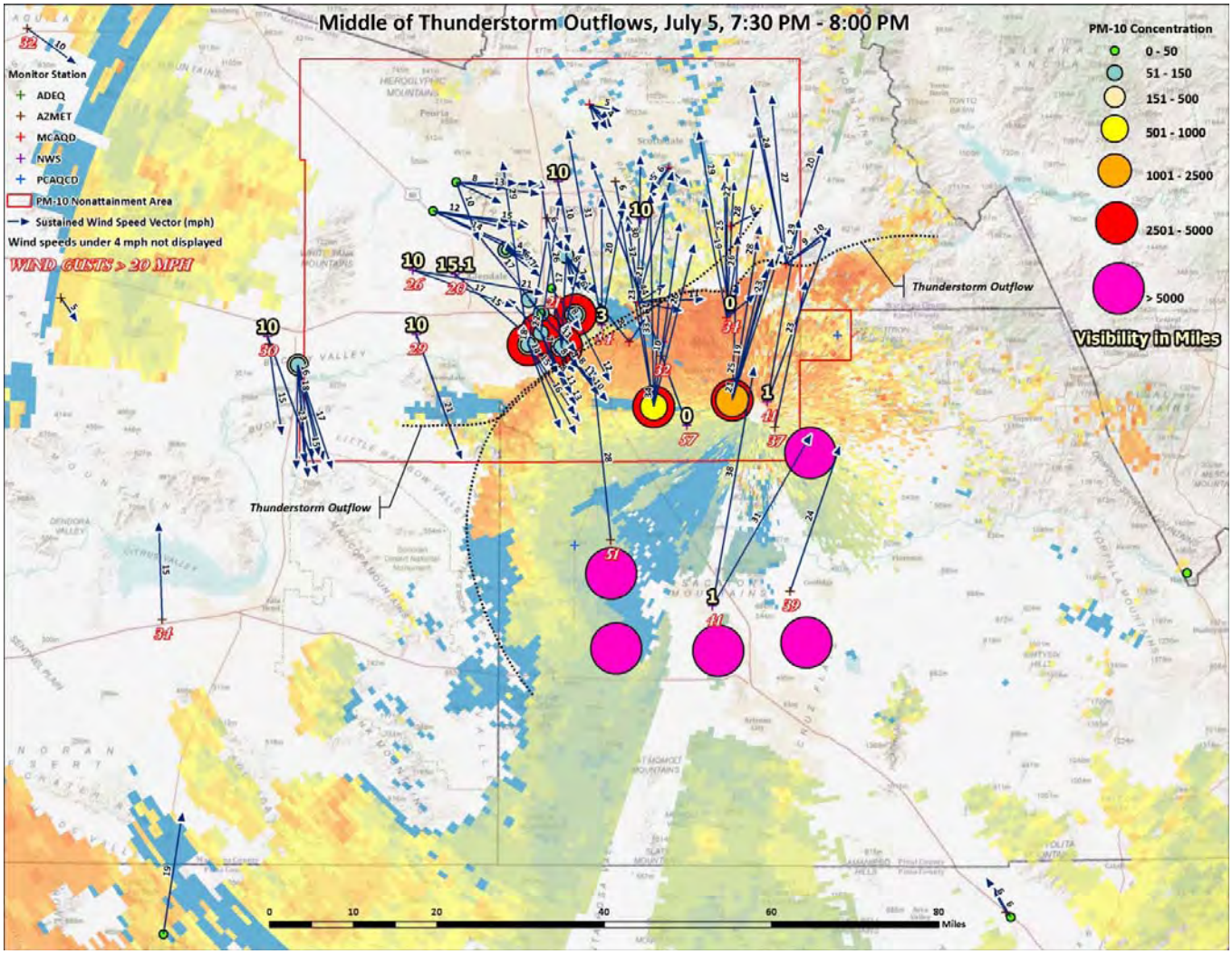


Figure 5-31. Middle of Thunderstorm Outflows (July 5, 7:30–8:00 PM).

The two thunderstorm outflows meet at approximately 7:45 pm. The southern outflow measures around 100 miles on base velocity radar. The dust wall from the southern outflow has reached some of the central Phoenix monitors, lowering visibility at Sky Harbor airport to 3 miles. Sustained winds remain in the upper 20's for many portions of southeastern Maricopa County.

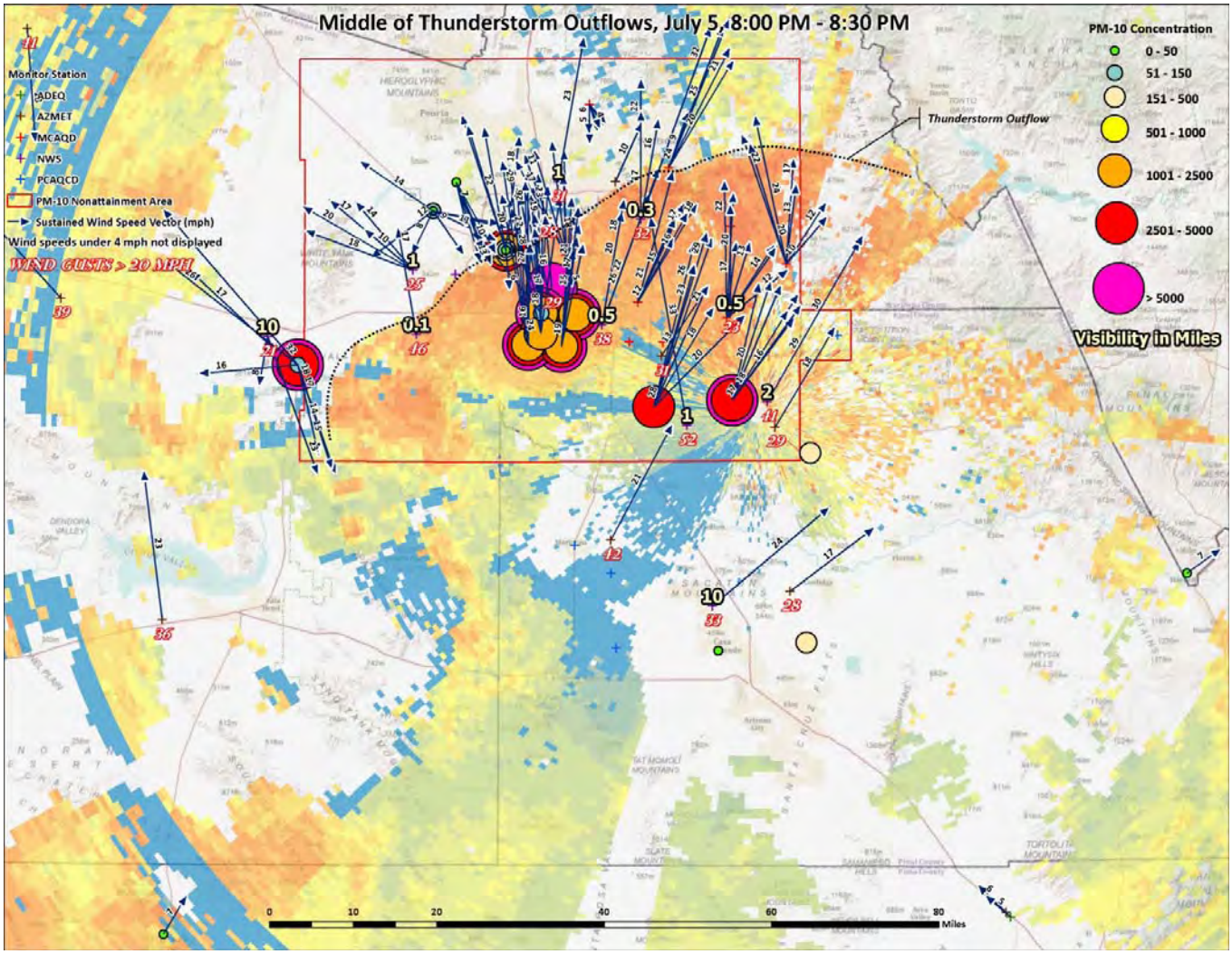


Figure 5-32. Middle of Thunderstorm Outflows (July 5, 8:00–8:30 PM).

By 8:00 pm, the dust wall from the southern outflow continues to push into northern Maricopa County, easily overtaking the winds associated with the earlier northern outflow. All reporting airports within the nonattainment area record visibility of 2 miles or less. This period will produce some of the highest concentrations at the Maricopa County monitors, with many monitors recording 5-minute concentrations over 5000 µg/m^3.

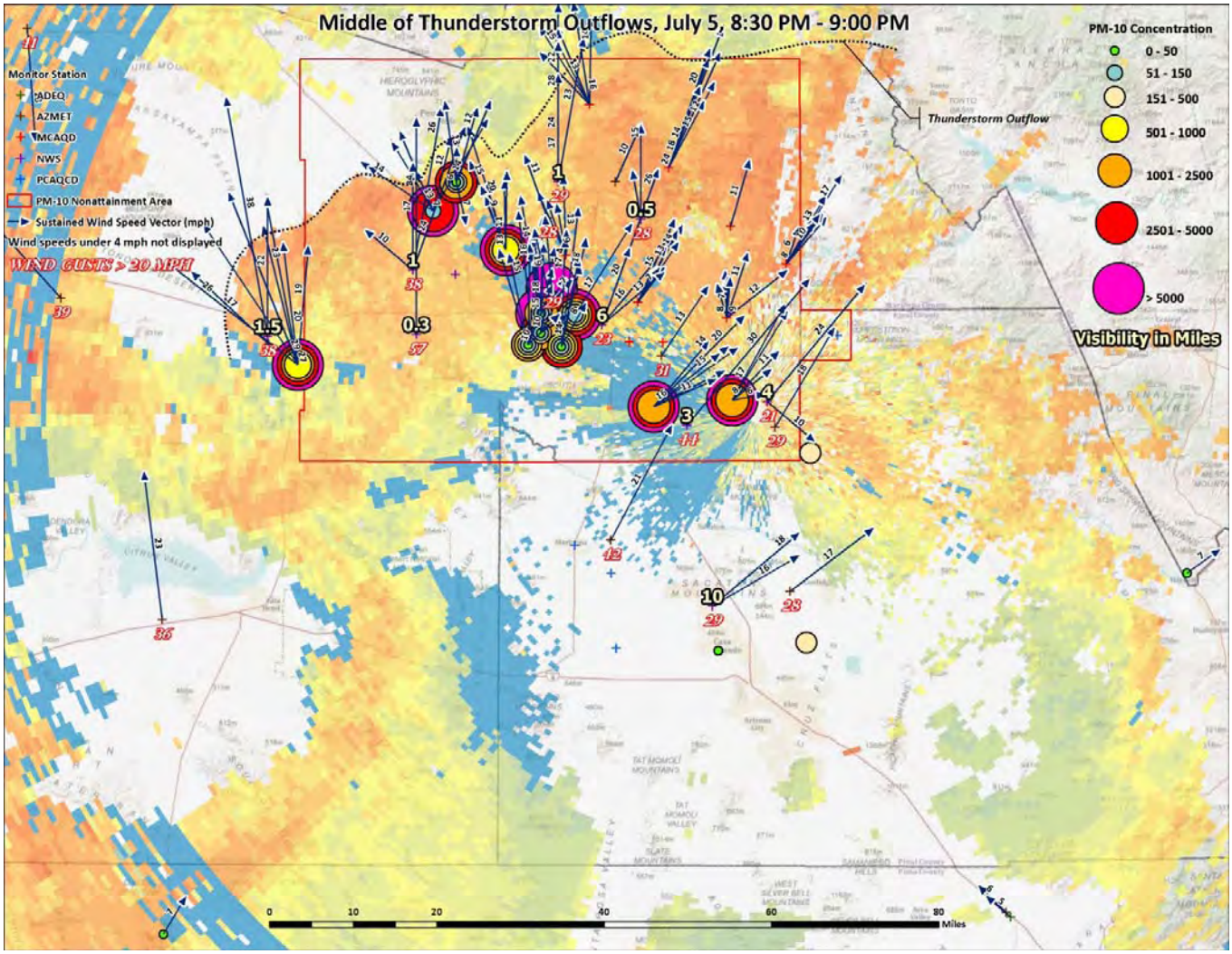


Figure 5-33. Middle of Thunderstorm Outflows (July 5, 8:30–9:00 PM).

Dust from the southern outflow has blanketed most of the nonattainment area through 9:00 pm. The outflow continues to push north until it is no longer visible from the radar stationed at Williams Gateway airport. PM10 concentrations are extremely high throughout the nonattainment area. Those areas with the greatest surface roughness conditions, like the central Phoenix monitors, will see concentrations start to decline quicker than the areas on the edge of the nonattainment area where dust from the outflow can remain suspended easier. Reported visibility continues to be poor throughout the nonattainment area, ranging from 0.3 to 4 miles.

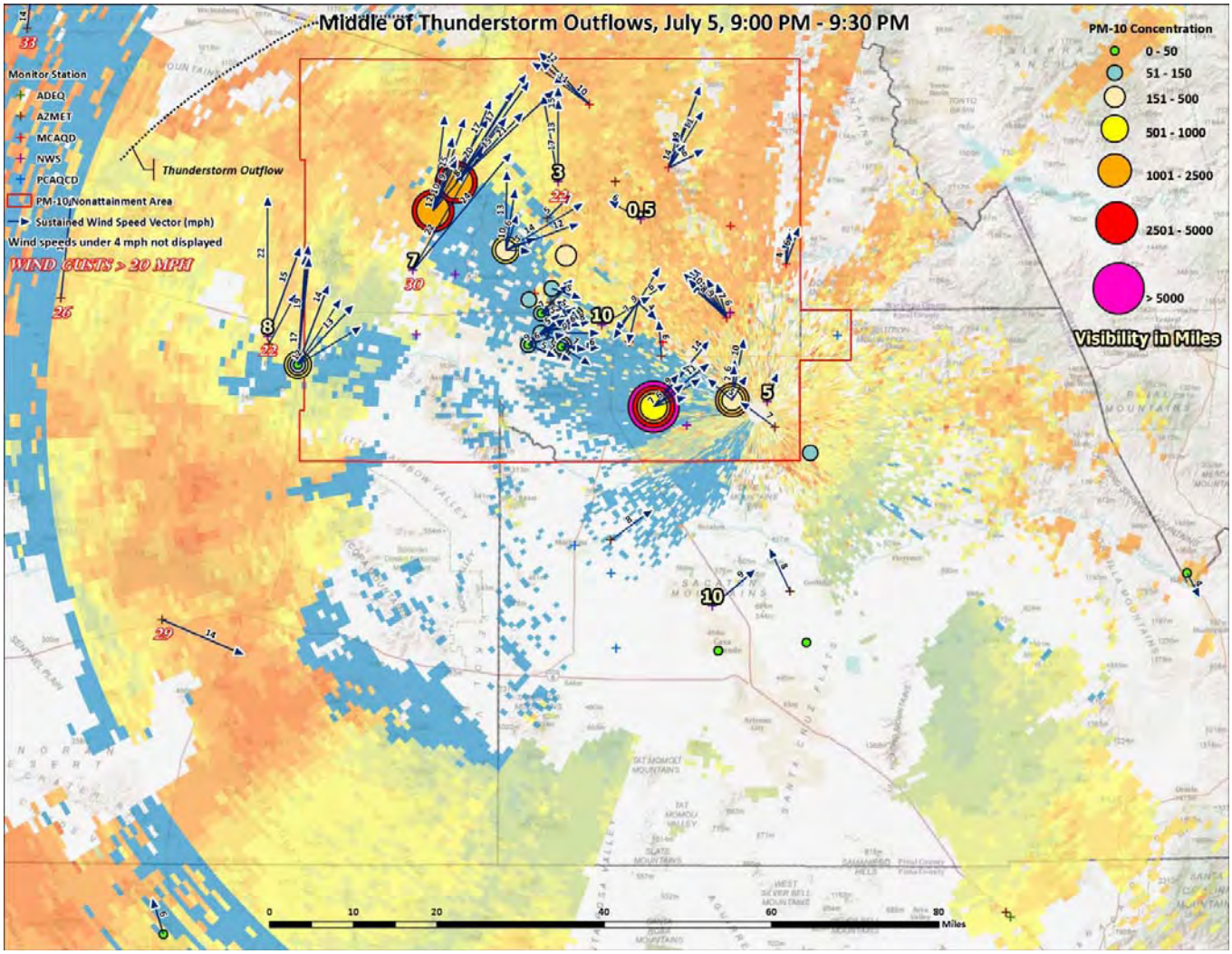


Figure 5-34. Middle of Thunderstorm Outflows (July 5, 9:00–9:30 PM).

By 9:30 pm, the outflow has entirely passed through the Phoenix PM10 nonattainment area and continues north into Yavapai County. Winds within the nonattainment area during this time begin to be affected by more localized activity as opposed to effects from the thunderstorm outflow. The central Phoenix area monitors are returning to pre-storm levels at this time, but visibility and PM10 concentrations remain mixed throughout the nonattainment as turbulent conditions in the wake of the massive thunderstorm outflow keep visibility low and PM10 concentrations high in some areas.

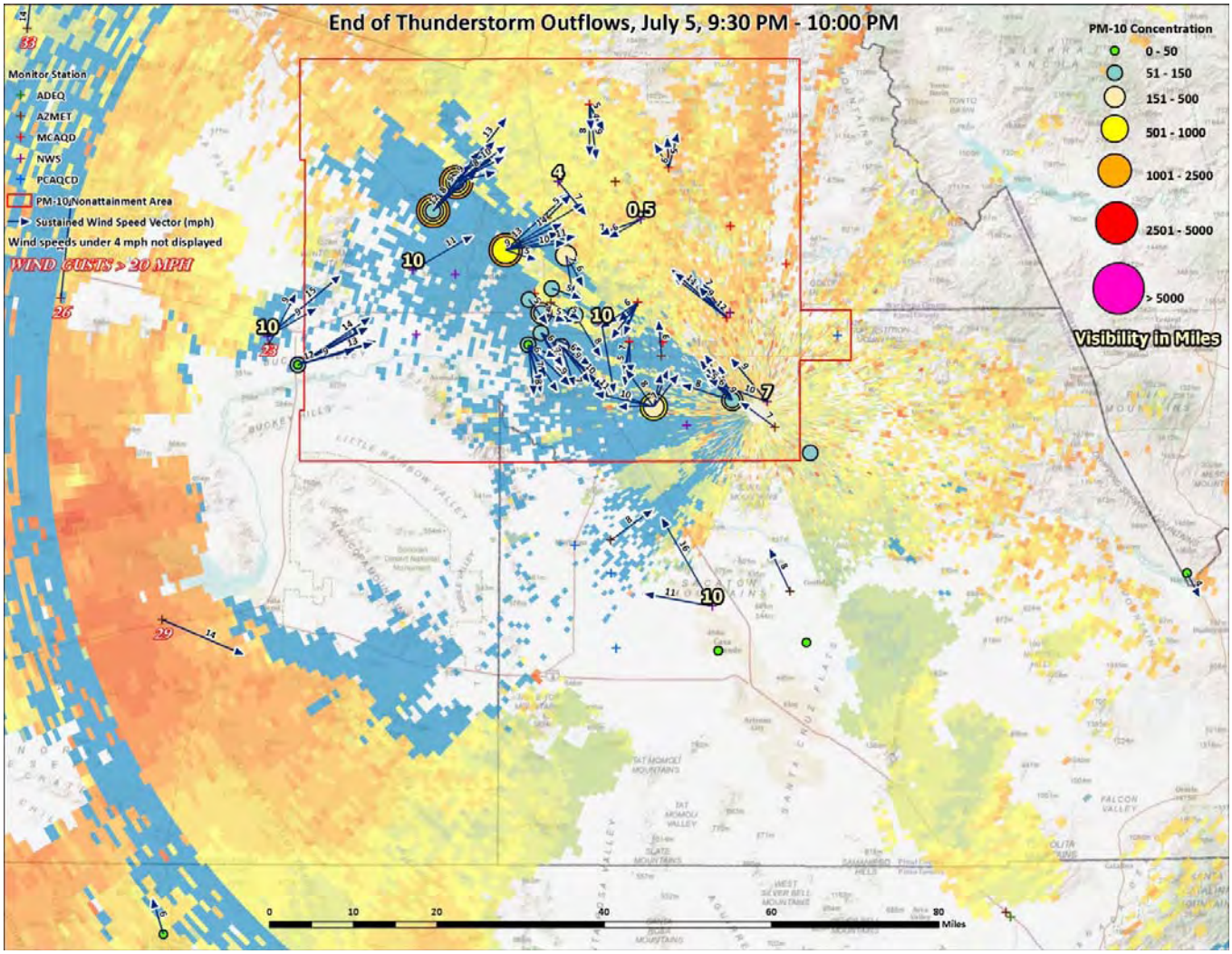


Figure 5-35. End of Thunderstorm Outflows (July 5, 9:30–10:00 PM).

At approximately 10:00 pm, most of the nonattainment area monitors have declining PM10 concentrations. However, large quantities of dust from the outflow remain suspended, and become resuspended, in response to localized wind patterns. Wind speeds are moderate during this time and swirling in direction in response to local conditions. Visibility has improved for most of the nonattainment area; yet some stations still report visibility as low as 0.5 miles.

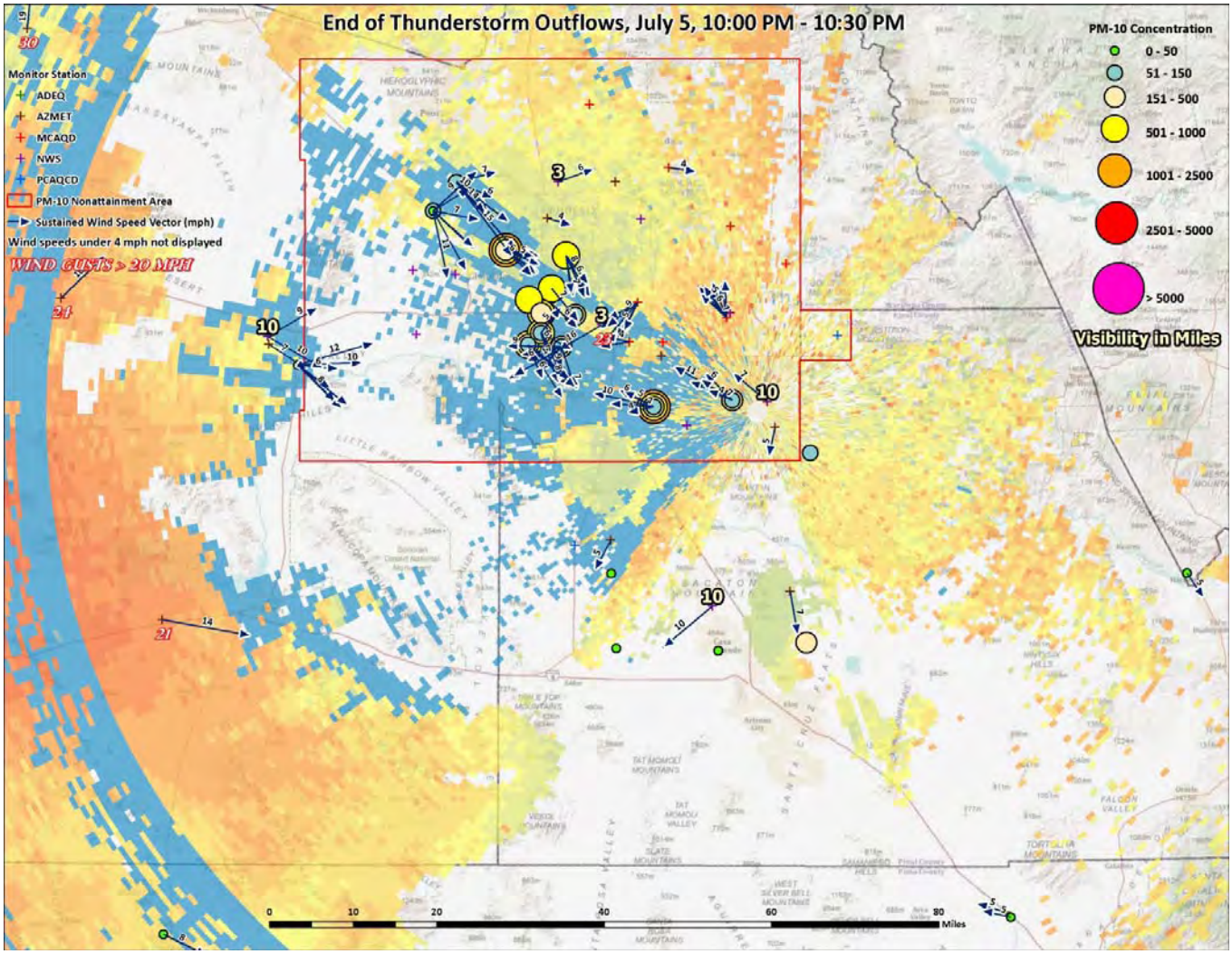


Figure 5-36. End of Thunderstorm Outflows (July 5, 10:00–10:30 PM).

At 10:30 pm, evidence of resuspended dust can be seen in a rise of PM10 concentrations at the central Phoenix monitors in response to winds from the northwest. Visibility at Sky Harbor airport also is lowered to 3 miles in response to this resuspension. This resuspended dust will slowly move in a southeastern vector due to more unified winds in the coming hours, causing the central Phoenix and southeastern monitors to experience a rise in PM10 concentrations.

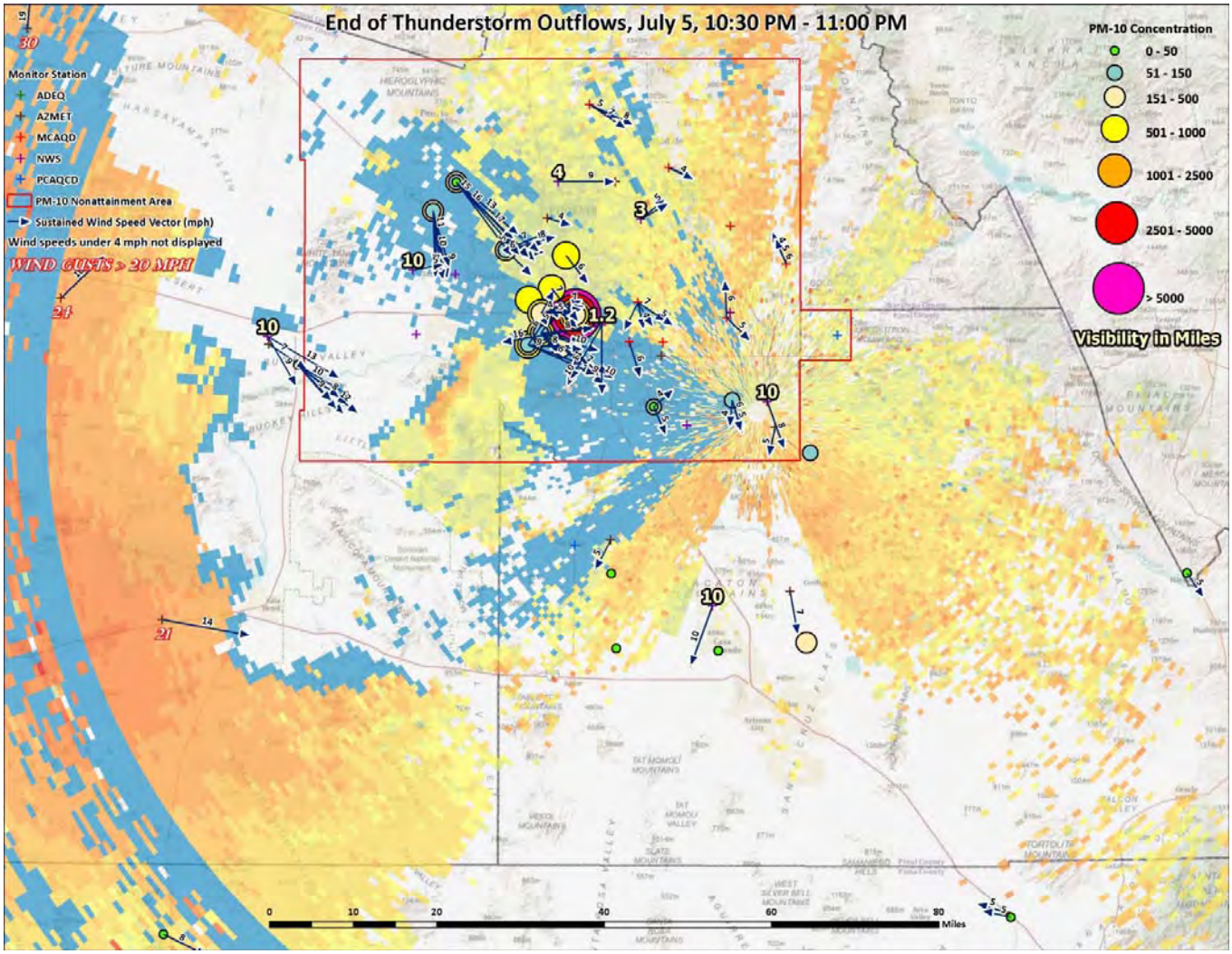


Figure 5-37. End of Thunderstorm Outflows (July 5, 10:30–11:00 PM).

Turbulent winds sustained up to 16 miles per hour near the central Phoenix monitors cause a spike in PM10 concentrations and reduce visibility to 1.2 miles at Sky Harbor airport at 11:00 pm. This resuspended dust will move towards the southeastern Maricopa County monitors and cause corresponding spikes in PM10 at those monitors in the next few hours.

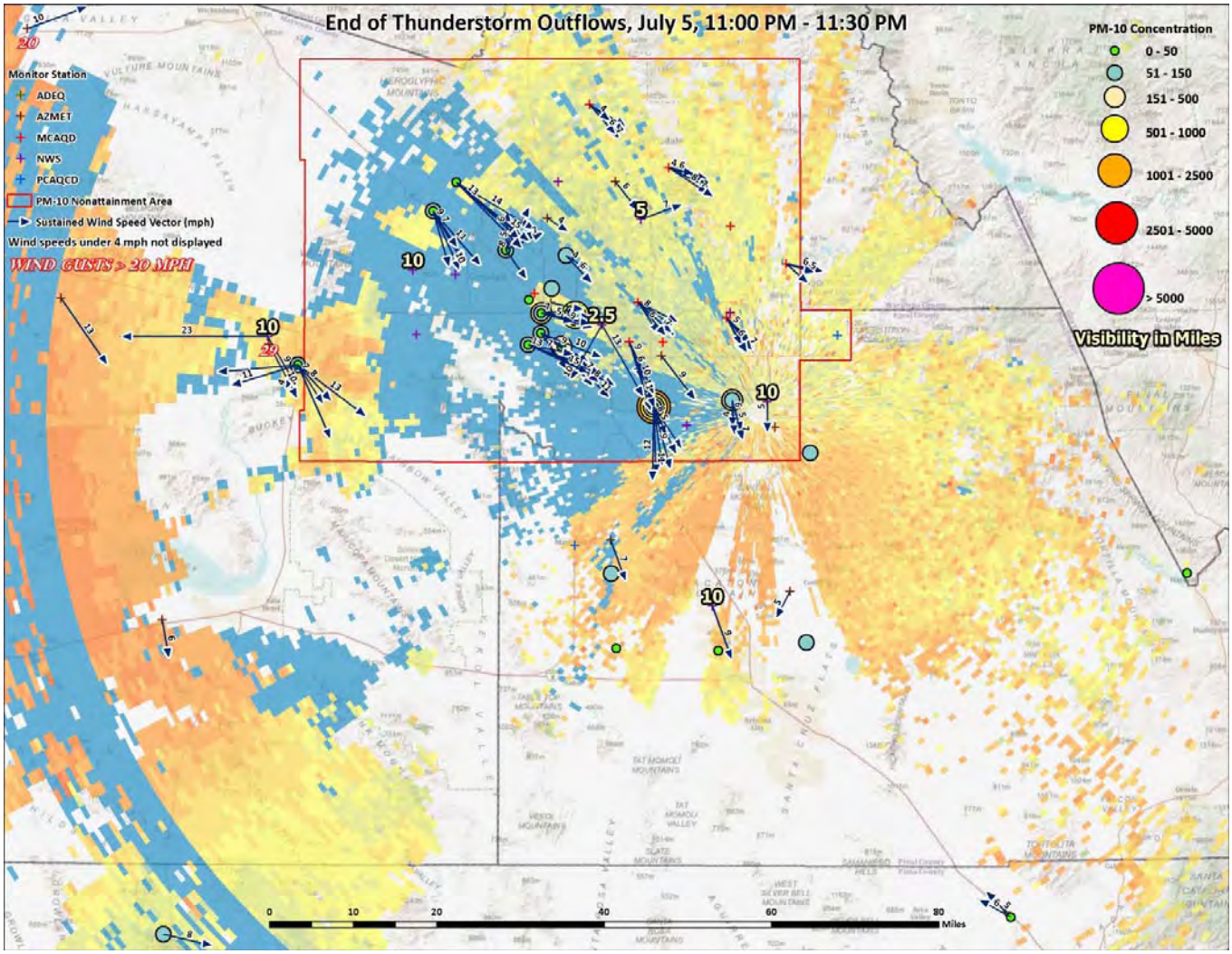


Figure 5-38. End of Thunderstorm Outflows (July 5, 11:00–11:30 PM).

At 11:30 pm, resuspended dust is moving out of the central Phoenix area and towards the southeast portions of Maricopa County. The West Chandler monitor begins to record rising PM10 concentrations in response. PM10 concentrations at the western and northern Maricopa County monitors have largely returned to pre-storm levels.

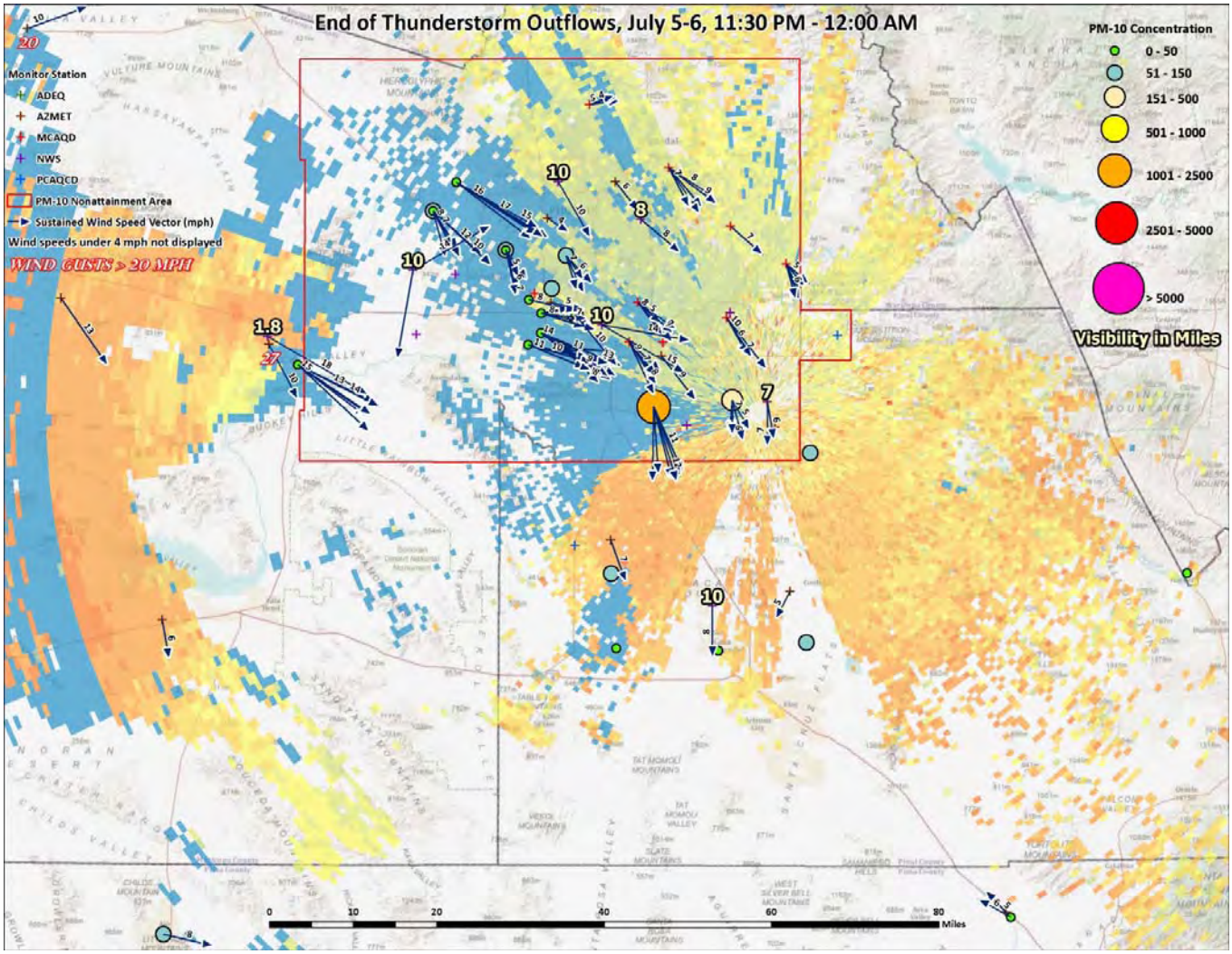


Figure 5-39. End of Thunderstorm Outflows (July 5–6, 11:30 PM–12:00 AM).

By 12:00 am on July 6th, only the southeastern portions of Maricopa County record elevated levels of PM10 as re-suspended dust moves through the area. A small, localized dust storm is noted at the western Buckeye airport, reducing visibility to 1.8 miles, but not yet affecting the Buckeye PM10 monitor. PM10 concentrations throughout the 6th will remain inconsistent and unusually elevated in response to various re-suspension events.

Thursday–Friday, July 7–8

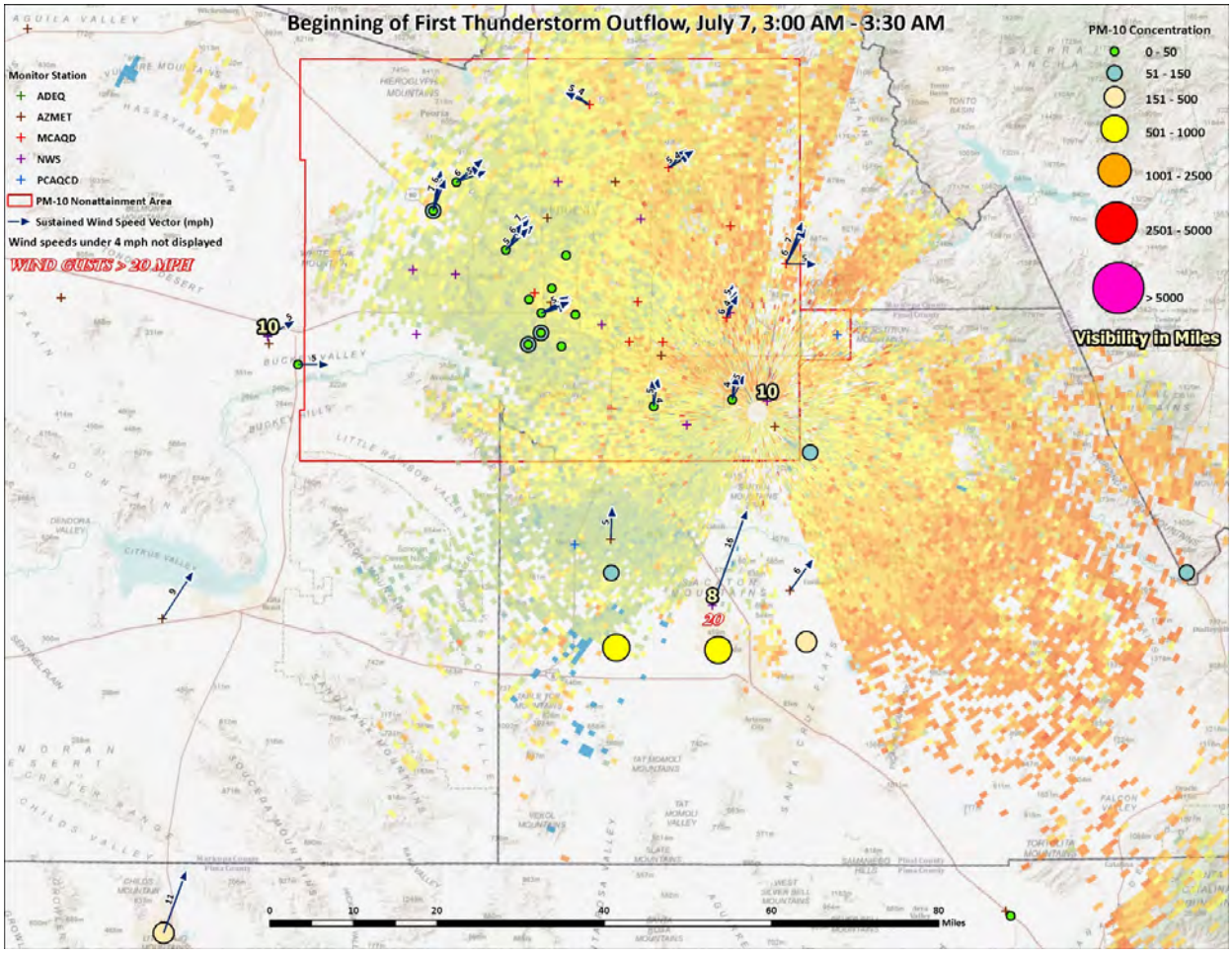


Figure 5-40. Beginning of First Thunderstorm Outflow (July 7, 3:00–3:30 AM).

The exceedances on July 7th at the southeast Maricopa County monitors (West Chandler and Higley) were caused by two thunderstorm outflow events. The exceedance on July 8th at the Apache Junction monitor in northwestern Pinal County was caused by the same, second thunderstorm outflow that contributed to the exceedance at West Chandler and Higley monitors in Maricopa County. The timing of the second outflow event was such that the bulk of the PM10 did not reach the Apache Junction monitor until after 12:00 am on the 8th, causing the exceedance to occur on that day as opposed to the 7th. The map above shows the beginning of the first, small, localized thunderstorm outflow, originating in Pinal County, which elevated concentrations in southeast Maricopa County. While not large enough to provide a signature on base velocity radar, the outflow's path is evident in monitored wind speed and PM10 concentration.

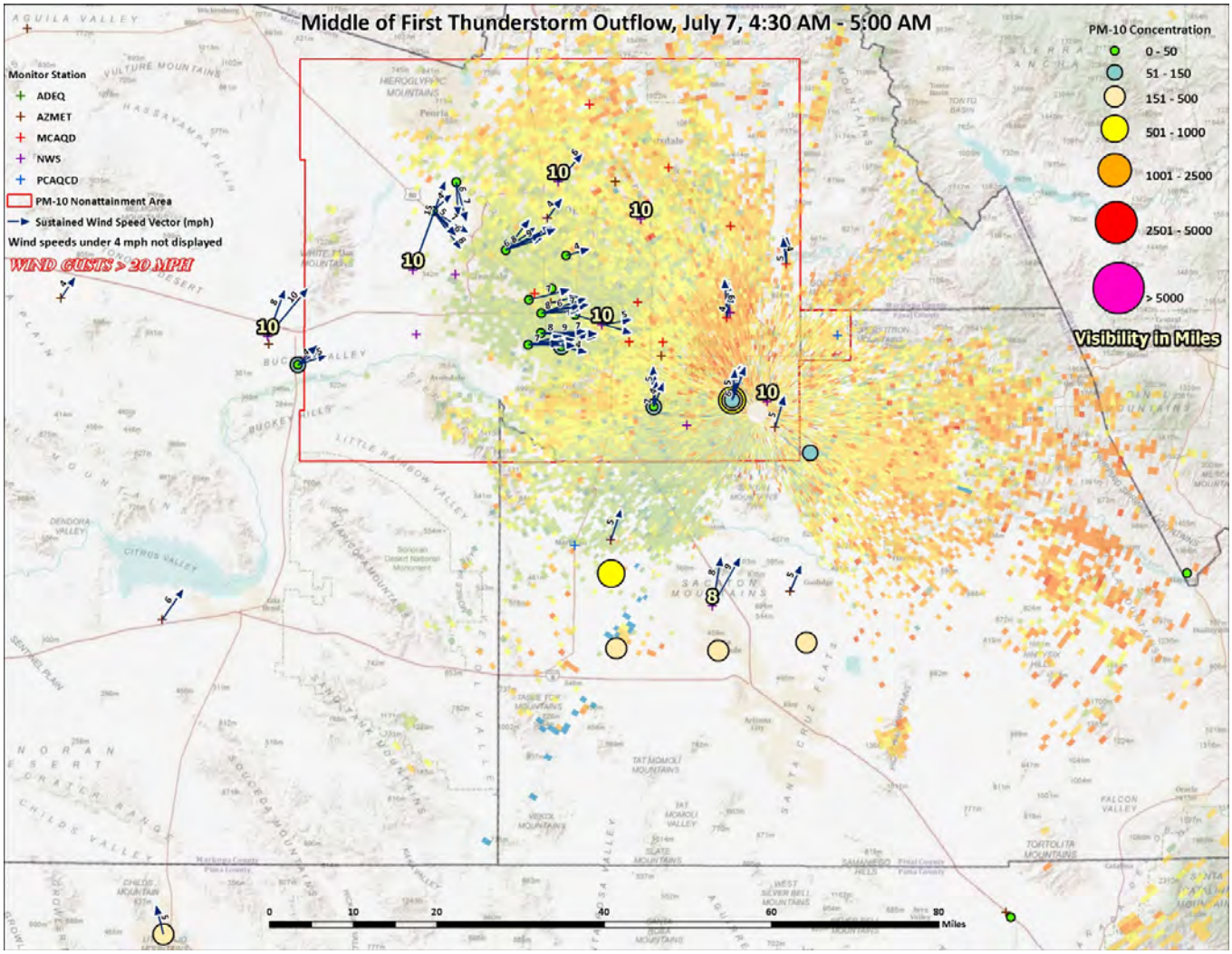


Figure 5-41. Middle of First Thunderstorm Outflow (July 7, 4:30–5:00 AM).

By 4:30 am, PM10 from the first thunderstorm outflow has begun to elevate concentrations at the south-east Maricopa County monitors. The wind energy from the outflow has largely dissipated, causing the dust from the outflow to slowly arrive in Maricopa County with the prevailing winds. Moderate westerly winds in the rest of the Phoenix PM10 nonattainment area will keep the PM10 from reaching other Maricopa County monitors. Visibility has been reduced in Pinal County, but has not yet been reduced in Maricopa County.

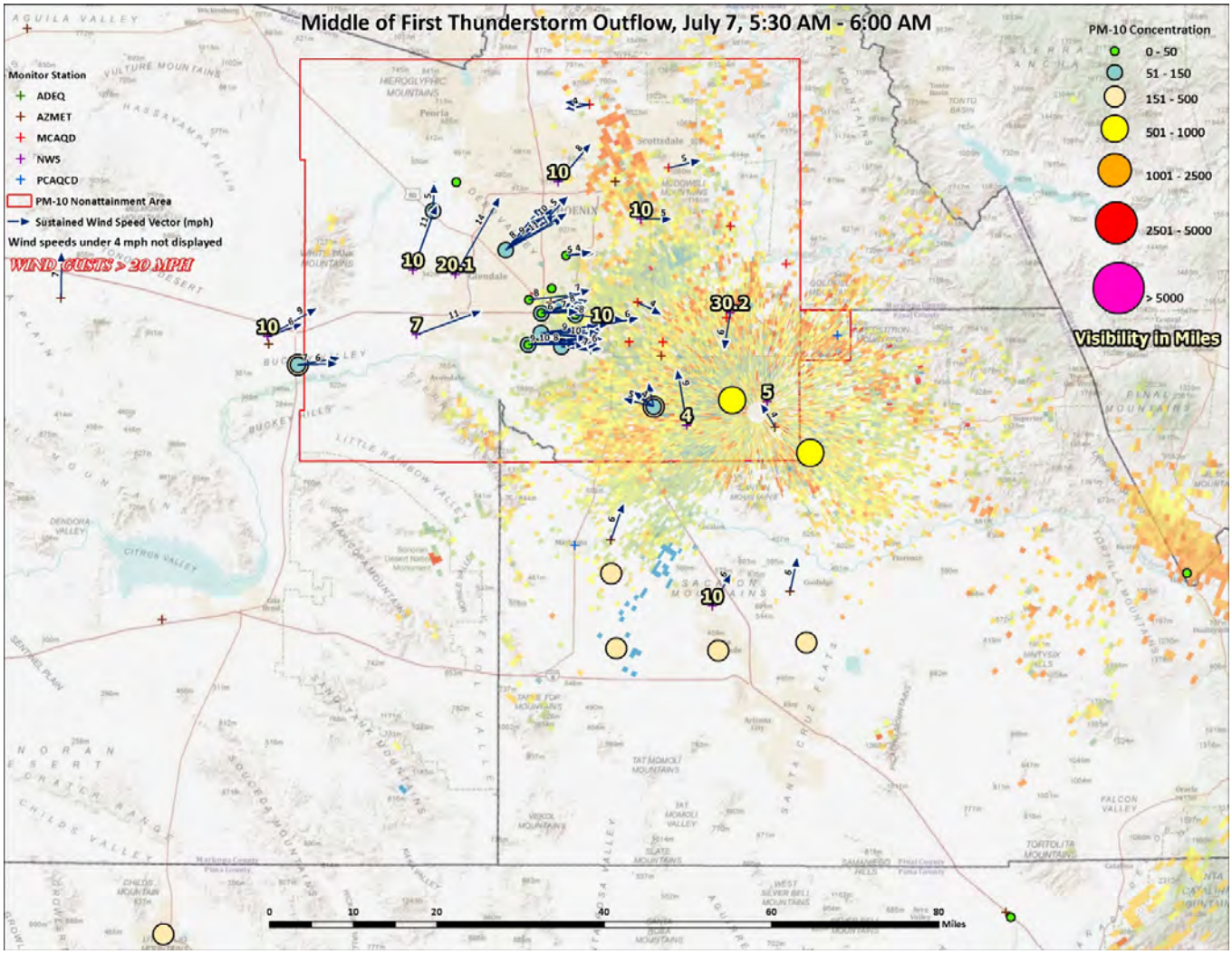


Figure 5-42. Middle of First Thunderstorm Outflow (July 7, 5:30–6:00 AM).

At 5:30 am, elevated concentrations and reduced visibility are present at the southeast Maricopa County monitors. PM10 concentrations from the outflow reach their highest levels during this time period. Moderate westerly winds throughout the rest of the nonattainment area continue, keeping the dust from the outflow isolated to southeast Maricopa County. It appears that dust from likely thunderstorm activity west of the PM10 nonattainment area has begun to be transported in on the prevailing winds. While not high enough to cause exceedance levels at the western and central Maricopa County monitors, the additional dust contributes to a higher area-wide loading and will raise PM10 concentrations for the next few hours.

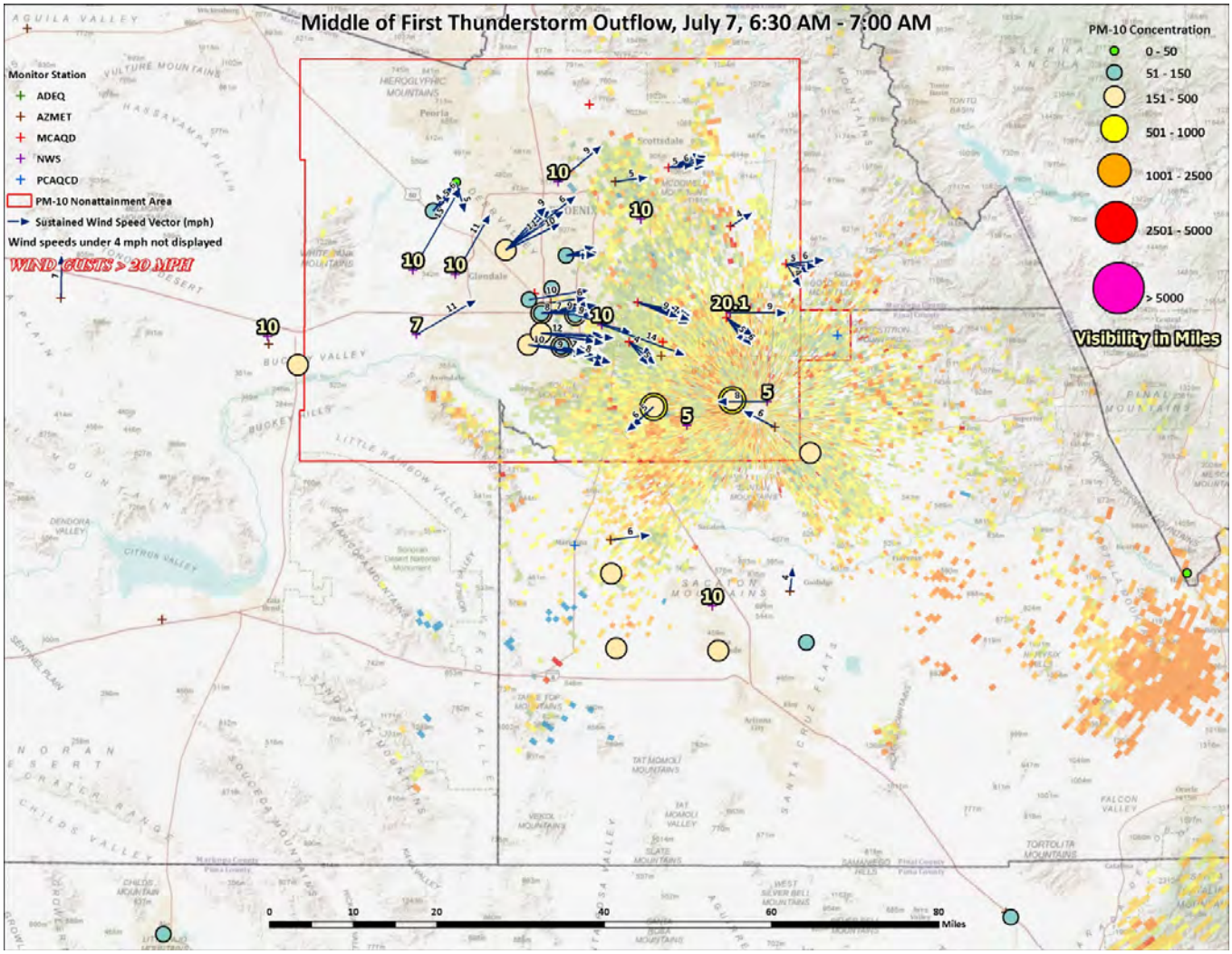


Figure 5-43. Middle of First Thunderstorm Outflow (July 7, 6:30–7:00 AM).

By 6:30 am, PM10 levels at the southeast monitors remain elevated and visibility is still obscured to 5 miles. Transported dusts from the westerly winds have reduced visibility at the Goodyear airport to 7 miles and contributed to higher PM10 concentration at the western, northern and central Maricopa County monitors. Prevailing winds begin to shift to a southeasterly flow at this point, which will help disperse some of the PM10 from the initial outflow out of southeast Maricopa County in the coming hours.

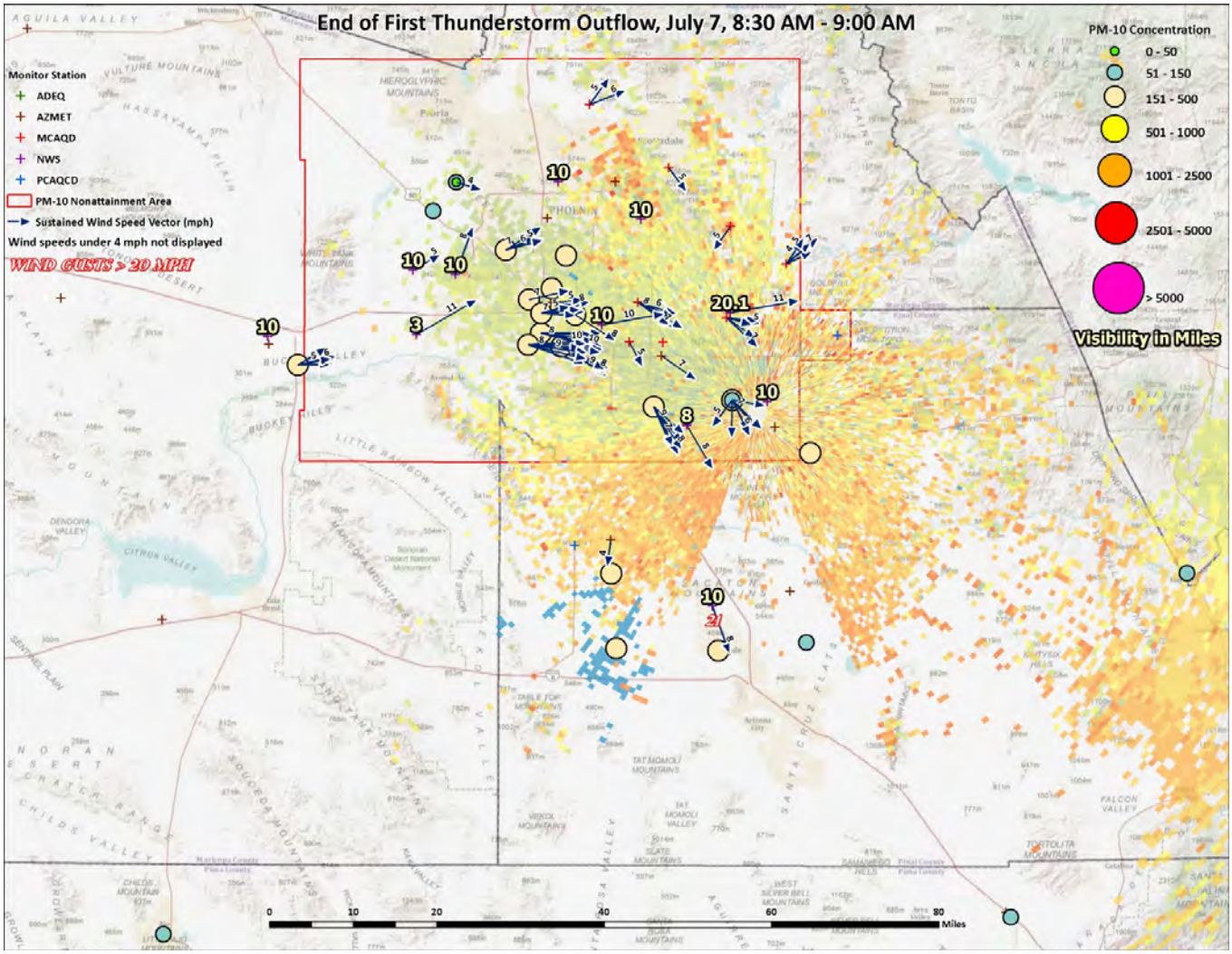


Figure 5-44. End of First Thunderstorm Outflow (July 7, 8:30–9:00 AM).

At 8:30 am, moderate winds from the west and northwest flow across the nonattainment area. PM10 concentrations continue to decline at the southeast Maricopa County monitors and visibility has improved to at least 8 miles at the area airports. PM10 loading throughout the nonattainment area is still higher than normal from the western transported dust, with visibility reduced to only 3 miles at the Goodyear airport.

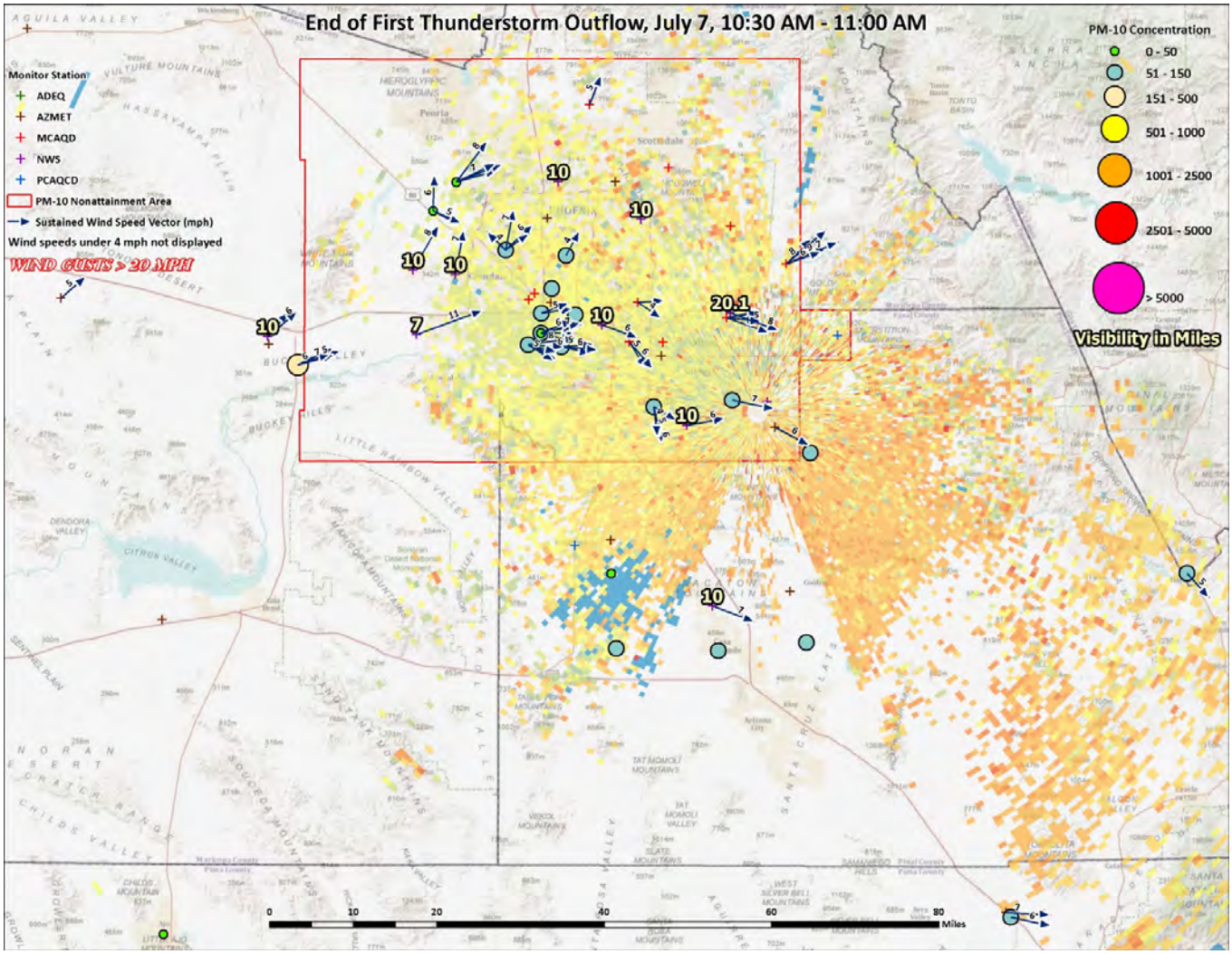


Figure 5-45. End of First Thunderstorm Outflow (July 7, 10:30–11:00 AM).

By 10:30 am, the lingering effects of the first thunderstorm outflow have largely been erased. Western and northwestern winds still dominate the nonattainment area, blowing any remaining suspended dust out of the nonattainment area. Concentrations will return to pre-storm levels until the arrival of the second thunderstorm at approximately 10:00 pm.

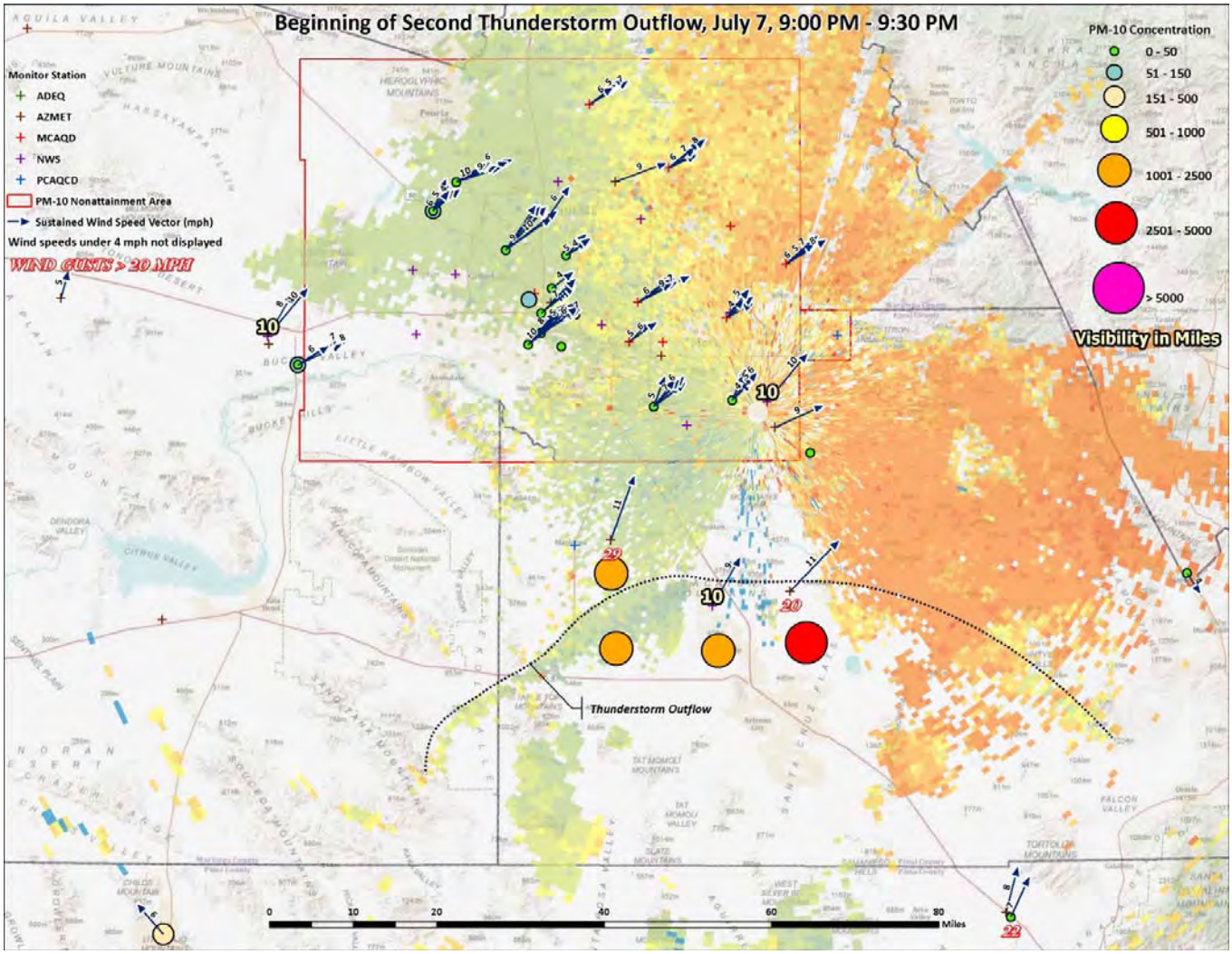


Figure 5-46. Beginning of Second Thunderstorm Outflow (July 7, 9:00–9:30 PM).

Beginning at 9:00 pm, a large thunderstorm outflow originating in the deserts of Pinal and Pima counties is visible on base velocity radar. This outflow is significantly larger than the earlier morning outflow, and rapidly raises PM10 concentrations at four Pinal County monitors.

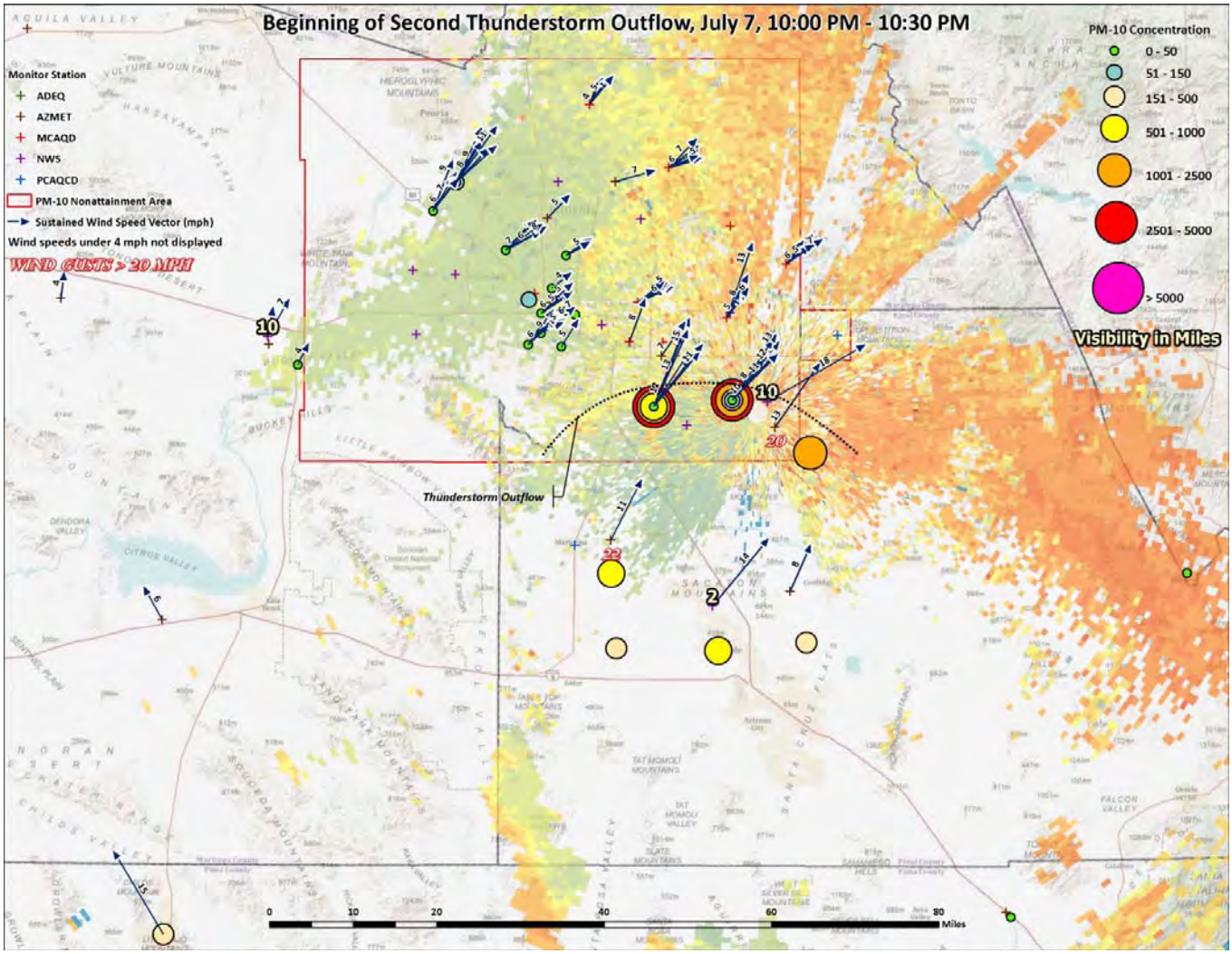


Figure 5-47. Beginning of Second Thunderstorm Outflow (July 7, 10:00–10:30 PM).

At 10:00 pm, the outflow has reached into southeastern Maricopa County, spiking PM10 concentrations at the West Chandler and Higley monitors. Visibility remains poor in Pinal County at 2 miles, indicating that a significant amount of dust is being carried along by the thunderstorm outflow. This outflow is the primary reason for the exceedances at West Chandler and Higley monitors on July 7th in Maricopa County and is the sole reason for the exceedance on the 8th at the Apache Junction monitor. The outflow has begun to lose some strength as it encounters the increased surface roughness of Maricopa County and will start to diminish quickly with each passing hour.

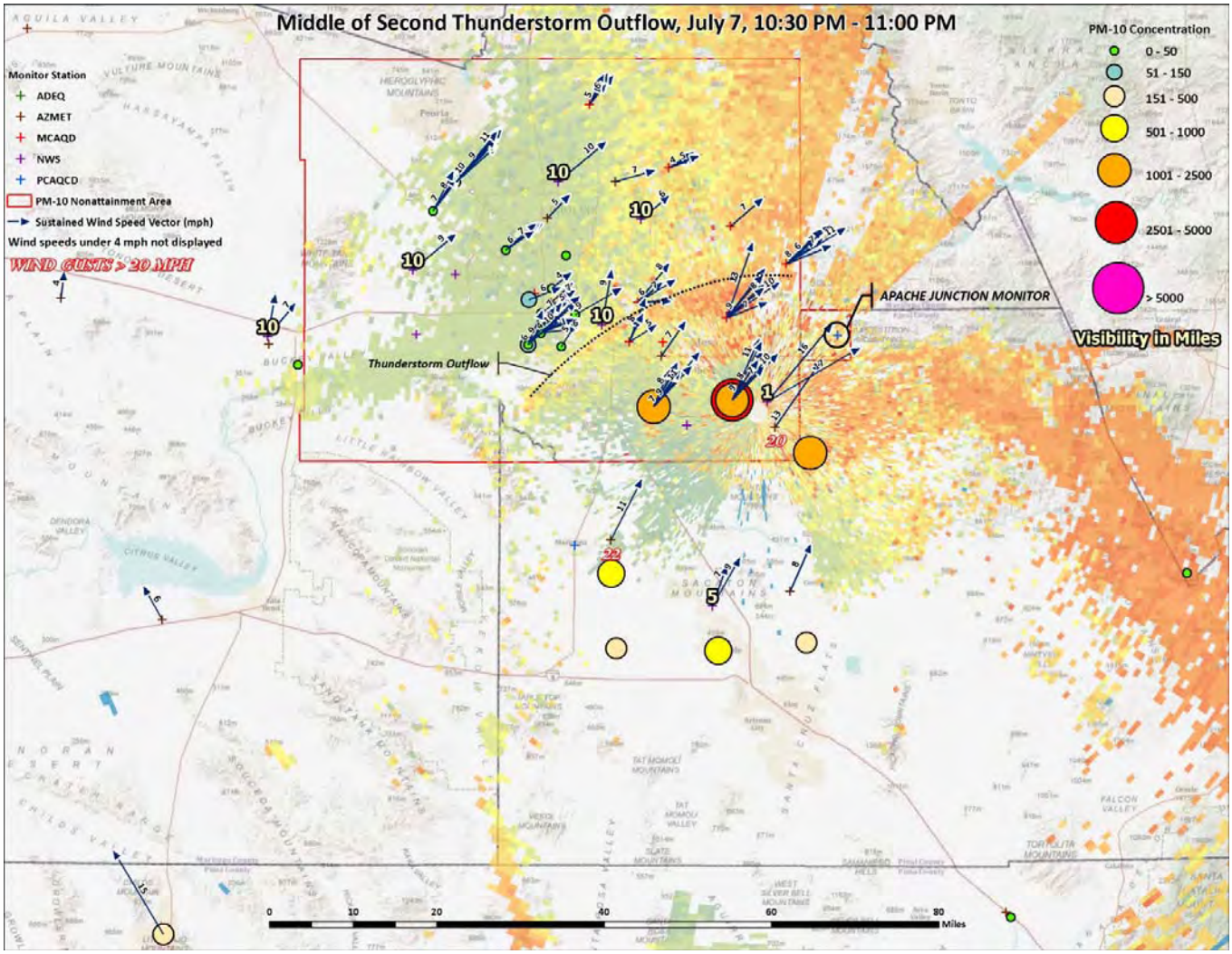


Figure 5-48. Middle of Second Thunderstorm Outflow (July 7, 10:30–11:00 PM).

By 11:00 pm, the prevailing winds guide the dust from the outflow on a straight path to the Apache Junction monitor. Visibility in southeast Maricopa County has been reduced to only 1 mile and PM10 concentrations remain high in the area. The northeasterly flow of the prevailing winds largely steers the bulk of the dust wall away from other Maricopa County monitors at this point. However, as the winds begin to die down over the next several hours, the suspended dust will slowly work its way across the nonattainment area, elevating PM10 concentrations at all monitors within Maricopa County.

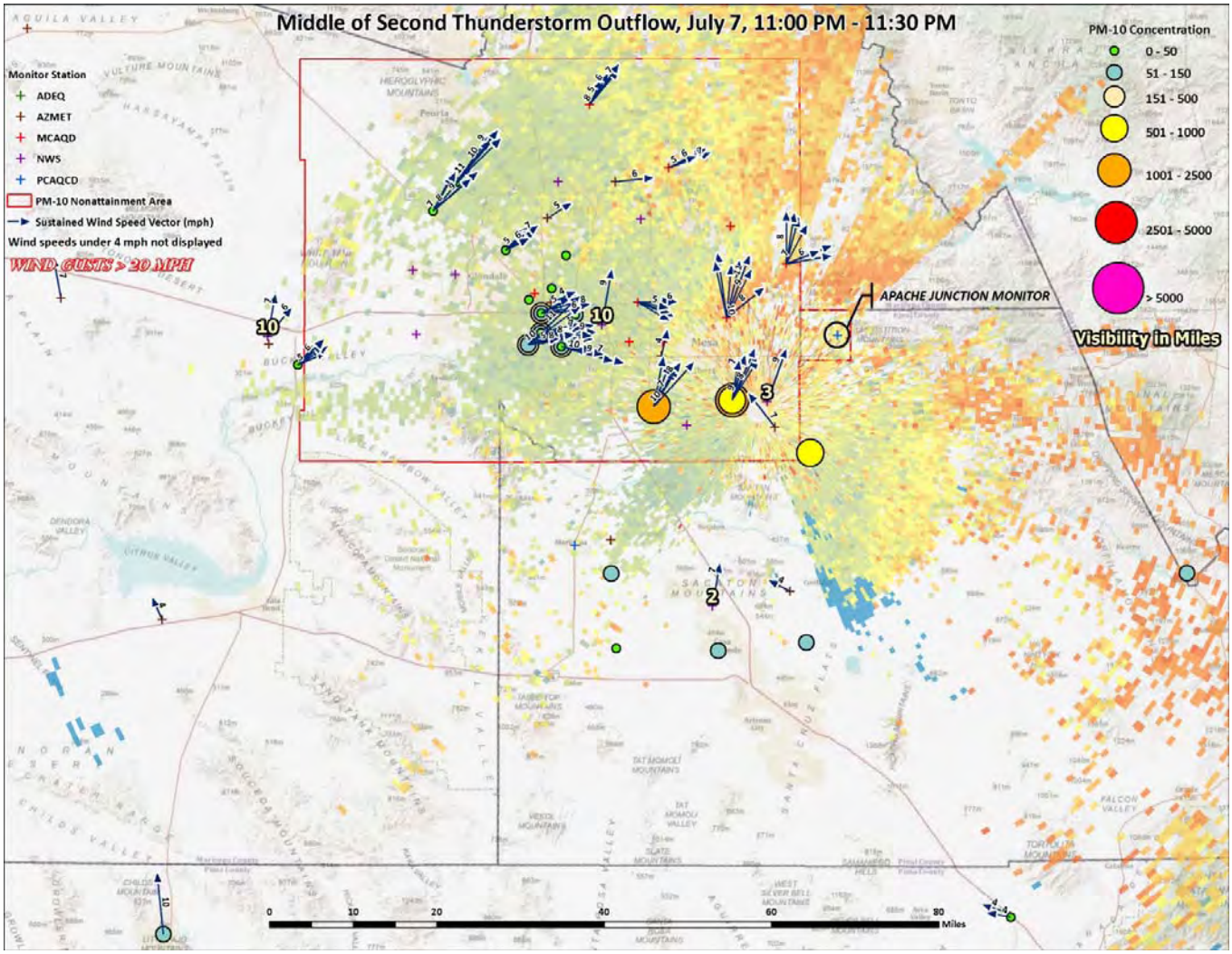


Figure 5-49. Middle of Second Thunderstorm Outflow (July 7, 11:00–11:30 PM).

At 11:30 pm, the thunderstorm outflow is no longer visible on base velocity radar. The bulk of the PM10 remains isolated to southeast Maricopa County, although the edge of the outflow has raised concentrations at some central Phoenix monitors. Concentrations from the outflow will begin to diminish in southeastern Maricopa County after this time and will slowly move across the nonattainment area with low and moderate winds.

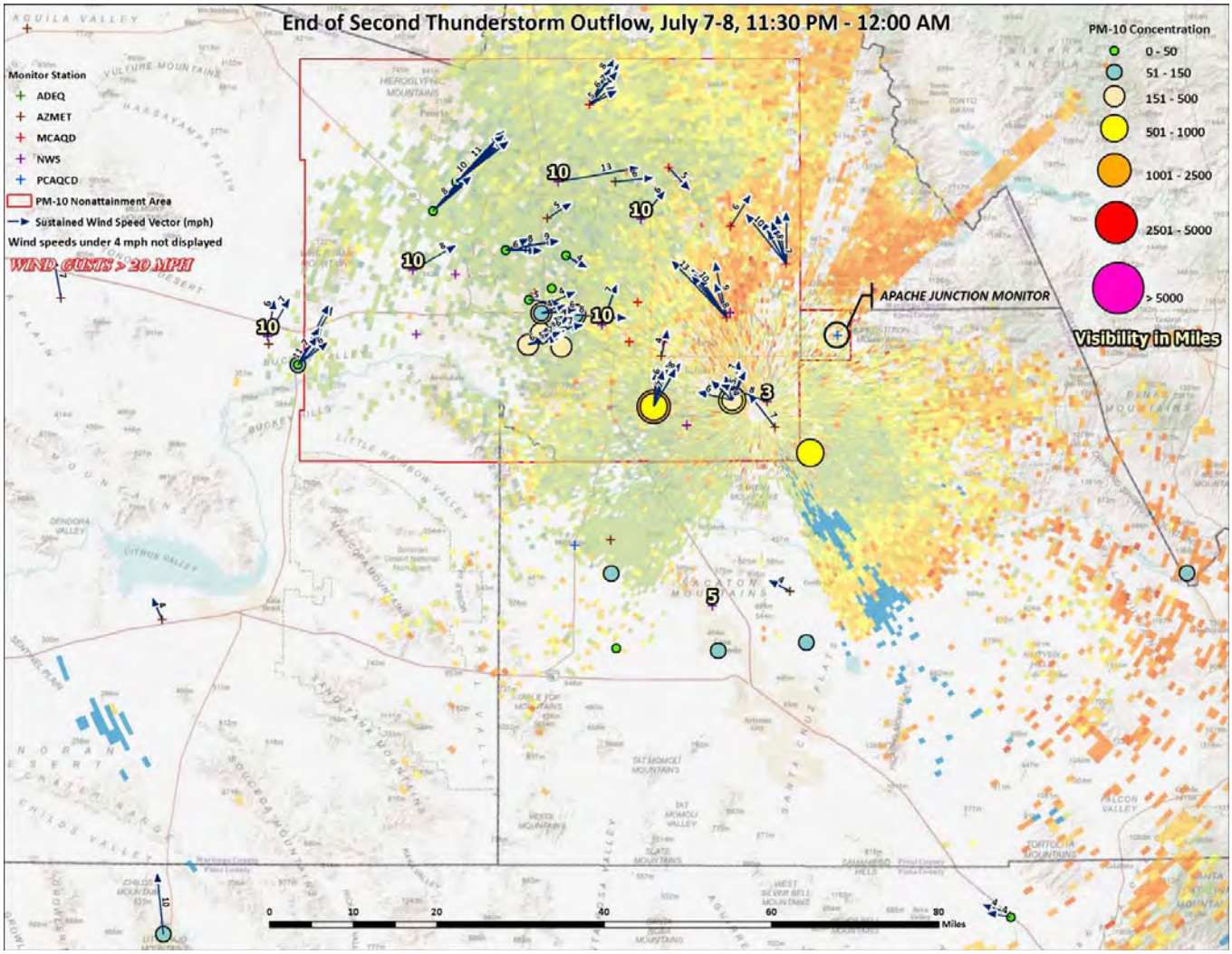


Figure 5-50. End of Second Thunderstorm Outflow (July 7–8, 11:30 PM–12:00 AM).

By 12:00 am on July 8th, winds have calmed down to low or moderate speeds and are mixed in direction throughout the area. The lower wind speeds ensure a slow deposition and dispersion of the suspended PM10. PM10 concentrations at southeastern monitors are beginning their decline with central, western and northern Maricopa County monitors showing increases in concentrations.

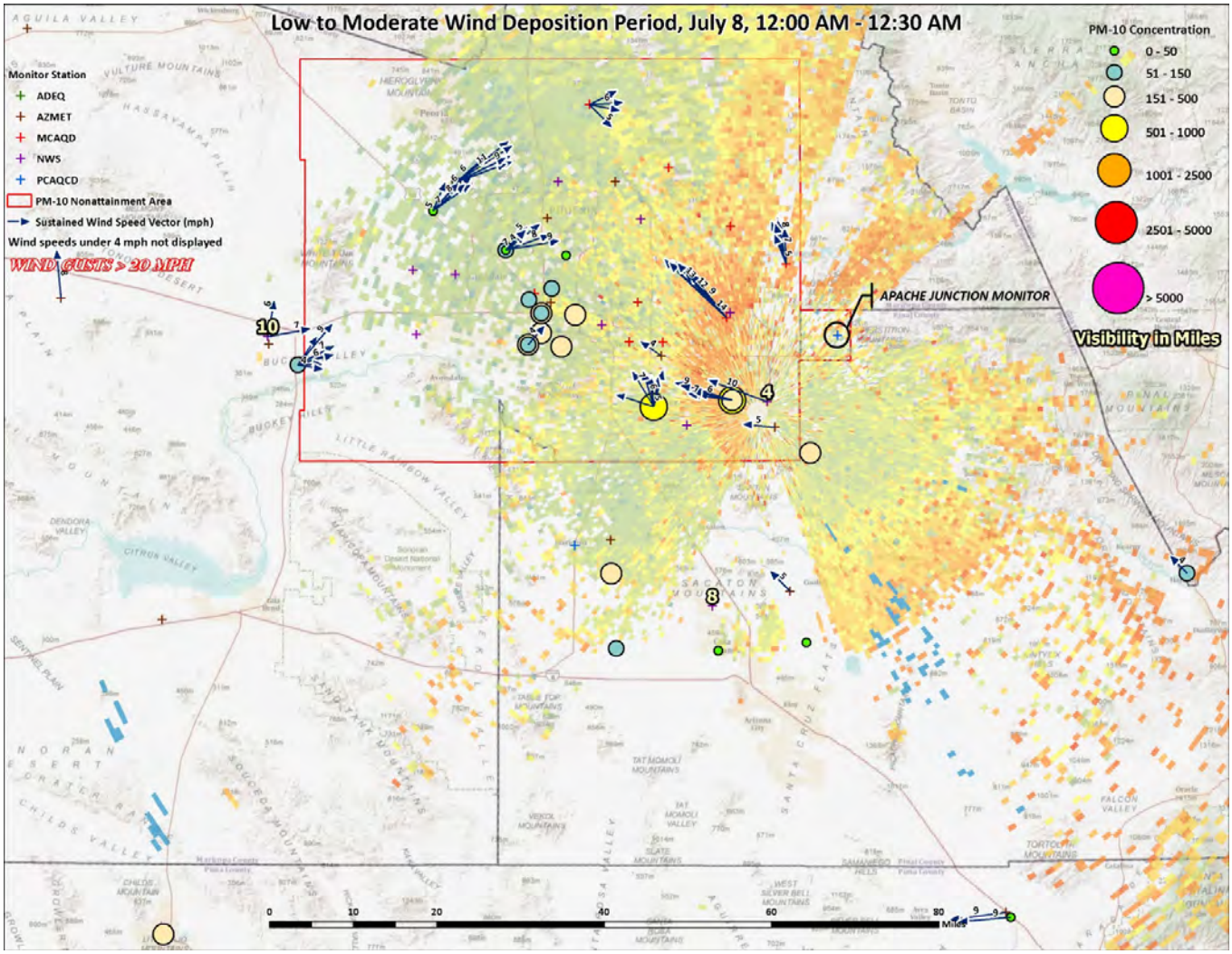


Figure 5-51. Low to Moderate Wind Deposition Period (July 8, 12:00–12:30 AM).

During the period of 12:30 am to approximately 8 am, PM10 slowly falls out by gravity or is pushed north and west across the nonattainment area through low and moderate winds. No one dominant wind direction is present throughout the nonattainment area during this period, allowing for irregular rises and falls of PM10 concentrations at the monitors. Even two hours after the arrival of the thunderstorm outflow in southeast Maricopa County, much of the PM10 remains located near these monitors. Visibility has only improved to 4 miles and will require another hour before returning to normal levels.

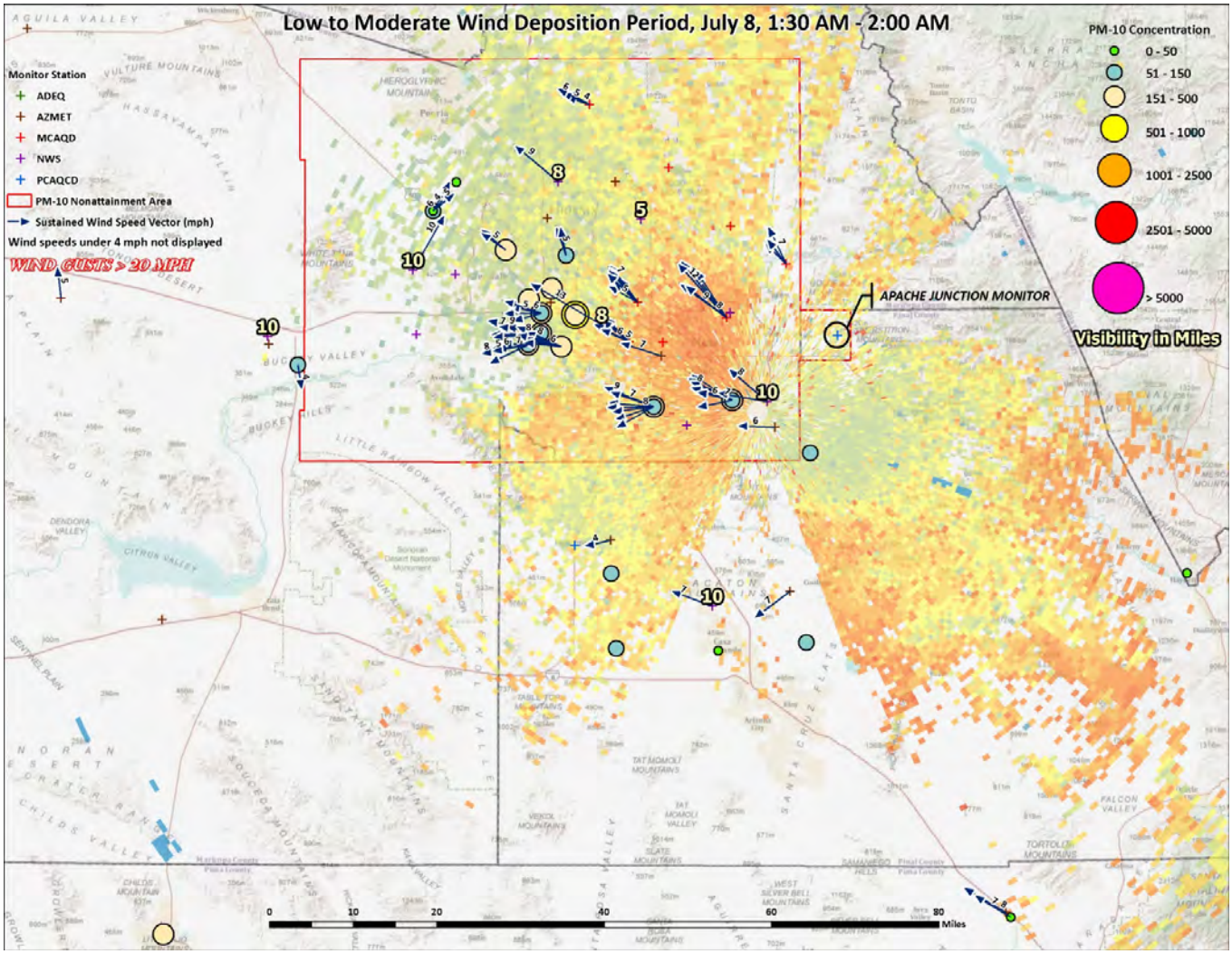


Figure 5-52. Low to Moderate Wind Deposition Period (July 8, 1:30–2:00 AM).

Moderate winds around 2 am have pushed suspended dust into central and northern Maricopa County. Visibility is reduced from this flow at Sky Harbor, Deer Valley and Scottsdale airports. The moderate winds have finally allowed the southeastern Maricopa County monitors to return to lower PM10 concentrations, although the overall loading of PM10 in the atmosphere keeps concentrations above pre-storm levels.

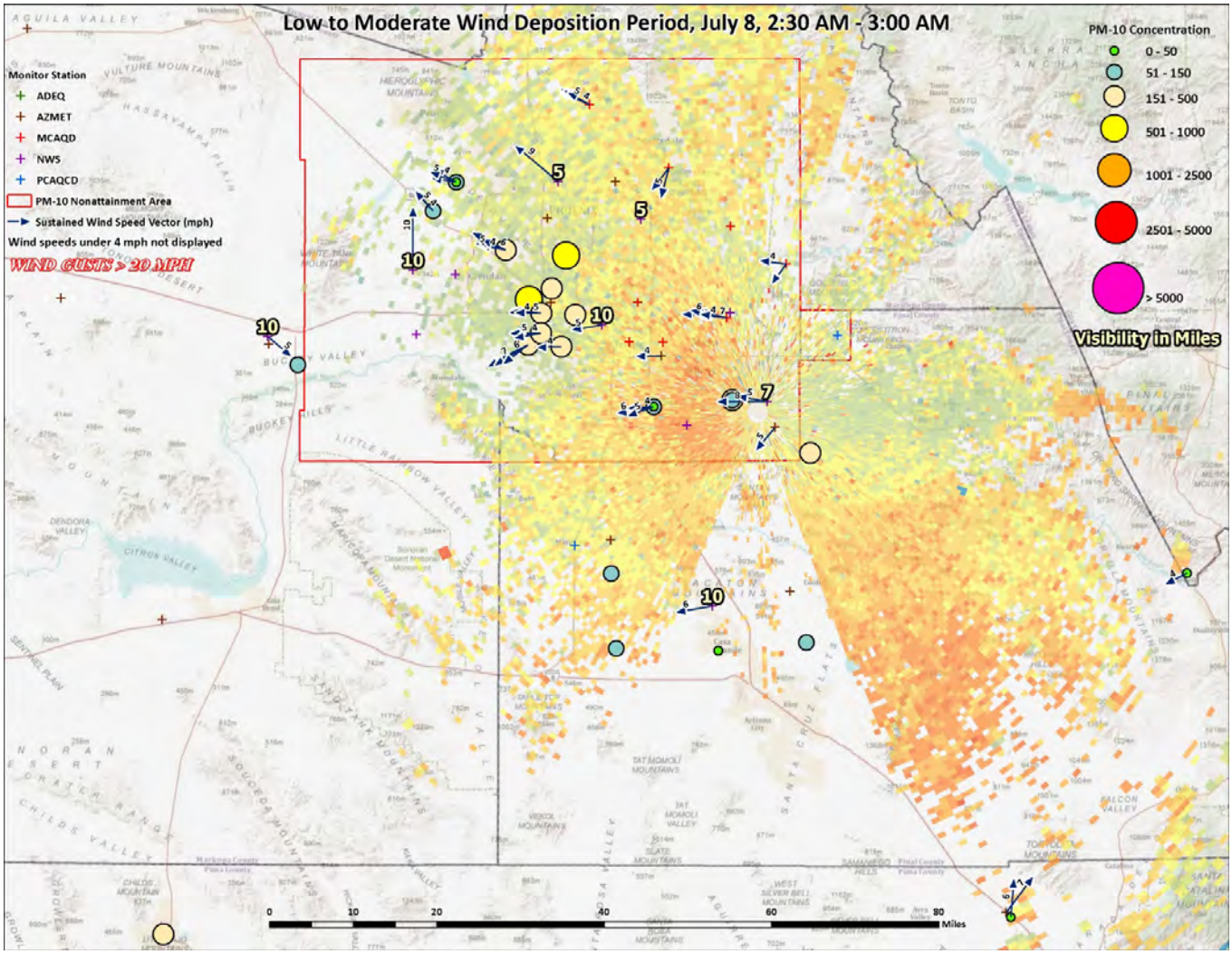


Figure 5-53. Low to Moderate Wind Deposition Period (July 8, 2:30–3:00 AM).

At 3:00 am, concentrations have begun to rise at the western Maricopa County monitors as the dust is carried by prevailing winds. A reduction in visibility is noted again in the southeast portion of Maricopa County, as remaining residual dust from Pinal County is transported in on prevailing winds.

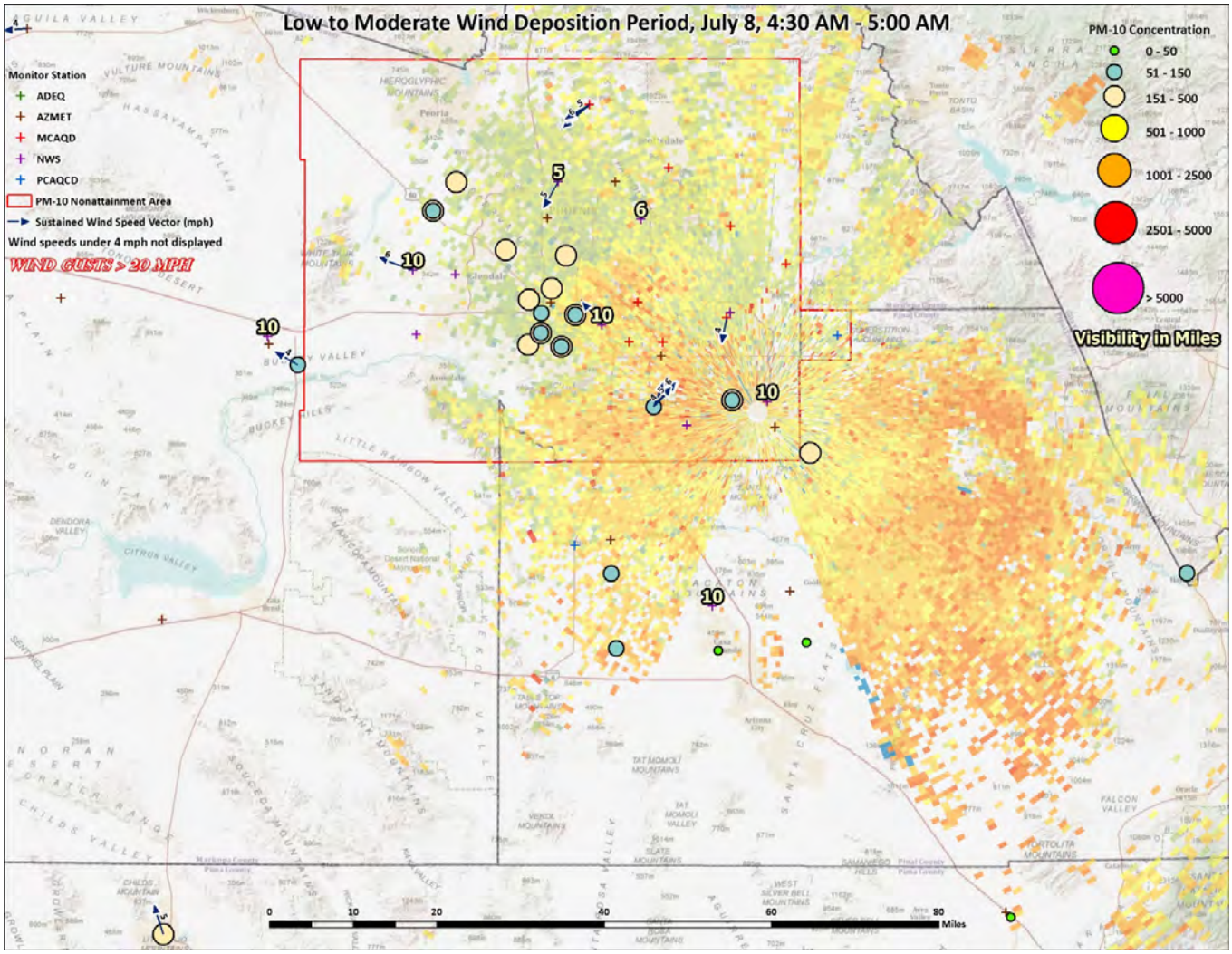


Figure 5-54. Low to Moderate Wind Deposition Period (July 8, 4:30–5:00 AM).

By 5:00 am, the dust from the late evening thunderstorm outflow has largely dispersed evenly throughout the nonattainment area. PM10 concentrations will now begin to decline at all monitors, but will not reach pre-storm levels until approximately 11 am. Despite the high PM10 loading throughout the area, exceedances of the 24-hour PM10 standard on the 8th will only occur at the filter-based Apache Junction monitor where the effects of the late evening July 7th storm provided enough carry-over mass to cause an exceedance on July 8.

Approximate PM10 Emission Source Flux Calculations from Selected Events

Tuesday, July 5, 2011

A preliminary back-of-the envelope calculation was performed of the implied emissions from the storm as follows: Storm front is 100 kilometers wide, 1000 meters tall, with an hourly average concentration of approximately 2,000 micrograms per cubic meter and a speed of 25 meters per second. This would imply that the haboob transported approximately 19,842 tons of PM10 into the Phoenix PM10 nonattainment area. Since this is almost half the total annual inventory figure, a more refined calculation was performed.

Refined Analysis:

The movement of material from south to north across a fixed plane in the east-west axis can be examined to estimate the approximate tonnage of material being suspended and transported by the haboob. Measurements from only the southernmost monitors in the Phoenix Metro area network were used to approximate the east-west plane to avoid duplication. Williams Gateway Airport, near the Higley monitor was used as the eastern extent of the plane since verifiable real-time data east of that point were not available. The Buckeye monitor was used as the western extent of the plane, for the same reason. Monitors utilized in the analysis included Higley, West Chandler, South Phoenix, West 43rd Avenue, and Buckeye. Airport data at Williams Gateway, Chandler, Sky Harbor International, and Luke AFB were relied upon to establish that the dust storm was homogeneous across the region of interest.

The calculation relied upon the 5-minute meteorological and PM10 data for the stations listed above from approximately 7:30 p.m. to 9:30 p.m. The following assumptions were made:

- The depth of the dust storm was approximately 1000 meters and uniform in the vertical dimension (per news reports and NWS analysis);
- The transport of material was uniform within each 5-minute average time period and directly representative of the area of the monitor (500-meters east and west of the monitor coordinate) representing a 1,000 meter wide cross-section in the east-west plane which is uniform;
- The Higley monitoring data are representative of the event at Williams Gateway Airport, and therefore representative of the area between Williams Gateway and the Higley monitor;
- The flux at the east-west coordinate corresponding with Luke Air Force Base along the cross-section can be approximated as a simple average between West 43rd Avenue and Buckeye;
- Simple interpolation between the stations is appropriate to represent the 1,000 meter wide cross section at the mid-points between stations; and,
- The spans between the stations and mid-points are an average of the adjacent station/mid-point flux rates.

Based on these assumptions the 5-minute monitoring data were assembled into a spreadsheet to compute each 5-minute emission source flux between Williams Gateway and Buckeye. The key values for the 5-minute time period from 8:25 p.m. to 8:30 p.m. to demonstrate the computational method, along with the overall hourly and event total emission fluxes across the cross-section, are included in Table 5-1.

This analysis indicates that approximately 12,362 tons of PM10 transported across the 90-kilometer east-west cross section in approximately two hours. This compares to an annual total county wide PM10 emission inventory of approximately 45,000 tons per year. Restating, the approximate annual average emission inventory would be approximately 5 tons per hour; the approximate hourly event emissions were 6,000 tons per hour, a factor of 1,200 higher.

Table 5-1. Summary of PM10 Emission Source Flux Calculation for July 5, 2011

Summary PM10 Emission Source Flux Calculation for July 5, 2011					Conditions for 5-Min Average 8:25 p.m. to 8:30 p.m.				7:30 to 8:30p	8:30 to 9:30p	Total Event
					Flow	Wind	PM10	PM10	PM10	PM10	PM10
Station		UTM-X	Height	Width	Vector	Spd	Conc	Mass	Mass	Mass	Mass
		Meters	Meters	Meters	(Deg)	m/s	ug/m3	Tons	Tons	Tons	Tons
Williams Gateway		438,974	1,000	1,000				15.5	145	64	210
	span		1,000	2,115				32.8	307	136	443
midpoint		435,859	1,000	1,000				15.5	145	64	210
	span		1,000	2,115				32.8	307	136	443
Higley		432,744	1,000	1,000	36	8.2	5,720	15.5	145	64	210
	span		1,000	6,519				90.3	960	420	1,380
midpoint		425,225	1,000	1,000				12.2	150	64	214
	span		1,000	6,519				68.8	989	420	1,409
West Chandler		417,706	1,000	1,000	31	8.1	3,325	8.9	154	64	218
	span		1,000	7,808				86.5	1,055	417	1,471
midpoint		408,898	1,000	1,000				13.3	116	42	159
	span		1,000	7,809				120.5	759	245	1,005
South Phoenix		400,089	1,000	1,000	8	7.8	6,831	17.6	78	20	99
	span		1,000	2,215				37.8	175	38	213
midpoint		396,874	1,000	1,000				16.6	79	14	93
	span		1,000	2,216				35.6	177	23	200
West 43rd Ave		393,658	1,000	1,000	356	11.0	4,272	15.5	80	7	87
	span		1,000	10,038				152.2	724	177	901
midpoint		382,620	1,000	1,000				14.8	64	28	92
	span		1,000	10,039				144.9	561	386	947
Luke AFB (Est)		371,581	1,000	1,000				14.1	48	49	97
	span		1,000	10,176				139.5	403	602	1,006
midpoint		360,405	1,000	1,000				13.3	31	70	101
	span		1,000	10,177				132.1	238	814	1,051
Buckeye		349,228	1,000	1,000	319	14.4	2,650	12.6	15	90	106
Total PM10		89,746	Meters E-W					1259.0	7,905	4,457	12,362

Thursday-Friday, July 7-8, 2011

A similar refined calculation for the late evening event on July 7th was performed for a 2.5 hour period beginning at 10:05 p.m. This event was more localized than the July 5th event and serves as a representation of more typical haboob events that occur in Arizona. As discussed in the conceptual model and earlier in this section, the West Chandler and Higley monitors were primarily impacted by this event, with the Apache Junction filter-based monitor also recording an exceedance of the PM10 NAAQS on the following day. This smaller event had an approximate emission source flux of 1,416 tons in 2.5 hours or approximately 566 tons per hour, approximately 110 times higher than the annual average. This primarily impacted the eastern part of the Phoenix Metro area, though suspended dust remained in the air throughout much of the Valley during the morning of July 8th.

Conclusion

The information presented within this section has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors. The maps provided in this section contain an illustration of each event as they unfold. The series of maps for each event show a spatial and temporal representation of the dust storms as they move throughout Maricopa and Pinal counties. The maps also relate the spatial distribution of the dust boundary (via radar data) to the PM and wind measurements recorded at the specific sites. These maps track the evolution and movement of the thunderstorm outflow boundaries, and the PM contained within these boundaries, and show a clear progression of PM-rich air-masses moving into the Phoenix PM10 nonattainment area. For most cases, the spatial and temporal analyses show a decrease in PM10 concentrations (relative to those measured upwind in Pinal County) as the boundary moves into the Phoenix metropolitan area, an indication that reasonable controls within the nonattainment area may have acted to decrease the magnitude of the event. This information supports the conclusion that the events were primarily drawing from emission sources outside of Maricopa County and were being transported into the Phoenix area. The information that supports this conclusion consists primarily of the maps contained within this section that show the transport of PM across Pinal and Maricopa Counties, but also the graphs in Section II and the time-lapse photography videos contained within Section V.

VI. "BUT FOR" ANALYSIS

Section 50.14(c)(3)(iv)(D) in 40 CFR part 50 requires that an exceptional event demonstration must satisfy 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 the exceedances during the week of July 2–8, 2011 were not reasonably controllable or preventable and there is a clear causal relationship between transported PM10 from thunderstorm outflows originating in the desert areas outside of the Phoenix PM10 nonattainment area and the measured exceedances within the nonattainment area. The weight of evidence in these sections demonstrates that but for the existence of emissions generated by these thunderstorm outflows and associated transported PM10, there would have been no exceedances of the 24-Hour PM10 standard.

As detailed in Section IV, all reasonable control measures were in place and actively enforced before, during, and after the exceedances of July 2–8, 2011. Inspection and compliance data of local fugitive dust sources during this time period revealed that PM10 from anthropogenic activities was well controlled and constant. Local regulatory agencies, industry and the general public were alerted to the possibility of dust storms due to thunderstorm activity through daily forecasts and media reports. Heightened, real-time surveillance of PM10 monitoring stations during the events established a clear link between rapidly rising PM10 concentrations and the arrival of the thunderstorm outflows. On the ground observations recorded during the events consistently identify transported or re-entrained PM10 as the cause of the elevated concentrations near the exceeding monitors.

As shown in Section V, detailed, time series maps establish a clear causal relationship between the arrival of emissions generated by thunderstorm outflows and elevated PM10 concentrations at the monitors. Multiple, independent measurements of wind speed, wind direction, and visibility all point to the presence of thunderstorm outflows as the delivery vehicle for transported PM10 into the nonattainment area. Any local PM10 generated during the arrival of the thunderstorm outflows are linked to the turbulent and gusty outflow front of the storm and pale in comparison to the amount of transported PM10 originating outside the nonattainment area. Estimations of the massive and historic amount of PM10 transported into the region, coupled with visibility photos, clearly establish the re-entrainment of transported PM10 during low wind periods. The source regions for the thunderstorm outflows and transported PM10 are clearly identified as the desert areas outside of the Phoenix PM10 nonattainment area.

The body of evidence presented in this submittal provides no alternative that could tie the exceedances of July 2-8, 2011 to any other causal source but transported and re-entrained PM10 generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.

VII. CONCLUSIONS

The exceedances that occurred during July 2-8, 2011 satisfy the criteria of 40 CFR 50.1(j) and meet the definition of an exceptional event. These criteria are:

- The event affects air quality.
- The event is not reasonably controllable or preventable.
- The event is unlikely to reoccur at a particular location or [is] a natural event.

A. Affects Air Quality

As stated in the preamble to the Exceptional Events Rule, 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.

B. Not Reasonably Controllable or Preventable

Section 50.1(j) of Title 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 and the Phoenix PM10 nonattainment area, high wind conditions overwhelmed all reasonably available controls. Despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM10 emissions into, and also overwhelmed controls within, the Phoenix PM10 nonattainment area. The events discussed in this document that caused the exceedances in this request (see Sections 2 and 5) were caused by thunderstorm driven outflow winds that transported dust into Maricopa County from areas largely outside of the Phoenix PM10 nonattainment area. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM10 emissions into 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 events and exceedances of July 2–8, 2011 recorded within the nonattainment area were not reasonably controllable or preventable.

C. Natural Event

As discussed above, the events shown to cause these exceedances were emissions of PM10 driven by high winds caused by thunderstorm activity and related outflow boundaries during the period of July 2-8, 2011. The events therefore qualify as natural events.

In summary, the exceedances of the federal 24-hour PM10 standard on July 3, July 4, July 5, July 7 and July 8, 2011, would not have occurred but for the monsoonal thunderstorm driven high winds and windblown dust transport from areas largely outside the Phoenix PM10 nonattainment area, based on the following weight of evidence:

- Graphs of PM10 at various Phoenix area monitors in Section II show that the timing of elevated PM10 events was consistent with decreased visibility and reports of blowing dust and/or haze at representative National Weather Service stations.

- Visibility camera imagery discussed in Section II indicates that extremely large quantities of PM10 were transported into the Phoenix Metro area during the week of July 2-8, especially during the July 5th event. The timing of the dust storms depicted in the visibility camera imagery is consistent with the PM10 concentration measurements, elevated winds, and reduced visibility reported during each of the events.

- Historical Fluctuation analyses and graphs in Section III and Appendix A showing five years of 24-hour average data for each of the Maricopa County monitors depict numerous atypically high PM10 concentrations during the third quarter of 2011 including the week of July 2-8. The sudden increase in the frequency of elevated PM10 concentrations during this time period was exceptional from a historical perspective.

- Each of the exceedances of the PM10 standard recorded during the period of July 2-8 are tied to thunderstorm activity and thunderstorm generated outflow winds, as can be seen in radar imagery analyses in Section V.

- Figures in Section V show that the timing of thunderstorm generated outflow boundary passage and increases in wind speeds at monitoring locations and National Weather Service stations during each of the events during this period is consistent with the timing of elevated PM10 concentrations recorded at the monitoring locations in the Phoenix PM10 nonattainment area.

- 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, all depicted in Section V, help show that a vast majority of the dust that impacted Phoenix PM10 nonattainment area monitors originated in Pinal County and other areas located generally south of the Phoenix PM10 nonattainment area.

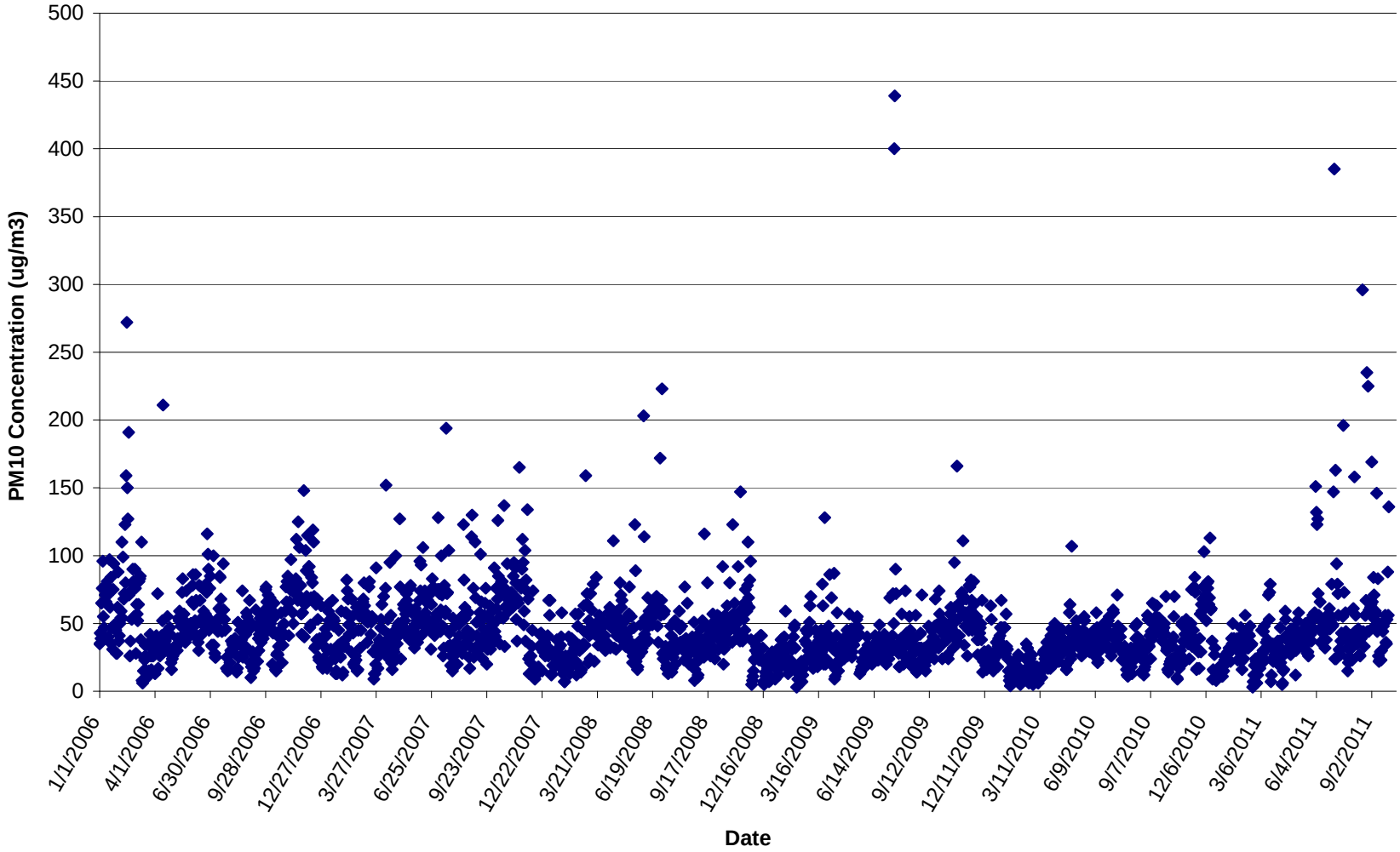
- Approximate PM10 emissions source flux calculations for select events are provided in Section V to give an idea of the magnitude of the dust storms that affected the Phoenix area and the amounts of PM10 that can be transported in during these types of events.

- Section IV discusses rules that are in place in the Phoenix PM10 nonattainment area as well as inspections that were conducted in the area to verify compliance with those rules in order to show that the events are not reasonably controllable or preventable. Additionally, the visibility webcam time lapse photography videos provided in Section II also helps illustrate the magnitude and scale of these events which supports the claim that the exceedances recorded during this period were not reasonably controllable or preventable.

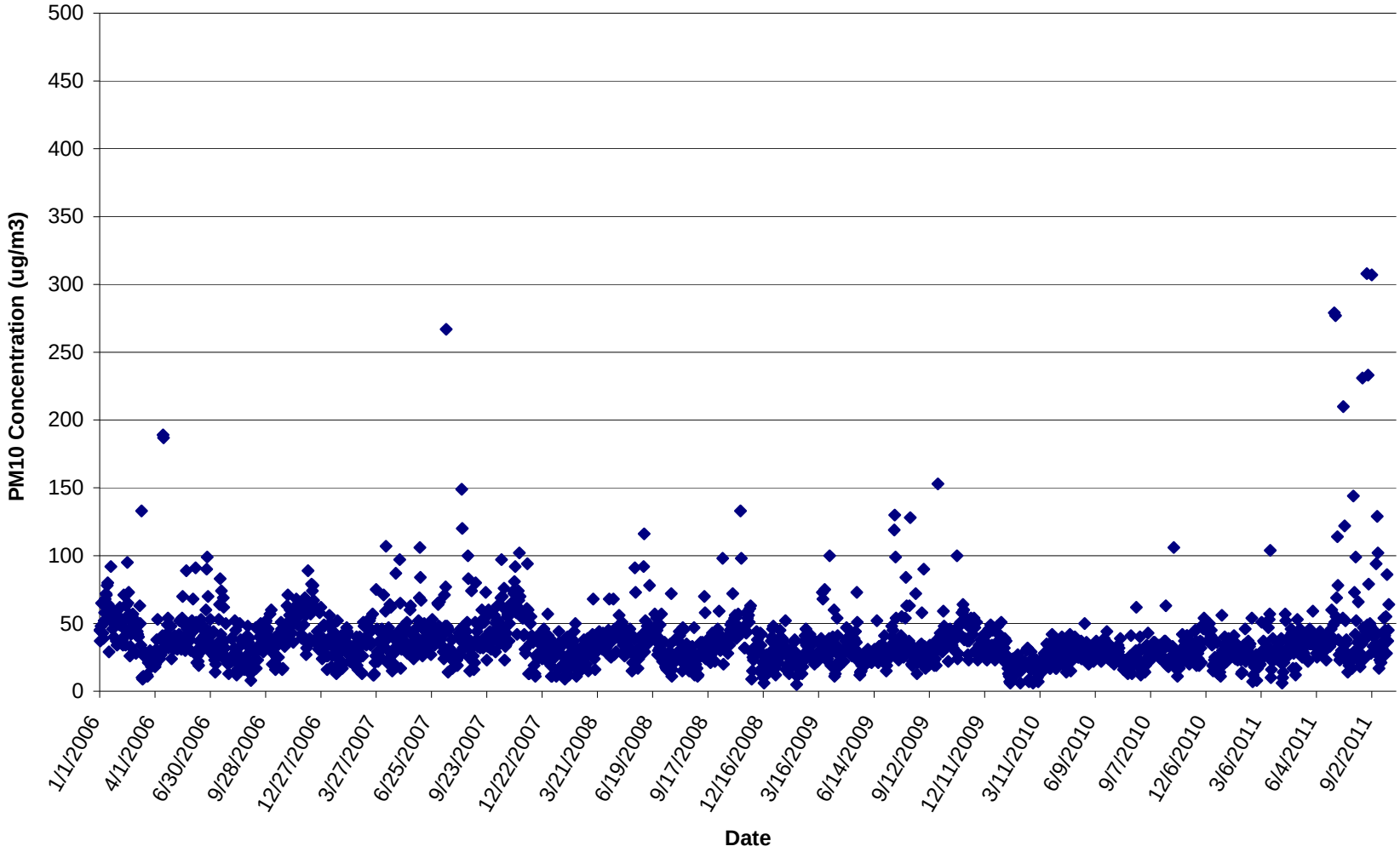
APPENDIX A

HISTORICAL FLUCTUATION GRAPHS FOR MARICOPA COUNTY PM10 SITES

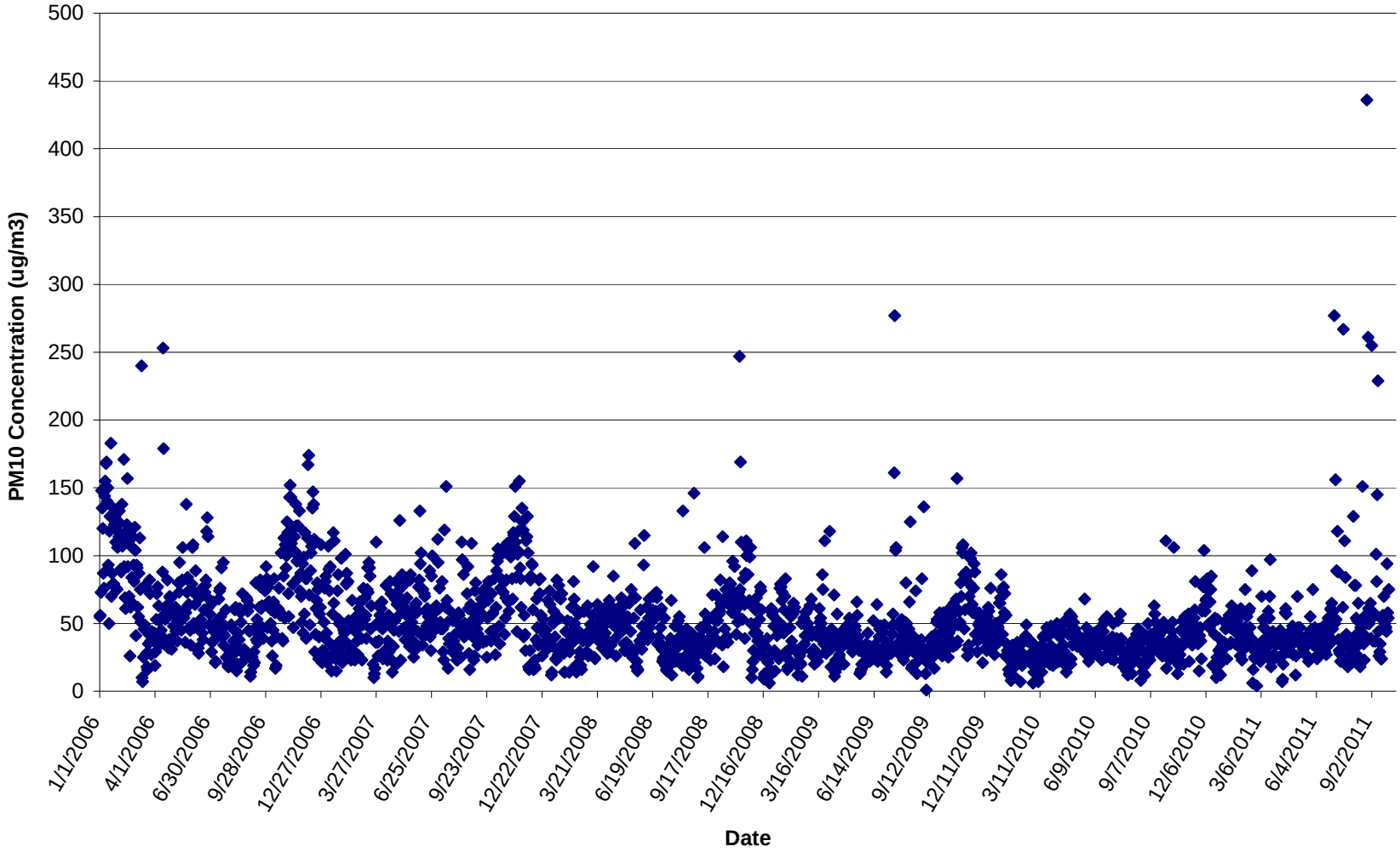
Buckeye 5-Year Historical Fluctuation - 24 Hour Averages



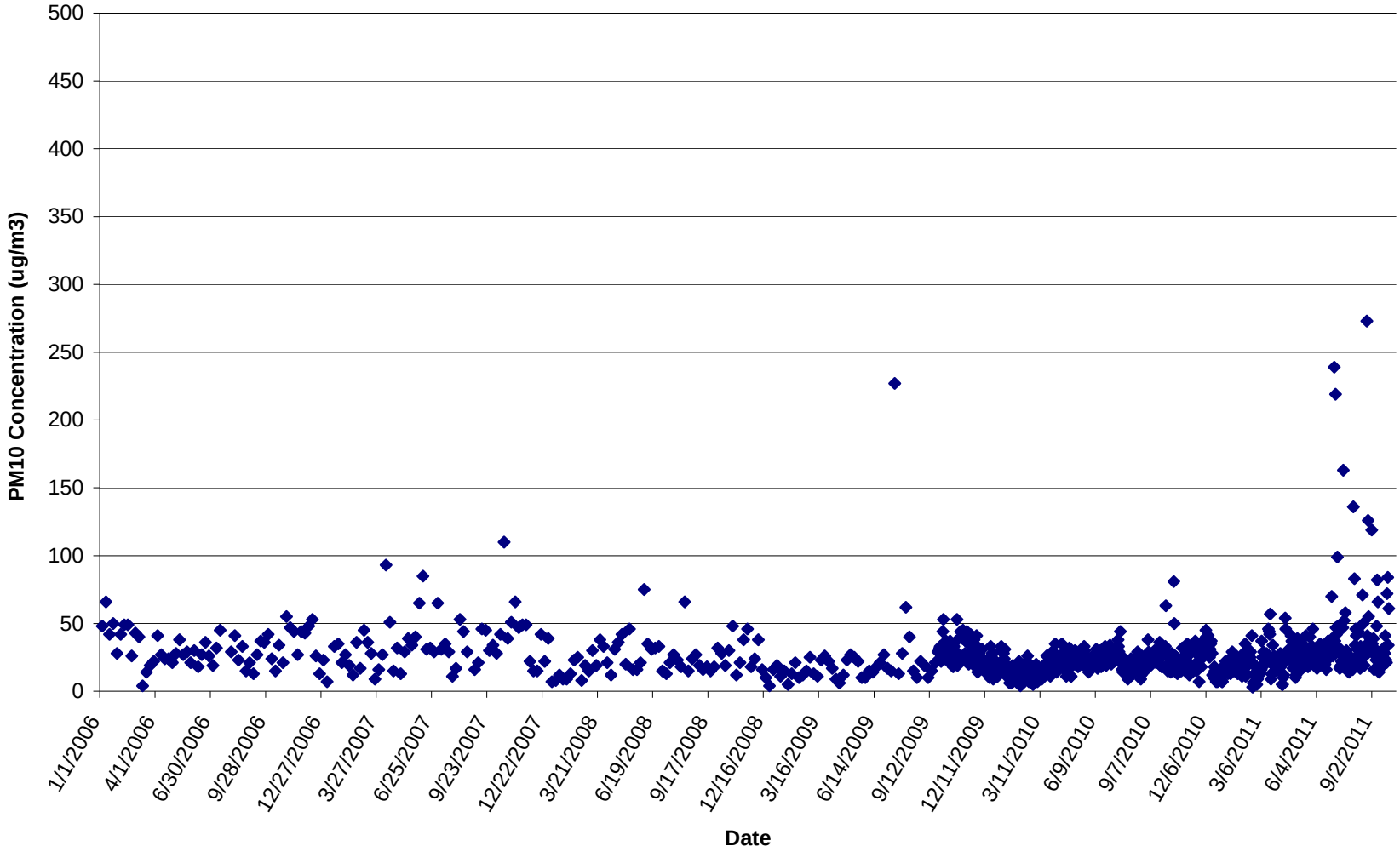
Central Phoenix 5-Year Historical Fluctuation - 24 Hour Averages



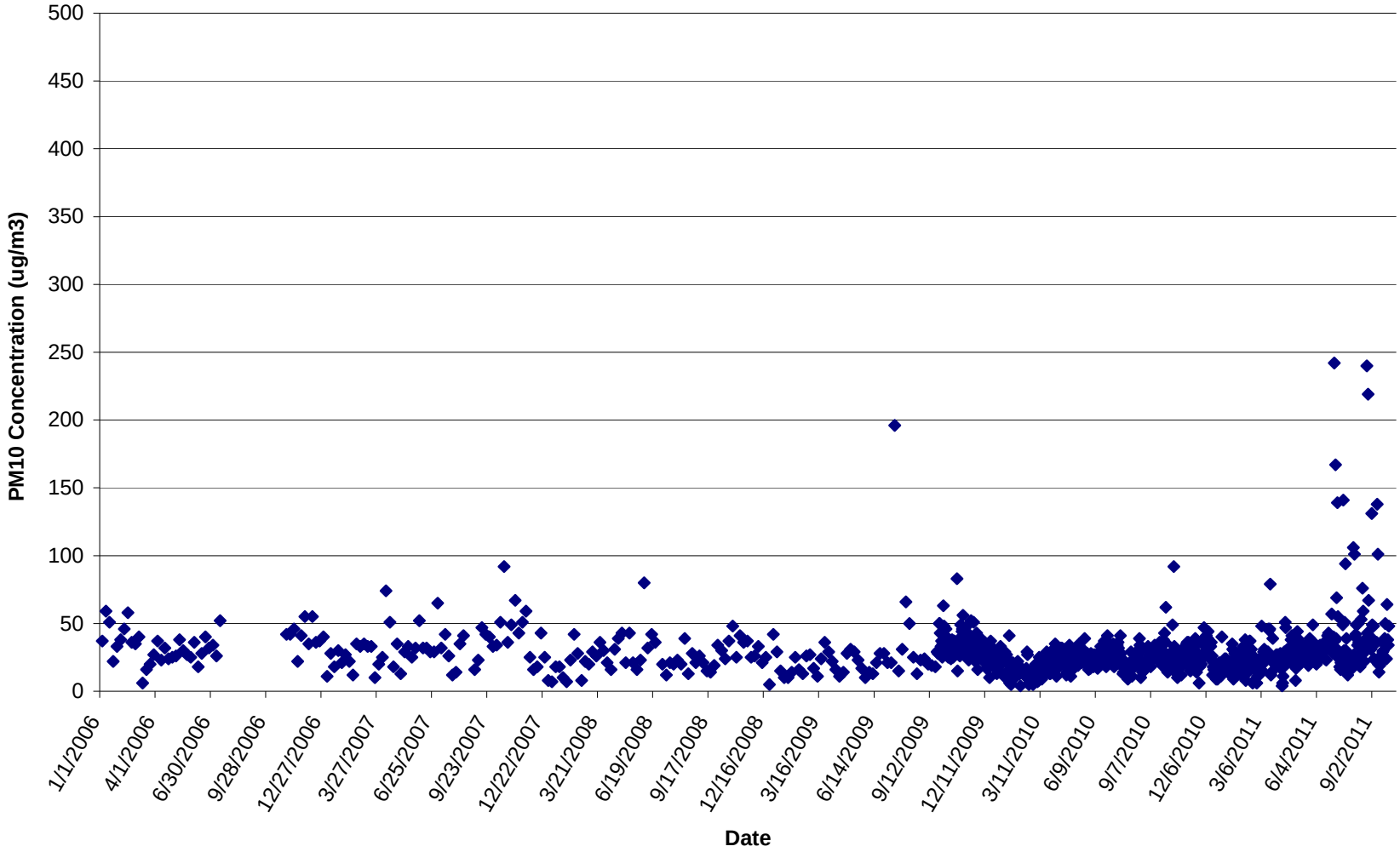
Durango 5-Year Historical Fluctuation - 24 Hour Averages



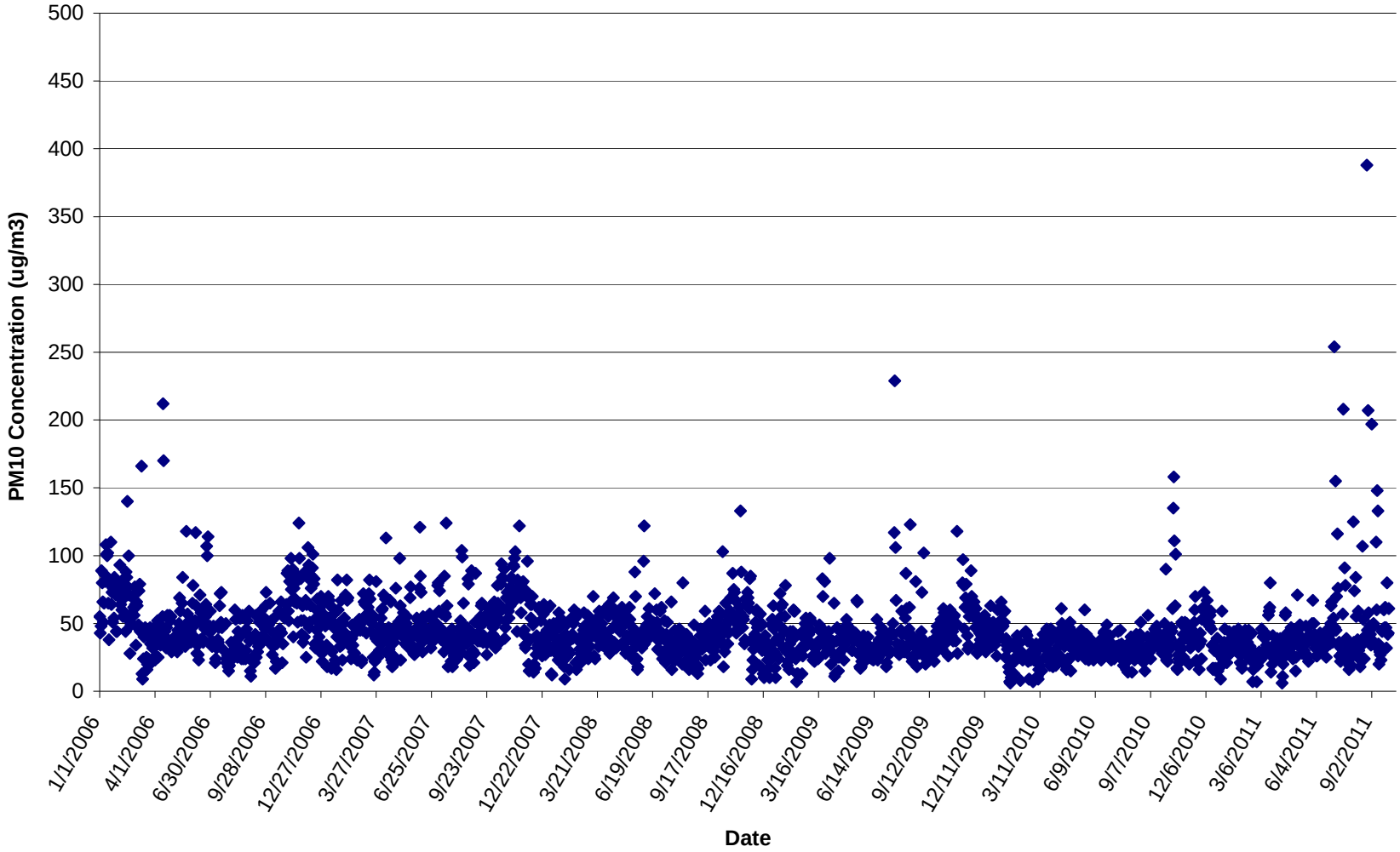
Dysart 5-Year Historical Fluctuation - 24 Hour Averages



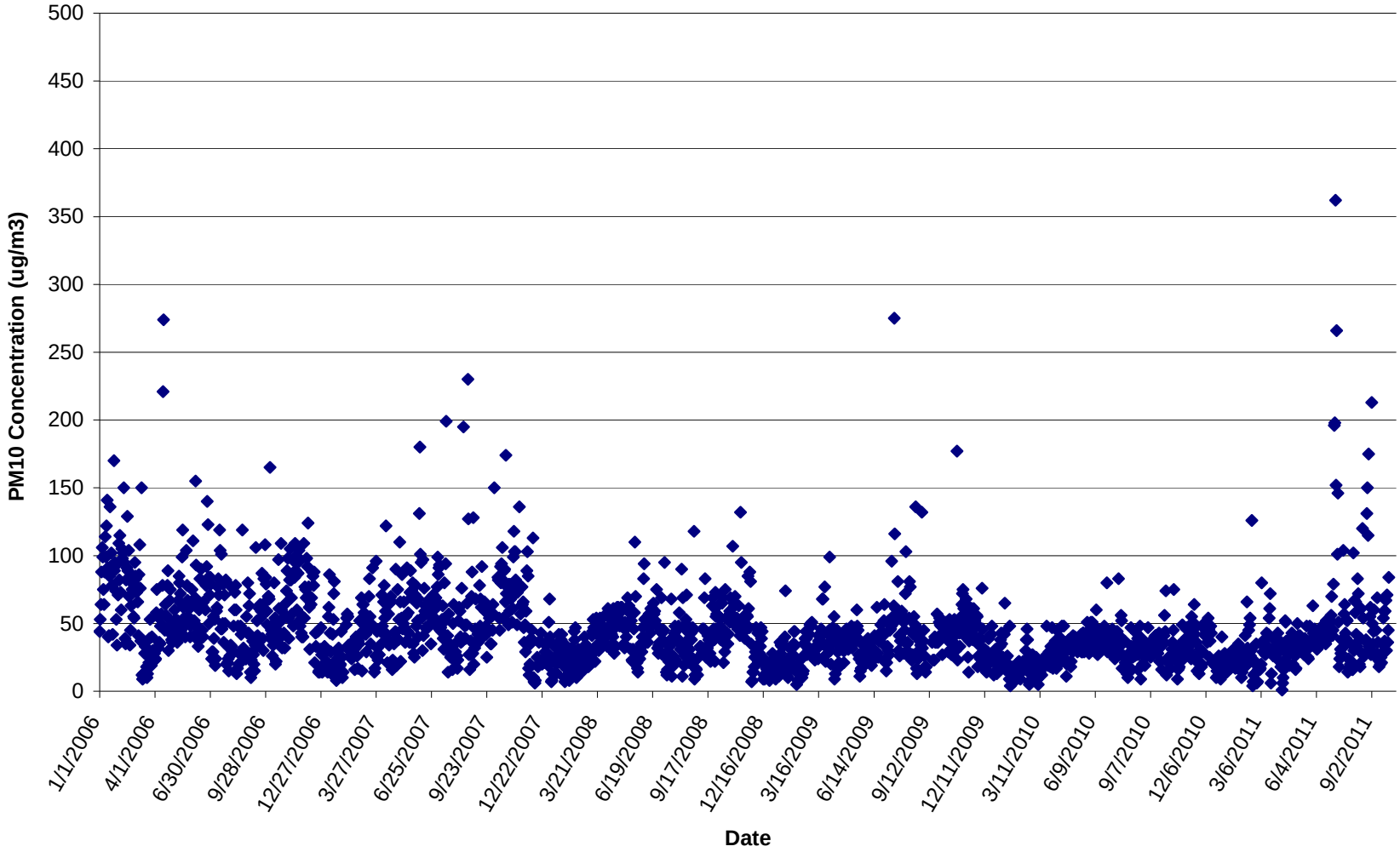
Glendale 5-Year Historical Fluctuation - 24 Hour Averages



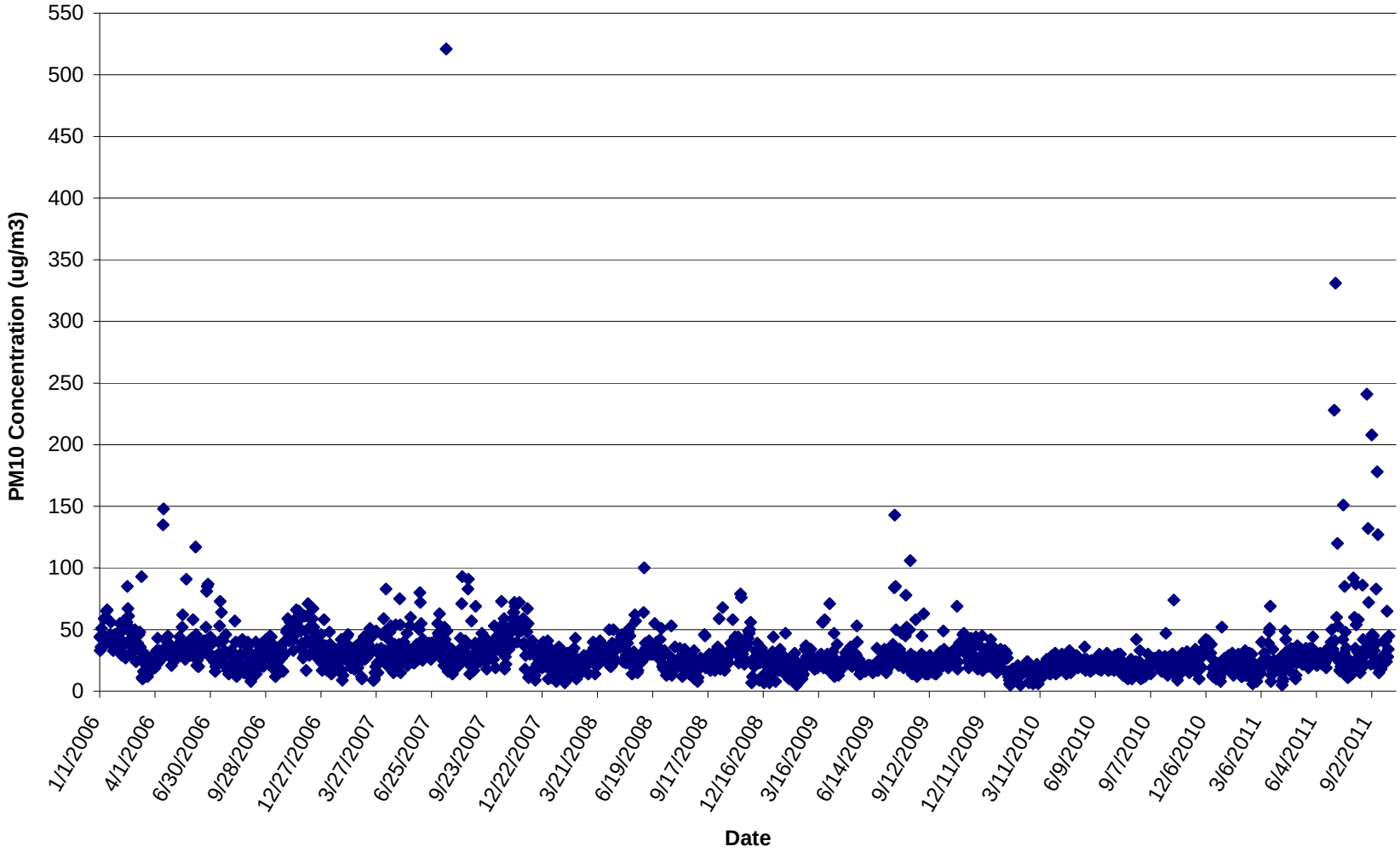
Greenwood 5-Year Historical Fluctuation - 24 Hour Averages



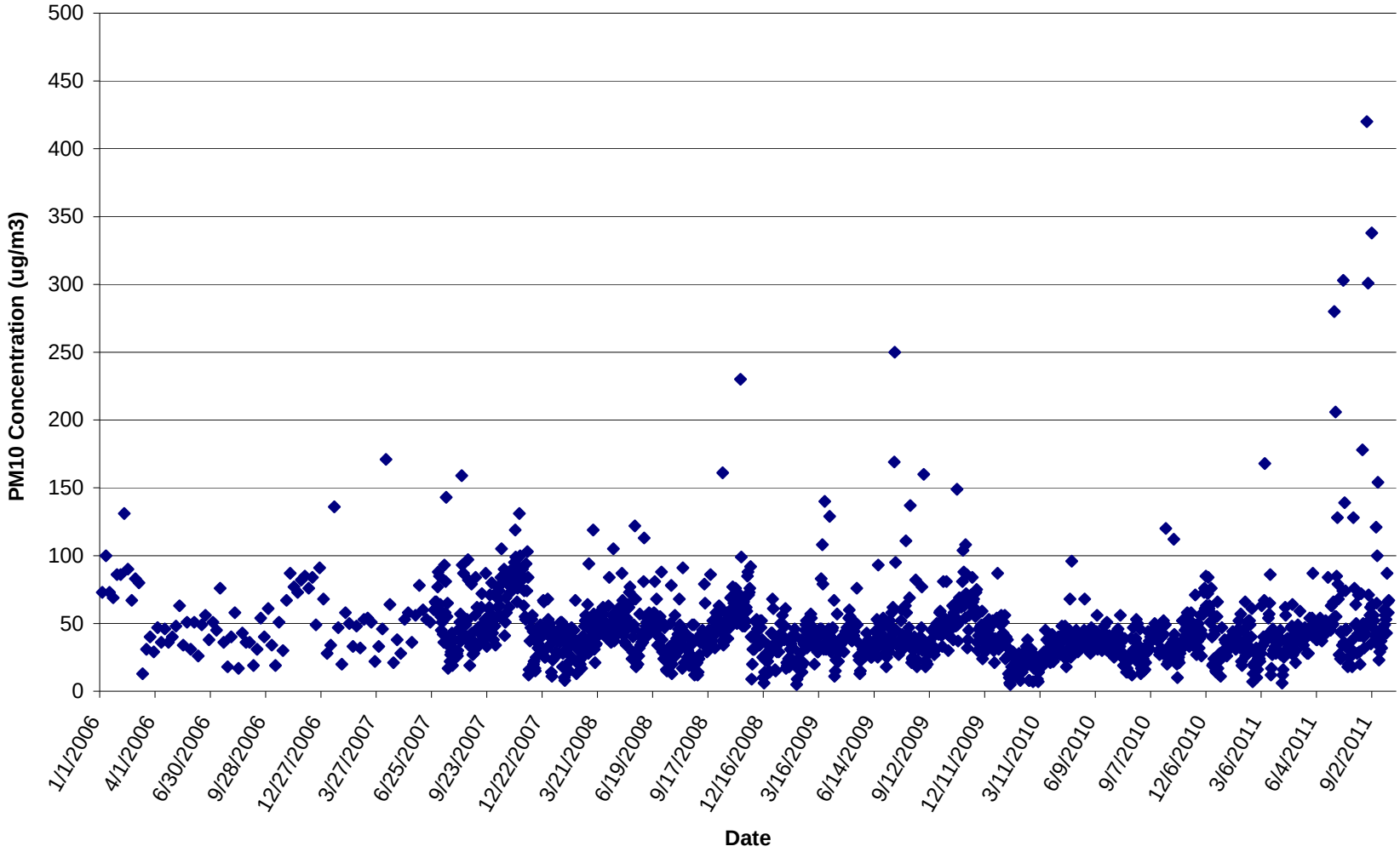
Higley 5-Year Historical Fluctuation - 24 Hour Averages

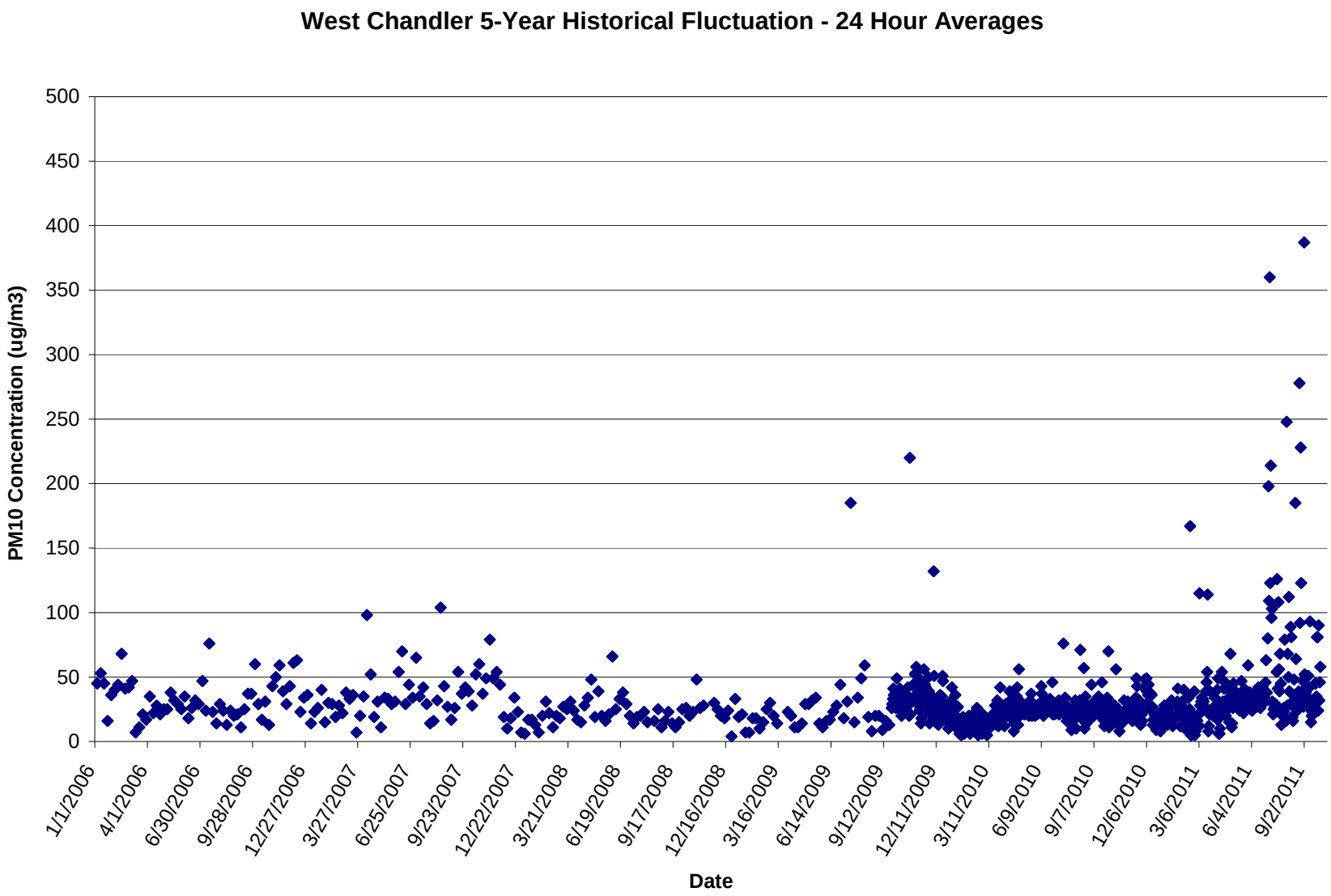


JLG Supersite 5-Year Historical Fluctuation - 24 Hour Averages

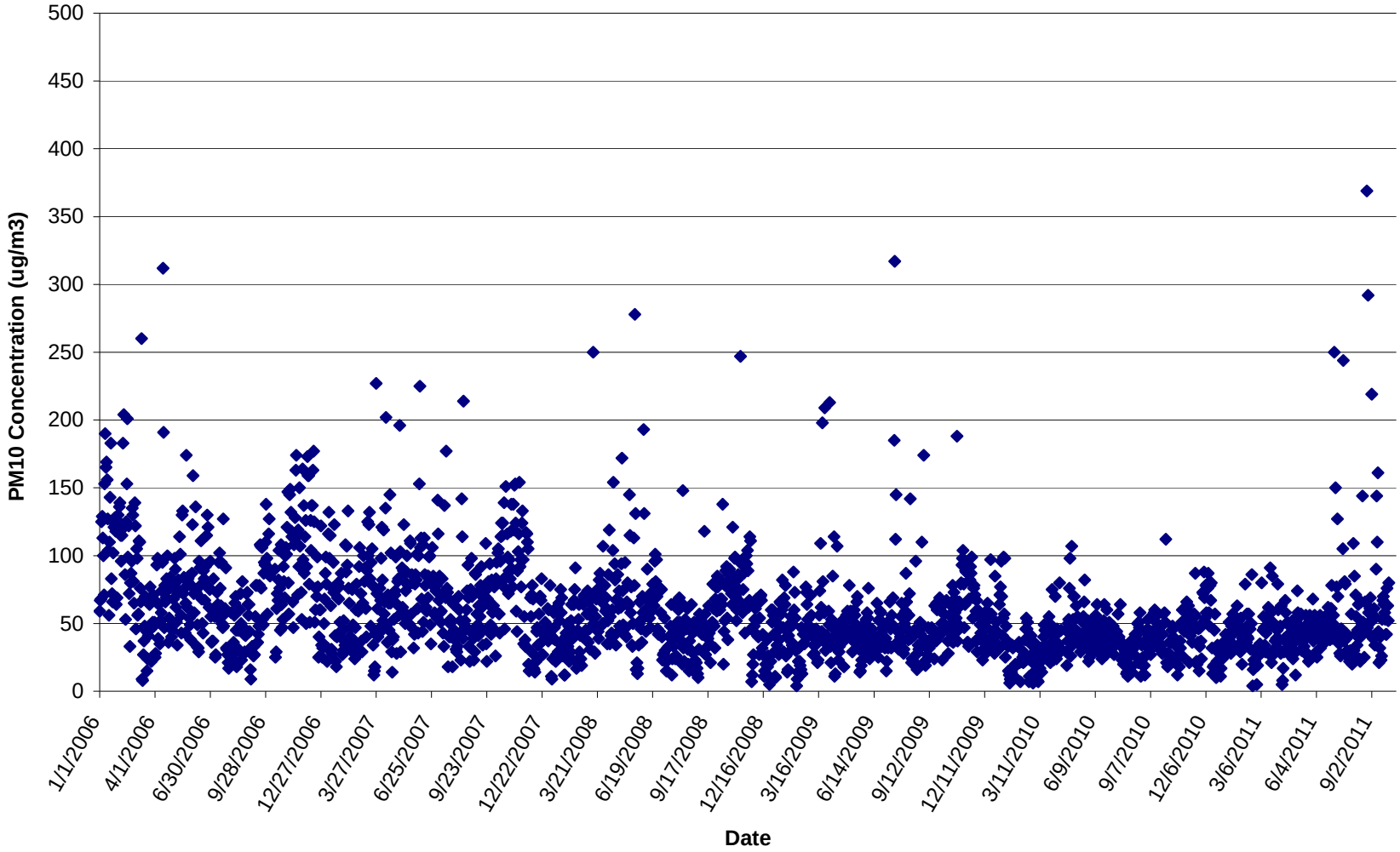


South Phoenix 5-Year Historical Fluctuation - 24 Hour Averages

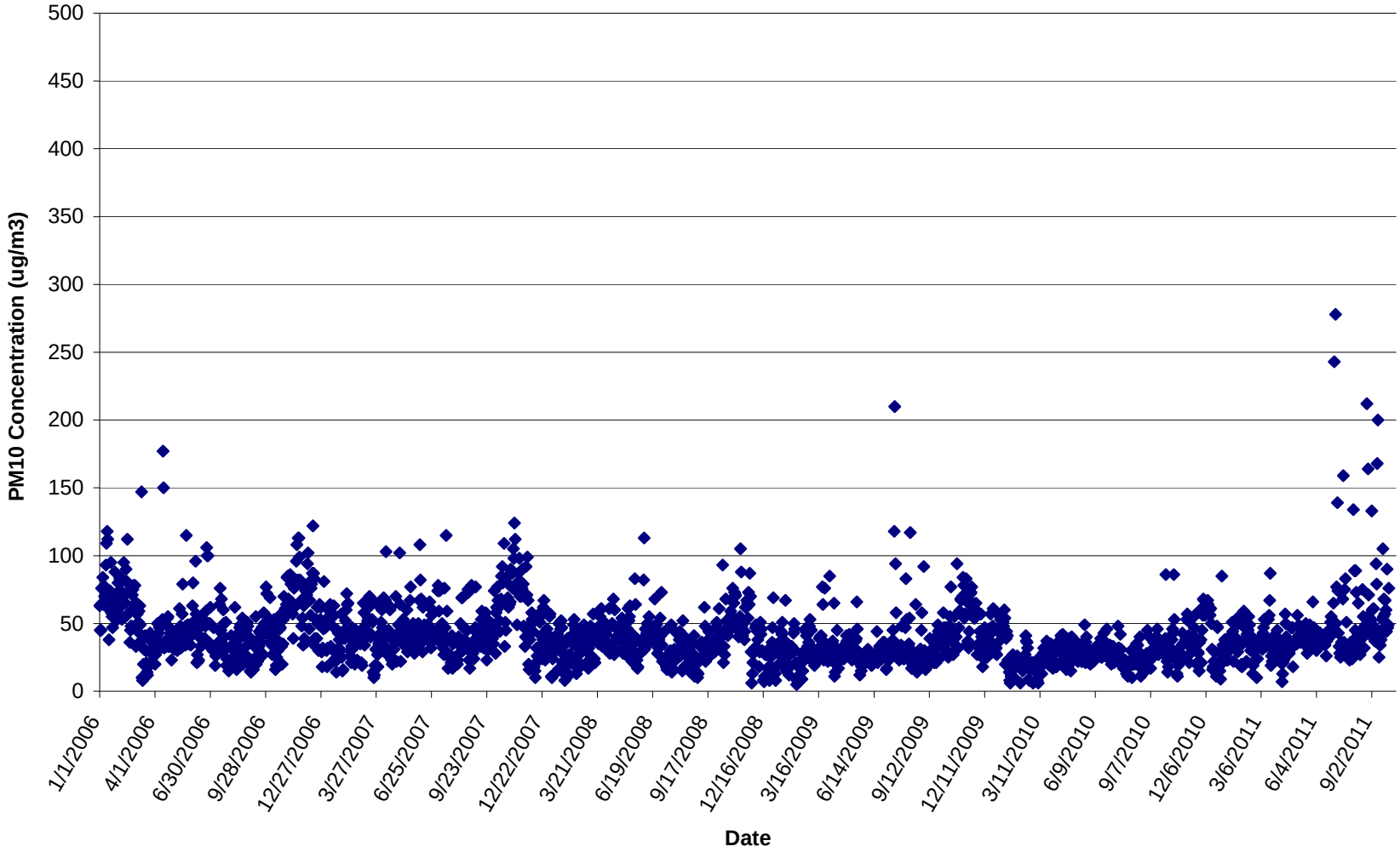



West Chandler 5-Year Historical Fluctuation - 24 Hour Averages
PM10 Concentration (ug/m3)
500
450
400
350
300
250
200
150
100
50
0
1/1/2006
4/1/2006
6/30/2006
9/28/2006
12/27/2006
3/27/2007
6/25/2007
9/23/2007
12/22/2007
3/21/2008
6/19/2008
9/17/2008
12/16/2008
3/16/2009
6/14/2009
9/12/2009
12/11/2009
3/11/2010
6/9/2010
9/7/2010
12/6/2010
3/6/2011
6/4/2011
9/2/2011
Date

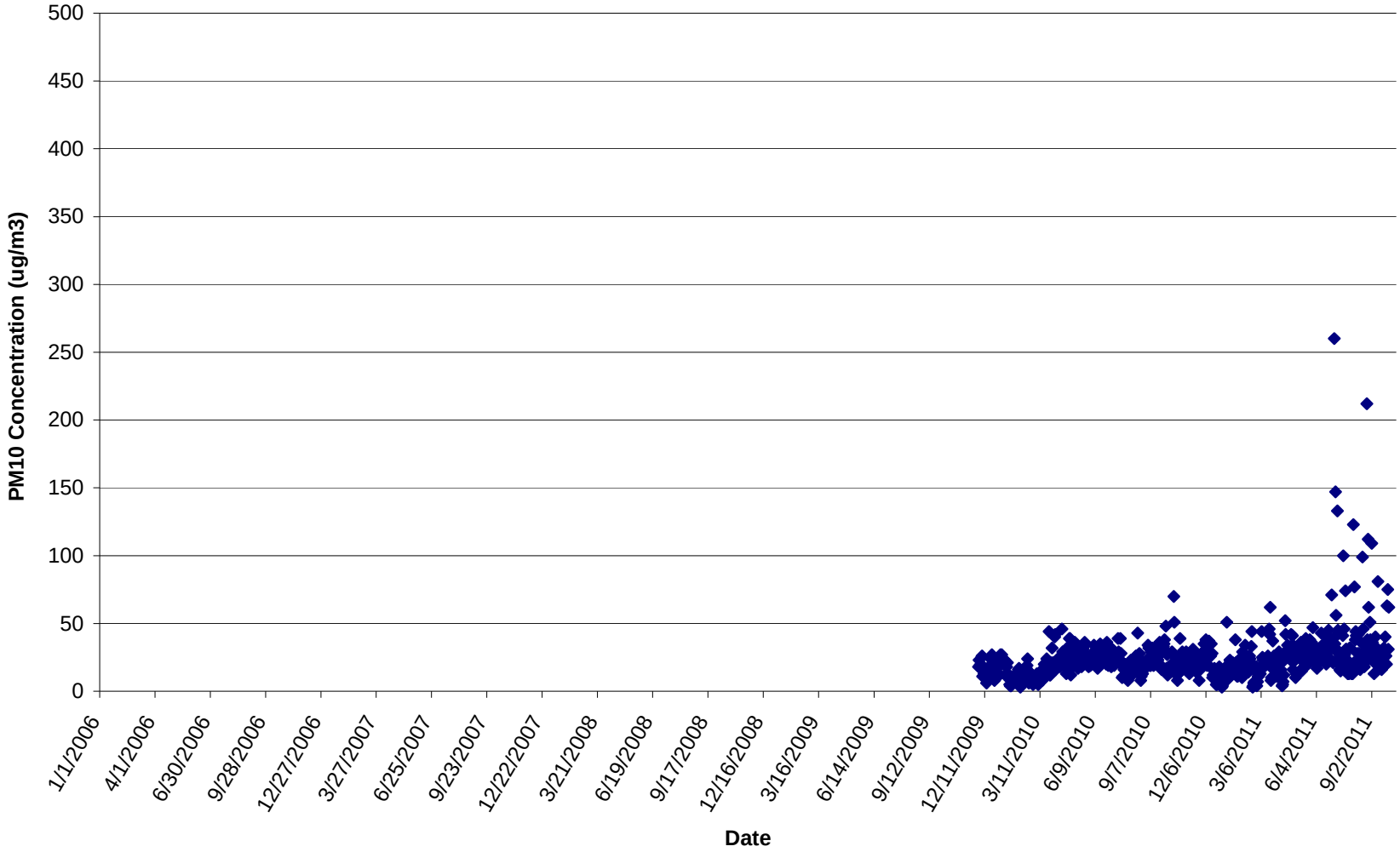
West 43rd 5-Year Historical Fluctuation - 24 Hour Averages



West Phoenix 5-Year Historical Fluctuation - 24 Hour Averages



Zuni Hills 5-Year Historical Fluctuation - 24 Hour Averages



APPENDIX B

ADEQ FORECAST PRODUCTS FOR PHOENIX METRO AND MARICOPA COUNTY

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR SATURDAY, JULY 2, 2011

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 NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY THU 06/30/2011 Highest AQI Reading/Site (Preliminary data only)	TODAY FRI 07/01/2011 HW (Ozone)	TOMORROW SAT 07/02/2011 HPA (Ozone) DUST	EXTENDED SUN 07/03/2011 DUST
O3*	**64** **QUEEN VALLEY**	**93** **MODERATE**	**109** **UNHEALTHY FOR SENSITIVE GROUPS**	**87** **MODERATE**
CO*	**3** **CENTRAL PHOENIX & GREENWOOD**	**8** **GOOD**	**8** **GOOD**	**8** **GOOD**
PM-10*	**47** **SOUTH PHOENIX**	**56** **MODERATE**	**65** **MODERATE**	**80** **MODERATE**
PM-2.5*	**29** **DURANGO**	**40** **GOOD**	**46** **GOOD**	**43** **GOOD**

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

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

Health message for Friday, July 1: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Saturday, July 2: Unusually sensitive people should consider limiting prolonged exertion outdoors.

…AN OZONE HEALTH WATCH REMAINS IN EFFECT FOR FRIDAY, JULY 1, 2011…
…AN OZONE HPA HAS BEEN ISSUED FOR SATURDAY, JULY 2, 2011…

The Monsoon flow will return this afternoon through early next week. As a result significant thunderstorm development will resume over the higher terrain of Arizona to the southeast, east, and northeast of the Phoenix forecast area. This shift in the weather pattern also has an affect on our local pollution levels. An abrupt shift in winds out of the east tends to lock ozone concentrations in the Valley. We anticipated this shift beginning on Friday but taking full effect on Saturday. It now appears that it has happened a day earlier. We already have an Ozone Health Watch in place for Friday. We are now issuing an Ozone High Pollution Advisory for Saturday. Highest concentrations are expected to be in the central, west, and northwest part of the Phoenix forecast area. Monitors with forecasted highest levels include but are not limited to: Glendale, North Phoenix, West Phoenix, Central Phoenix and even Dysart. Under such a wind pattern, east valley monitors tend to have lower concentrations of ozone. As the flow persists, concentrations will become lower as ozone and precursors are dispersed to the west. Thus, Sunday's highest levels should climb no higher than the upper MODERATE range of the Air Quality Index (AQI).

Another threat from thunderstorm activity over the mountains south, east, and northeast of the forecast area is blowing dust. As the storms collapse, cold air from heights near 40,000-60,000 feet come crashing to the surface and spread in all directions like liquid spilling onto the floor from a glass on a table. Such outflow can generate significant dust storms resulting in unhealthy dust levels. We anticipate one or more dust storms through early next week. Rain is possible during the late evening or early morning hours of Saturday through Tuesday which may help settle some airborne dust while stabilizing the soil.

Check back on Sunday for your 4th of July weather and air quality forecast. Until then, have a great weekend! -J.Paul

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

POLLUTION MONITOR READINGS FOR THURSDAY, JUNE 30, 2011

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 (La Paz County)	72	90	
Apache Junction (Pinal County)	49	42	
Blue Point	60	51	
Buckeye	47	40	
Casa Grande	45	38	
Cave Creek	53	45	
Central Phoenix	48	41	
Dysart	45	38	
Falcon Field	NOT AVBL	NOT AVBL	NOT AVBL
Fountain Hills	53	45	
Glendale	50	42	
Humboldt Mountain	51	43	
North Phoenix	50	42	

Phoenix Supersite	50	42	
Pinal Air Park (Pinal County)	47	40	
Pinnacle Peak	48	41	
Queen Valley (Pinal County)	64	64	HIGHEST LOCALLY
Rio Verde	50	42	
South Phoenix	50	42	
South Scottsdale	53	45	
Tempe	50	42	
Tonto Nat'l Mon. (Gila County)	52	44	
West Chandler	53	45	
West Phoenix	53	45	
Yuma	67	74	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Central Phoenix	0.3	3	
Greenwood	0.3	3	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.2	2	

PM-10 (PARTICLES)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Buckeye	48.8	44	
Central Phoenix	37.2	34	
Combs School (Pinal County)	54.5	50	
Durango	46.7	43	
Dysart	33.5	31	
Glendale	33.4	30	
Greenwood	36.8	34	
Higley	42.3	39	
Maricopa (Pinal County)	43.3	40	
Phoenix Supersite	36.1	33	
South Phoenix	51.1	47	HIGHEST LOCALLY
West Chandler	39.0	36	
West Forty Third	39.6	36	
West Phoenix	NOT AVBL	NOT AVBL	NOT AVBL
Zuni Hills	35.7	33	

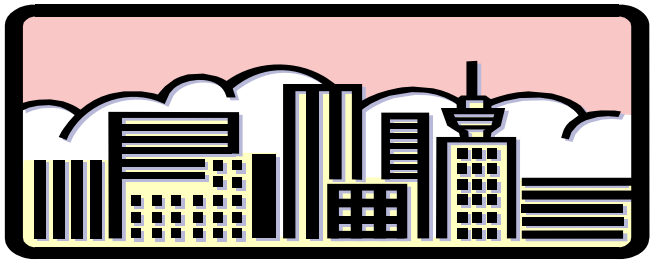
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

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

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Durango	8.9	29	
Dysart	5.5	18	
Estrella Mountain Park	5.8	19	
Glendale	6.1	20	
Phoenix Supersite	8.5	28	
South Phoenix	5.6	18	
Vehicle Emissions Lab	5.1	17	
West Phoenix	7.2	23	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

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

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

Unit of measurement – Parts per billion (ppb).

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

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

CO (CARBON MONOXIDE):

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

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

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

Unit of measurement – Parts per million (ppm).

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

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

PM-10 & PM-2.5 (PARTICLES):

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

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

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

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

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR MONDAY, JULY 4, 2011

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 **NOTICES** (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY SAT 07/02/2011 HPA **(Ozone)** **DUST** Highest AQI Reading/Site (Preliminary data only)	TODAY SUN 07/03/2011 **DUST**	TOMORROW MON 07/04/2011 **DUST**	EXTENDED TUE 07/05/2011 **DUST**
O3*	**58** **MULTIPLE SITES**	**87** **MODERATE**	**54** **MODERATE**	**61** **MODERATE**
CO*	**13** **GREENWOOD**	**8** **GOOD**	**9** **GOOD**	**7** **GOOD**
PM-10*	**97** **BUCKEYE**	**80** **MODERATE**	**65** **MODERATE**	**60** **MODERATE**
PM-2.5*	**49** **DURANGO**	**43** **GOOD**	**46** **GOOD**	**43** **GOOD**

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

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

Health message for Sunday, July 3: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Monday, July 4: Unusually sensitive people should consider limiting prolonged exertion outdoors.

The first real shot for Monsoon storms in the Valley ended with a whimper Saturday and strong cells collapse just east of the Valley and failed to generated secondary cells over the Valley. Significant dust pushed particulates close to an exceedance of the 24-hr PM10 health standard in parts of the Phoenix forecast area. Buckeye registered a 97 on the Air Quality Index (AQI) for the day with a one-hour concentration over 1700 micrograms per cubic meter! The same threat exists each of the next two days. The best chance for Valley rain will be Monday night. That's right. The 4th of July…

Valley ozone levels dropped off nicely Saturday while under a High Pollution Advisory. The sustained east-to-west flow will keep ozone and precursors mixing and dispersing to the west. This will keep maximum 8-hr concentration in the lower MODERATE range for the next few days. Interestingly, Yuma exceeded the ozone standard on Saturday due to the same flow.

Check back on tomorrow for the latest. With a salute to all the men and women who have served or are currently serving our country, have a happy, safe 4th! -J.Paul

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

POLLUTION MONITOR READINGS FOR SATURDAY, JULY 2, 2011

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 (La Paz County)	57	48	
Apache Junction (Pinal County)	47	40	
Blue Point	51	43	
Buckeye	56	47	
Casa Grande	55	47	
Cave Creek	57	48	
Central Phoenix	57	48	
Dysart	61	54	
Falcon Field	52	44	
Fountain Hills	53	45	
Glendale	62	58	
Humboldt Mountain	62	58	
North Phoenix	59	50	
Phoenix Supersite	61	54	
Pinal Air Park (Pinal County)	49	42	
Pinnacle Peak	53	45	
Queen Valley (Pinal County)	51	43	
Rio Verde	50	42	
South Phoenix	54	46	
South Scottsdale	53	45	
Tempe	50	42	
Tonto Nat'l Mon. (Gila County)	NOT AVBL	NOT AVBL	NOT AVBL
West Chandler	54	46	

West Phoenix	60	51	
Yuma	76	101	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Central Phoenix	0.8	9	
Greenwood	1.1	13	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.9	10	

PM-10 (PARTICLES)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Buckeye	148.0	97	
Central Phoenix	50.1	46	
Combs School (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Durango	59.9	53	
Dysart	36.3	33	
Glendale	41.0	37	
Greenwood	54.9	50	
Higley	79.6	63	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	44.1	40	
South Phoenix	67.0	57	
West Chandler	80.7	64	
West Forty Third	56.5	52	
West Phoenix	66.4	57	
Zuni Hills	39.8	36	

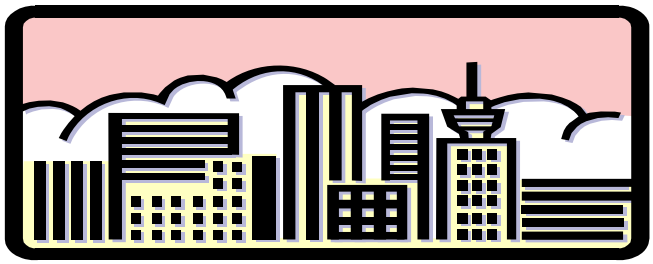
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

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

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Durango	15.2	49	
Dysart	6.0	19	
Estrella Mountain Park	6.9	22	
Glendale	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	12.6	41	
South Phoenix	10.5	34	
Vehicle Emissions Lab	6.8	22	
West Phoenix	12.9	42	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

Description – This is a secondary pollutant that is formed by the reaction of other primary

pollutants (precursors) such as VOCs (volatile organic compounds) and NOx (Nitrogen Oxides) in the presence of heat and sunlight.
Sources – VOCs are emitted from motor vehicles, chemical plants, refineries, factories, and other industrial sources. NOx is emitted from motor vehicles, power plants, and other sources of combustion.
Potential health impacts – Exposure to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other effects include decrease in lung function, chest pain, and cough.
Unit of measurement – Parts per billion (ppb).
Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight).
Reduction tips – Curtail daytime driving, refuel cars and use gasoline-powered equipment as late in the day as possible.

CO (CARBON MONOXIDE):

Description – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely.
Sources – In cities, as much as 95 percent of all CO emissions emanate from automobile exhaust. Other sources include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak concentrations occur in colder winter months.
Potential health impacts – Reduces oxygen delivery to the body's organs and tissues. The health threat is most serious for those who suffer from cardiovascular disease.
Unit of measurement – Parts per million (ppm).
Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight)
Reduction tips – Keep motor vehicle tuned properly and minimize nighttime driving.

PM-10 & PM-2.5 (PARTICLES):

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations such as the "Valley Brown Cloud" (see http://www.phoenixvis.net/). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".
Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.
Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.
Units of measurement – Micrograms per cubic meter (ug/m3)
Averaging interval – 24 hours (midnight to midnight).
Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{Updated 03/23/2010}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR TUESDAY, JULY 5, 2011

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 **NOTICES** (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY SUN 07/03/2011 **DUST** Highest AQI Reading/Site (Preliminary data only)	TODAY MON 07/04/2011 **DUST**	TOMORROW TUE 07/05/2011 **DUST**	EXTENDED WED 07/06/2011 **DUST**
O3*	**54** **NORTH PHOENIX & WEST PHOENIX**	**54** **MODERATE**	**61** **MODERATE**	**61** **MODERATE**
CO*	**6** **GREENWOOD**	**9** **GOOD**	**7** **GOOD**	**6** **GOOD**
PM-10*	**244** **BUCKEYE**	**65** **MODERATE**	**75** **MODERATE**	**70** **MODERATE**
PM-2.5*	**97** **DURANGO**	**46** **GOOD**	**43** **GOOD**	**43** **GOOD**

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

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

Health message for Monday, July 4: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Tuesday, July 5: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Another round of thunderstorms with blowing dust and possibly some Valley rain is likely Monday evening. One way or another, there will be a good light show in the sky. There's plenty of moisture available that the threat of fires from lightning (of fireworks) has been decreased.

Blowing dust Sunday evening led to every PM10 monitor in the network exceeding the health standard. Buckeye had Very High (code PURPLE) levels on the Air Quality Index. A repeat performance is possible later tonight.

Ozone has benefited greatly from the continued southeast to northwest flow. Highest levels were only in the lower MODERATE range. This is not expected to change much in the Valley the next few days.

Check back on tomorrow for the latest. Have a happy, safe 4th! -J.Paul

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

POLLUTION MONITOR READINGS FOR SUNDAY, JULY 3, 2011

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 (La Paz County)	NOT AVBL	NOT AVBL	NOT AVBL
Apache Junction (Pinal County)	57	48	
Blue Point	58	49	
Buckeye	49	42	
Casa Grande	54	46	
Cave Creek	60	51	
Central Phoenix	58	49	
Dysart	50	42	
Falcon Field	55	47	
Fountain Hills	NOT AVBL	NOT AVBL	NOT AVBL
Glendale	56	47	
Humboldt Mountain	59	50	
North Phoenix	61	54	
Phoenix Supersite	60	51	
Pinal Air Park (Pinal County)	53	45	
Pinnacle Peak	57	48	
Queen Valley (Pinal County)	53	45	
Rio Verde	56	47	
South Phoenix	NOT AVBL	NOT AVBL	NOT AVBL
South Scottsdale	57	48	
Tempe	53	45	
Tonto Nat'l Mon. (Gila County)	47	40	
West Chandler	58	49	
West Phoenix	61	54	
Yuma	46	39	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Central Phoenix	0.2	2	
Greenwood	0.5	6	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.2	2	

PM-10 (PARTICLES)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Buckeye	385.7	244	
Central Phoenix	279.8	163	
Combs School (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Durango	278.1	162	
Dysart	240.1	143	
Glendale	242.9	144	
Greenwood	254.6	150	
Higley	196.9	122	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	229.0	137	
South Phoenix	280.8	164	
West Chandler	199.2	123	
West Forty Third	250.8	148	
West Phoenix	244.2	145	
Zuni Hills	260.8	154	

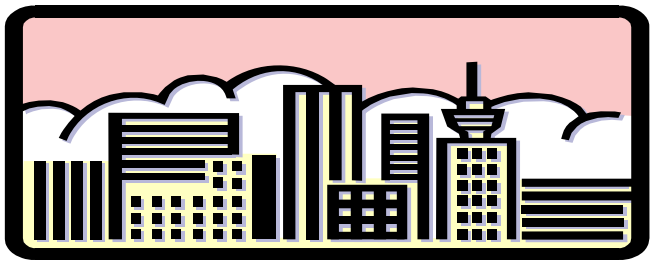
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

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

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Durango	34.6	98	
Dysart	19.9	62	
Estrella Mountain Park	21.6	66	
Glendale	30.6	88	
Phoenix Supersite	33.6	96	
South Phoenix	20.9	64	
Vehicle Emissions Lab	19.0	60	
West Phoenix	25.8	76	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

Sources – VOCs are emitted from motor vehicles, chemical plants, refineries, factories, and other industrial sources. NOx is emitted from motor vehicles, power plants, and other sources of combustion.
Potential health impacts – Exposure to ozone can make people more susceptible to respiratory infection, result in lung inflammation, and aggravate pre-existing respiratory diseases such as asthma. Other effects include decrease in lung function, chest pain, and cough.
Unit of measurement – Parts per billion (ppb).
Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight).
Reduction tips – Curtail daytime driving, refuel cars and use gasoline-powered equipment as late in the day as possible.

CO (CARBON MONOXIDE):

Description – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely.
Sources – In cities, as much as 95 percent of all CO emissions emanate from automobile exhaust. Other sources include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak concentrations occur in colder winter months.
Potential health impacts – Reduces oxygen delivery to the body's organs and tissues. The health threat is most serious for those who suffer from cardiovascular disease.
Unit of measurement – Parts per million (ppm).
Averaging interval – Highest eight-hour period within a 24-hour period (midnight to midnight)
Reduction tips – Keep motor vehicle tuned properly and minimize nighttime driving.

PM-10 & PM-2.5 (PARTICLES):

Description – The term "particulate matter" (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as "fine" particles and are responsible for many visibility degradations such as the "Valley Brown Cloud" (see http://www.phoenixvis.net/). Particles with diameters between 2.5 and 10 micrometers are referred to as "coarse".
Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.
Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.
Units of measurement – Micrograms per cubic meter (ug/m3)
Averaging interval – 24 hours (midnight to midnight).
Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR WEDNESDAY, JULY 6, 2011

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 **NOTICES** (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY MON 07/04/2011 **DUST** Highest AQI Reading/Site (Preliminary data only)	TODAY TUE 07/05/2011 **DUST**	TOMORROW WED 07/06/2011 HW **(Ozone)**	EXTENDED THU 07/06/2011 HW **(Ozone) Possible**
O3*	**122** **RIO VERDE**	**61** **MODERATE**	**93** **MODERATE**	**90** **MODERATE**
CO*	**5** **GREENWOOD**	**7** **GOOD**	**6** **GOOD**	**6** **GOOD**
PM-10*	**122** **HIGLEY**	**75** **MODERATE**	**58** **MODERATE**	**55** **MODERATE**
PM-2.5*	**42** **PHOENIX SUPERSITE**	**43** **GOOD**	**40** **GOOD**	**42** **GOOD**

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

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

Health message for Tuesday, July 5: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Wednesday, July 6: Unusually sensitive people should consider limiting prolonged exertion outdoors.

…AN OZONE HEALTH WATCH HAS BEEN ISSUED FOR WEDNESDAY, JULY 6, 2011…

A double whammy hit the Valley on Monday, July 4th. Ozone levels soared above the health standard Monday in the far east part of the forecast area. Rio Verde's monitor hit 122 on the Air Quality Index (AQI), which is unhealthy for sensitive groups. A line of thunderstorms moved west, generating a significant dust storm that impacted the southeast and south part of the Valley. Higley's monitor exceeded the PM10 health standard as a result. A pop-up cell over the 51-101 interchange in the north Valley dropped the only measurable rain, but it wasn't the Valley-wide event we're looking for to end the threat of dust in the near future.

Models suggest that there will be one more good shot of showers and thunderstorms (and likely blowing dust) this evening before high pressure slides east a bit. Wednesday through Sunday will have a much lower chance of Monsoon activity locally as storms will be limited to the mountains of eastern Arizona and western New Mexico. Phoenix's chances increase once again by next Monday as high pressure moves back over the Four Corners area.

We're issuing an Ozone Health Watch for Wednesday with the eastern part of the forecast area expected to see the highest levels. Concentrations may tail off a bit Thursday and Friday.

Particulates could push deep into the MODERATE range this evening, but decrease Wednesday through the weekend as the threat of thunderstorms decrease.

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

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

POLLUTION MONITOR READINGS FOR MONDAY, JULY 4, 2011

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 (La Paz County)	55	47	
Apache Junction (Pinal County)	66	71	
Blue Point	69	80	
Buckeye	51	43	
Casa Grande	57	48	
Cave Creek	67	74	
Central Phoenix	67	74	
Dysart	57	48	
Falcon Field	66	71	
Fountain Hills	NOT AVBL	NOT AVBL	NOT AVBL
Glendale	60	51	
Humboldt Mountain	64	64	
North Phoenix	66	71	
Phoenix Supersite	66	71	
Pinal Air Park (Pinal County)	58	49	
Pinnacle Peak	62	58	
Queen Valley (Pinal County)	73	97	

Rio Verde	84	122	
South Phoenix	NOT AVBL	NOT AVBL	NOT AVBL
South Scottsdale	69	80	
Tempe	64	64	
Tonto Nat'l Mon. (Gila County)	57	48	
West Chandler	73	93	
West Phoenix	65	67	
Yuma	36	31	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Central Phoenix	0.2	2	
Greenwood	0.4	5	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.2	2	

PM-10 (PARTICLES)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Buckeye	24.5	22	
Central Phoenix	52.3	48	
Combs School (Pinal County)	210.3	128	
Durango	50.4	46	
Dysart	38.3	35	
Glendale	38.0	35	
Greenwood	47.4	43	
Higley	198.6	122	HIGHEST LOCALLY
Maricopa (Pinal County)	118.4	82	
Phoenix Supersite	51.1	47	
South Phoenix	55.9	51	
West Chandler	109.6	78	
West Forty Third	47.1	43	
West Phoenix	51.5	47	
Zuni Hills	35.5	32	

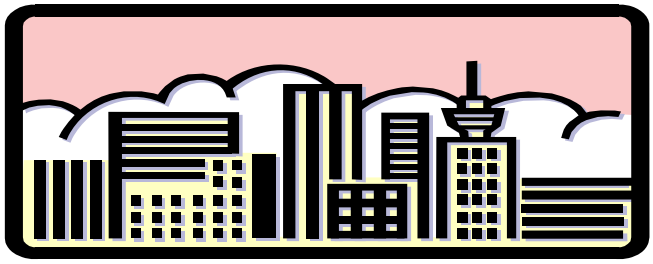
PM-2.5 (PARTICLES)

(Some data derived from light-scattering equipment)

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

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Durango	11.2	36	
Dysart	7.3	24	
Estrella Mountain Park	6.1	20	
Glendale	11.6	38	
Phoenix Supersite	13.0	42	
South Phoenix	8.6	28	
Vehicle Emissions Lab	7.2	23	
West Phoenix	10.4	34	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

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

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

Unit of measurement – Parts per billion (ppb).

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

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

CO (CARBON MONOXIDE):

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

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

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

Unit of measurement – Parts per million (ppm).

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

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

PM-10 & PM-2.5 (PARTICLES):

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

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

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

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

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR THURSDAY, JULY 7, 2011

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 NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY TUE 07/05/2011 DUST Highest AQI Reading/Site (Preliminary data only)	TODAY WED 07/06/2011 HW (Ozone) DUST	TOMORROW THU 07/07/2011 P.M. DUST	EXTENDED FRI 07/08/2011 A.M. DUST
O3*	**93** **FOUNTAIN HILLS**	**93** **MODERATE**	**80** **MODERATE**	**77** **MODERATE**
CO*	**6** **GREENWOOD**	**6** **GOOD**	**7** **GOOD**	**5** **GOOD**
PM-10*	**213** **HIGLEY**	**58** **MODERATE**	**75** **MODERATE**	**63** **MODERATE**
PM-2.5*	**151** **SOUTH PHOENIX**	**40** **GOOD**	**55** **MODERATE**	**51** **MODERATE**

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

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

Health message for Wednesday, July 6: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Thursday, July 7: Unusually sensitive people should consider limiting prolonged exertion outdoors.

…AN OZONE HEALTH WATCH REMAINS IN EFFECT FOR WEDNESDAY, JULY 6, 2011…

A major dust storm rolled into the Valley from the southeast Tuesday evening just as the sun was setting. The wall of dust was between 4,000 – 7,000 feet high and stretched about 70 miles wide. Moving at 50-60 miles per hour, cars traveling along freeways and valley streets were not able to escape it. Visibility dropped to less than 100 feet as the densest part of the dust cloud rolled through. Flights into and out of Sky Harbor were diverted, delayed for over an hour or even cancelled as a result. Needless to say, nearly every PM10 in the Phoenix forecast area exceeded the standard. Higley had the highest 24-hour concentrations equating to 213 AQI (code PURPLE). Chandler was right behind at 209 AQI. The highest 1-hr measurement was over 6,000 micrograms per cubic meter at the Phoenix Supersite monitor.

Questions have been pouring in about air quality this morning as visibility is obviously hampered. Current levels are elevated at most monitors but are still below the health standard at every site with the exception of Chandler. As of 11am, concentrations have spiked to over 400 micrograms per cubic meter. This appears to be isolated as not other monitor is showing similar levels. There is a lot of moisture in the atmosphere. This moisture wraps around suspended particles making enhancing the appearance of the particle and making it look worse than it actually is. This haze will linger through the rest of the day and perhaps into tomorrow as surface winds are expected to be mostly light the next several days.

The Monsoon track will pull slightly to the east the Thursday through much of next week giving the Valley a break in thunderstorm activity. Storms will generally be confined to the mountains and deserts along the Arizona/New Mexico border. This will not keep us safe from addition dust storms moving into the Valley as a result of those storms. Dust storms are very hard to forecast for, especially more than 3 hours out. To be on the safe side, we'll keep the PM10 and PM2.5 forecast in the MODERATE range the next few days.

Ozone is under a Health Watch for today with east Valley monitors likely to see the highest levels. Concentrations are generally lower today than 24-hr ago and should continue to decrease the next few days as a southwest-northeast flow kicks in.

We'll have more for you tomorrow. Until then, have a good day! -J.Paul

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

POLLUTION MONITOR READINGS FOR TUESDAY, JULY 5, 2011

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 (La Paz County)	NOT AVLB	NOT AVBL	NOT AVBL
Apache Junction (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Blue Point	72	90	
Buckeye	42	36	
Casa Grande	58	49	
Cave Creek	64	64	
Central Phoenix	55	47	
Dysart	48	41	
Falcon Field	66	71	

Fountain Hills	73	93	
Glendale	50	42	
Humboldt Mountain	65	67	
North Phoenix	58	49	
Phoenix Supersite	56	47	
Pinal Air Park (Pinal County)	60	51	
Pinnacle Peak	64	64	
Queen Valley (Pinal County)	65	67	
Rio Verde	64	64	
South Phoenix	NOT AVBL	NOT AVBL	NOT AVBL
South Scottsdale	64	64	
Tempe	NOT AVBL	NOT AVBL	NOT AVBL
Tonto Nat'l Mon. (Gila County)	59	50	
West Chandler	68	77	
West Phoenix	52	44	
Yuma	33	28	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Central Phoenix	0.2	2	
Greenwood	0.5	6	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.2	2	

PM-10 (PARTICLES)

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Buckeye	164.3	106	
Central Phoenix	277.6	162	
Combs School (Pinal County)	419.3	293	
Durango	156.9	102	
Dysart	220.1	133	
Glendale	168.4	108	
Greenwood	156.1	102	
Higley	363.3	213	HIGHEST LOCALLY
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	331.8	189	
South Phoenix	193.1	120	
West Chandler	360.6	209	
West Forty Third	150.8	98	
West Phoenix	267.1	157	
Zuni Hills	148.2	97	

PM-2.5 (PARTICLES)

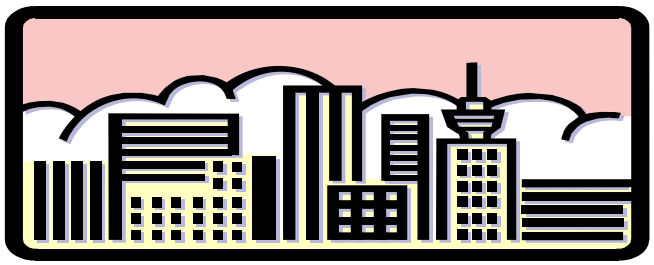
(Some data derived from light-scattering equipment)

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

SITE NAME	MAX 8-HR VALUE (PPB	MAX AQI	AQI COLOR CODE
Durango	52.6	143	
Dysart	18.1	57	
Estrella Mountain Park	19.1	60	
Glendale	37.3	105	
Phoenix Supersite	49.8	136	
South Phoenix	55.6	151	
Vehicle Emissions Lab	46.4	128	

West Phoenix	35.9	102	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

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

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

Unit of measurement – Parts per billion (ppb).

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

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

CO (CARBON MONOXIDE):

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

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

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

Unit of measurement – Parts per million (ppm).

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

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

PM-10 & PM-2.5 (PARTICLES):

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

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

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

Units of measurement – Micrograms per cubic meter (ug/m3)
Averaging interval – 24 hours (midnight to midnight).
Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR FRIDAY, JULY 8, 2011

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 NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY WED 07/06/2011 HW (Ozone) DUST Highest AQI Reading/Site (Preliminary data only)	TODAY THU 07/07/2011 P.M. DUST	TOMORROW FRI 07/08/2011 P.M. DUST	EXTENDED SAT 07/08/2011 HW (Ozone) P.M. DUST
O3*	**111** **QUEEN VALLEY**	**80** **MODERATE**	**87** **MODERATE**	**93** **MODERATE**
CO*	**5** **GREENWOOD**	**7** **GOOD**	**5** **GOOD**	**5** **GOOD**
PM-10*	**99** **HIGLEY**	**75** **MODERATE**	**72** **MODERATE**	**68** **MODERATE**
PM-2.5*	**52** **PHOENIX SUPERSITE**	**55** **MODERATE**	**51** **MODERATE**	**51** **MODERATE**

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

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

Health message for Thursday, July 7: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Friday, July 8: Unusually sensitive people should consider limiting prolonged exertion outdoors.

A lot of issues related to Tuesday evening's dust storm continue to affect us nearly 36 hours later. Lingering dust across the Valley floor has made a mess of streets, cars, houses and swimming pools. Clean up efforts continue in Chandler and Higley, ground zero for Tuesday's storm impact. Perception is that the air quality must be really bad since the visibility is down. However, overall concentrations were much lower Wednesday than they were Tuesday. This morning's concentrations were elevated slightly in Higley and Chandler, are starting to improve.

The reason for the decreased visibility is the unusually high amount of moisture. Current valley dew points are still in the mid to upper 60s. That's almost unheard of for this time of day. In fact, moisture levels are comparable cities in the southeastern U.S. such as Atlanta, Georgia and Charlotte, North Carolina. Current web cams in both cities show similar visibility issues and neither city is having PM10 issues. Atlanta is seeing some elevated ozone levels. Ozone is formed from car exhaust particles. When you have moisture, any particle becomes a magnet for the microscopic water particles. When the water wraps around the particle, it enhances its image, just like a magnifying glass. That's why it looks worse air quality-wise than it actually is. Here in Phoenix, our particles are a combination of vehicle exhaust and lingering dust. Until moisture levels drop off, the dust settles out, or we get a valley-wide pollution-clearing rain event, visibility will continue to be compromised. But it does not mean that dust levels are high.

Turning our attention to the pollutant that is causing some heath concerns at the moment, ozone levels managed to exceed the health standard on Wednesday in Queen Valley, about 47 miles southeast of downtown Phoenix. That area will continue to see the highest levels the next few days, though concentrations may be slightly lower on Friday. We may be looking at an Ozone Health Watch or HPA for Saturday if levels go back up.

We'll have more for you tomorrow. Until then, have a good day! -J.Paul

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

POLLUTION MONITOR READINGS FOR WEDNESDAY, JULY 6, 2011

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 (La Paz County)	54	46	
Apache Junction (Pinal County)	75	100	
Blue Point	75	100	
Buckeye	57	48	
Casa Grande	67	74	
Cave Creek	65	67	
Central Phoenix	69	80	
Dysart	64	64	
Falcon Field	72	90	
Fountain Hills	72	90	
Glendale	64	64	
Humboldt Mountain	67	74	

North Phoenix	70	84	
Phoenix Supersite	72	90	
Pinal Air Park (Pinal County)	70	84	
Pinnacle Peak	64	64	
Queen Valley (Pinal County)	80	111	
Rio Verde	75	100	
South Phoenix	67	74	
South Scottsdale	70	84	
Tempe	64	64	
Tonto Nat'l Mon. (Gila County)	NOT AVBL	NOT AVBL	NOT AVBL
West Chandler	69	80	
West Phoenix	70	84	
Yuma	66	71	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.2	2	
Greenwood	0.4	5	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.3	3	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (µg/m3)	MAX AQI	AQI COLOR CODE
Buckeye	39.8	36	
Central Phoenix	24.5	22	
Combs School (Pinal County)	121.7	84	
Durango	55.8	51	
Dysart	53.7	49	
Glendale	48.4	44	
Greenwood	45.9	42	
Higley	152.5	99	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	30.4	28	
South Phoenix	55.7	51	
West Chandler	124.4	85	
West Forty Third	40.7	37	
West Phoenix	50.7	46	
Zuni Hills	57.3	52	

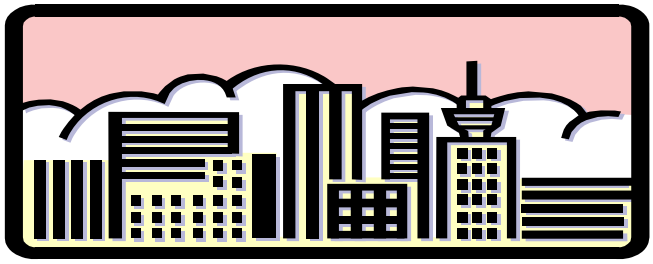
PM-2.5 (PARTICLES)

(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	11.1	36	
Dysart	7.4	24	
Estrella Mountain Park	5.1	17	
Glendale	8.5	28	
Phoenix Supersite	16.1	52	
South Phoenix	7.5	24	
Vehicle Emissions Lab	14.3	46	
West Phoenix	13.1	43	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

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

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

Unit of measurement – Parts per billion (ppb).

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

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

CO (CARBON MONOXIDE):

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

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

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

Unit of measurement – Parts per million (ppm).

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

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

PM-10 & PM-2.5 (PARTICLES):

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

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

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

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

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

ADEQ Arizona Department of Environmental Quality

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

For more information visit:
http://www.airnow.gov/index.cfm?action=aqibasics.aqi

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

AIR QUALITY FORECAST FOR SATURDAY, JULY 9, 2011

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 **NOTICES** (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY THU 07/07/2011 **DUST** Highest AQI Reading/Site (Preliminary data only)	TODAY FRI 07/08/2011 **P.M. DUST**	TOMORROW SAT 07/08/2011 **P.M. DUST**	EXTENDED SUN 07/09/2011 **P.M. DUST**
O3*	**101** **QUEEN VALLEY**	**87** **MODERATE**	**71** **MODERATE**	**80** **MODERATE**
CO*	**5** **GREENWOOD**	**5** **GOOD**	**5** **GOOD**	**5** **GOOD**
PM-10*	**157** **HIGLEY**	**72** **MODERATE**	**85** **MODERATE**	**80** **MODERATE**
PM-2.5*	**67** **PHOENIX SUPERSITE**	**51** **MODERATE**	**54** **MODERATE**	**52** **MODERATE**

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

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

Health message for Friday, July 8: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Health message for Saturday, July 9: Unusually sensitive people should consider limiting prolonged exertion outdoors.

Ozone concentrations exceeded the standard again in the far east part of the Valley. Queen Valley registered 101 on the Air Quality Index (AQI), its second exceedance in as many days. Models suggest much lower levels are expected across the forecast area through the weekend with the same east-southeast region expected to have highest levels.

PM10 continues to be an issue in parts of the Valley. Both Higley and West Chandler exceeded the standard again Thursday due to another thunderstorm-generated dust event around 11 pm. Other parts of the forecast area did see an increase in particulates overnight as the weak out flow boundary continued west and north, but nothing compared to what Higley and Chandler experienced. We need a significant rain event across the entire Valley to clear the air and stabilized the loose dirt on the streets and in the open deserts surrounding the Valley. That doesn't appear to be coming any time soon. Forecast models suggest some showers may make it into parts of the Valley following additional dust fronts each night through Monday. Unfortunately, these showers will be spotty at best with totals less than a tenth of an inch. Then the storm track pulls east into New Mexico Tuesday and Wednesday. This break in the action could last 10 to 14 days, prolonging the time without the much need soaking rains while increasing the risk of more dust storms upon the pattern's return.

Check back on Sunday for the latest. Until then, have a great weekend! -J.Paul

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

POLLUTION MONITOR READINGS FOR THURSDAY, JULY 7, 2011

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 (La Paz County)	61	54	
Apache Junction (Pinal County)	68	77	
Blue Point	66	71	
Buckeye	55	47	
Casa Grande	61	54	
Cave Creek	60	51	
Central Phoenix	62	58	
Dysart	56	47	
Falcon Field	62	58	
Fountain Hills	67	74	
Glendale	61	54	
Humboldt Mountain	61	54	
North Phoenix	63	61	
Phoenix Supersite	65	67	
Pinal Air Park (Pinal County)	66	71	
Pinnacle Peak	59	50	
Queen Valley (Pinal County)	76	101	
Rio Verde	67	74	
South Phoenix	60	51	

South Scottsdale	62	58	
Tempe	57	48	
Tonto Nat'l Mon. (Gila County)	61	54	
West Chandler	64	64	
West Phoenix	65	67	
Yuma	58	49	

CO (CARBON MONOXIDE)

SITE NAME	MAX 8-HR VALUE (PPM)	MAX AQI	AQI COLOR CODE
Central Phoenix	0.1	1	
Greenwood	0.4	5	
Phoenix Supersite	NOT AVBL	NOT AVBL	NOT AVBL
West Phoenix	0.3	3	

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (µg/m3)	MAX AQI	AQI COLOR CODE
Buckeye	107.3	77	
Central Phoenix	94.5	70	
Combs School (Pinal County)	189.1	117	
Durango	88.8	68	
Dysart	42.9	39	
Glendale	70.2	58	
Greenwood	71.3	59	
Higley	267.0	157	
Maricopa (Pinal County)	NOT AVBL	NOT AVBL	NOT AVBL
Phoenix Supersite	70.9	59	
South Phoenix	85.7	66	
West Chandler	205.8	126	
West Forty Third	78.0	62	
West Phoenix	84.2	65	
Zuni Hills	32.4	30	

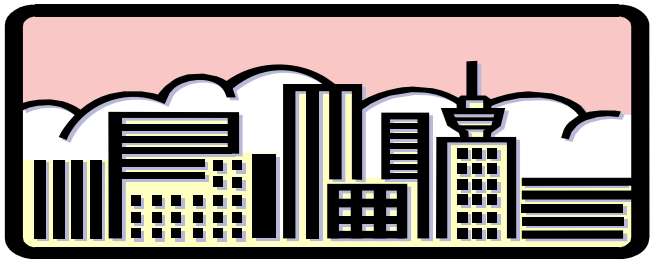
PM-2.5 (PARTICLES)

(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	13.6	44	
Dysart	7.0	23	
Estrella Mountain Park	10.5	34	
Glendale	11.3	37	
Phoenix Supersite	21.8	67	
South Phoenix	8.5	28	
Vehicle Emissions Lab	15.9	52	
West Phoenix	12.4	40	

LOCAL AIR POLLUTANTS IN DETAIL



O3 (OZONE):

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

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

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

Unit of measurement – Parts per billion (ppb).

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

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

CO (CARBON MONOXIDE):

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

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

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

Unit of measurement – Parts per million (ppm).

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

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

PM-10 & PM-2.5 (PARTICLES):

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

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

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

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

Averaging interval – 24 hours (midnight to midnight).

Reduction tips – Stabilize loose soils, slow down on dirt roads, carpool, and use public transit.

{**Updated 03/23/2010**}

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED FRIDAY, JULY 1, 2011

Three-day weather outlook:

High pressure will be near the Four Corners later Friday afternoon through early next week. This will increase moisture levels across Arizona. Thunderstorm activity will ramp up considerably across the mountains as well as the deserts Saturday through Monday. Outflow winds may generate desert dust storms each day through Monday night. A little break in the action is likely Tuesday and Wednesday. Thus, the risk of exceeding the 24-hr PM10 health standard in Phoenix due to blowing dust will **MODERATE** Saturday through Monday, dropping back to **LOW** by Tuesday.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Sat 07/02/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 2: Sun 07/03/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 3: Mon 07/04/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
EXTENDED OUTLOOK					
Day 4: Tue 07/05/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely.	=	**LOW**
Day 5: Wed 07/06/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely.	=	**LOW**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED SUNDAY, JULY 3, 2011

Three-day weather outlook:

High pressure will remain in position near the Four Corners into next weekend. This will keep the flow of moisture moving north into Arizona. Chances for mountain thunderstorms are good each day with many of these storms migrating into the deserts. Isolated dust storms are possible each day with these thunderstorms. Until widespread rain sweeps across the Valley, the risk of exceeding the 24-hr PM10 health standard in Phoenix will remain MODERATE through at least Friday.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Mon 07/04/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 2: Tue 07/05/2011	Southwest winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 3: Wed 07/06/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
EXTENDED OUTLOOK					
Day 4: Thu 07/07/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 5: Fri 07/06/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED MONDAY, JULY 4, 2011

Three-day weather outlook:

Monsoon moisture will keep the area primed for thunderstorm activity the next 7 days. Along with the threat of thunderstorms comes the risk of dust storm from the outflow winds. Otherwise, general winds will be relatively light. Thus, the risk of exceeding the 24-hr PM10 health standard in Phoenix will be **MODERATE** through Saturday.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Tue 07/05/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 2: Wed 07/06/2011	Southwest winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 3: Thu 07/07/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
EXTENDED OUTLOOK					
Day 4: Fri 07/08/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 5: Sat 07/09/2011	West winds around 10 mph are expected. Thunderstorm outflow may generate gusty winds and possible blowing dust late.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED TUESDAY, JULY 5, 2011

Three-day weather outlook:

The Monsoon flow will pull a bit more to the east the next few days keeping showers and thunderstorms limited to the mountains or eastern Arizona and western New Mexico Wednesday through the weekend. General winds will be mostly light across the deserts with afternoon desert temperatures between 105-108 degrees F. The risk of exceeding the 24-hr PM10 health standard in Phoenix will be MODERATE on Wednesday, dropping to LOW Thursday through Saturday.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Wed 07/06/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 2: Thu 07/07/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**LOW**
Day 3: Sat 07/08/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are expected much of the day	=	**LOW**
EXTENDED OUTLOOK					
Day 4: Sun 07/09/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**LOW**
Day 5: Mon 07/10/2011	Mostly light winds are likely much of the day. Thunderstorm outflow may generate gusty winds and possible blowing dust.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED WEDNESDAY, JULY 6, 2011

Three-day weather outlook:

High pressure will begin to pull slightly to the east Wednesday, taking with it the track of thunderstorm activity. This means west and central deserts will have a break in the action while the eastern most deserts of Arizona will continue to have the chance for afternoon and evening showers and storms. Afternoon temperatures will range from 103-108°F the next several days under sunny skies and light winds. Until we get a Valley-wide rain event, the risk of exceeding the 24-hr PM10 health standard in Phoenix will be MODERATE through at least Tuesday.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Thu 07/07/2011	Southwest winds between 5 and 10 mph are expected.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 2: Fri 07/08/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 3: Sat 07/09/2011	Southwest winds between 5 and 10 mph are expected.	+	Rather stagnant conditions are expected much of the day	=	**MODERATE**
EXTENDED OUTLOOK					
Day 4: Sun 07/10/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 5: Mon 07/11/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED THURSDAY, JULY 7, 2011

Three-day weather outlook:

Tuesday night's major dust storm is still causing lingering dust issues 36 hours later. Local visibility has been impacted as moisture wrapping around the suspended particles enhances the *appearance* of those particles. Current PM10 concentrations are slightly elevated and will continue to fluctuate over the course of the next 48 hours due to traffic patterns and local cleanup efforts. We are bumping the risk of exceeding the 24-hour PM10 health standard up to **HIGH for Friday** as a result of current levels and the threat of additional dust storm exist.

NOTE: This does not necessarily mean a Health Watch or HPA will be issued. The dust control forecast simply indicates a risk level for the generation of dust.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Fri 07/08/2011	Southwest winds between 5 and 10 mph are expected.	+	Rather stagnant conditions are likely early, improving late.	=	**HIGH**
Day 2: Sat 07/09/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 3: Sun 07/10/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are expected much of the day	=	**MODERATE**
EXTENDED OUTLOOK					
Day 4: Mon 07/11/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 5: Tue 07/12/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED FRIDAY, JULY 8, 2011

Three-day weather outlook:

Thunderstorm activity will continue south, east and north of the Valley each day through Monday. This means that the Valley will experience and increased chance for a dust storm each night through Monday as well. Models suggest that there is a chance for spotty rain in parts of the Valley from storms moving in from the south during this period, but totals will generally be less than a tenth of an inch. The risk of exceeding the 24-hr PM10 health standard in Phoenix will be HIGH Saturday through Monday, dropping to MODERATE on Tuesday and LOW by Wednesday as the storm track moves east into New Mexico.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Sat 07/09/2011	Southwest winds between 5 and 10 mph are expected much of the day. Chance for dust storm in the evening.	+	Rather stagnant conditions are likely early, improving late.	=	**HIGH**
Day 2: Sun 07/10/2011	Mostly light winds are likely much of the day. Chance for dust storm in the evening.	+	Rather stagnant conditions are likely early, improving late.	=	**HIGH**
Day 3: Mon 07/11/2011	Mostly light winds are likely much of the day. Chance for dust storm in the evening.	+	Rather stagnant conditions are expected much of the day	=	**HIGH**
EXTENDED OUTLOOK					
Day 4: Tue 07/12/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**MODERATE**
Day 5: Wed 07/13/2011	Mostly light winds are likely much of the day.	+	Rather stagnant conditions are likely early, improving late.	=	**LOW**

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. 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 for recorded forecast information or click on ADEQ's Air Quality Forecast at http://www.azdeq.gov/environ/air/ozone/ensemble.pdf.

JRP 04/28/2011

APPENDIX C

NATIONAL WEATHER SERVICE METEOROLOGICAL OBSERVATIONS AT PHOENIX SKY HARBOR AIRPORT AND MESA WILLIAMS GATEWAY AIRPORT

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE PHOENIX SKY HARBOR INTL AIRPORT (23183) PHOENIX , AZ (07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
Data Version: VER3

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
02	0051	11	CLR	10.00		94	34.4	63	16.9	38	3.3	14	7	080		28.49			29.59	AA		29.66
02	0151	11	CLR	10.00		91	32.8	62	16.5	39	3.9	16	0	000		28.48			29.58	AA		29.65
02	0251	11	CLR	10.00		89	31.7	61	16.0	38	3.3	17	8	100		28.49	0	000	29.59	AA		29.66
02	0351	11	CLR	10.00		88	31.1	59	15.1	34	1.1	15	3	110		28.49			29.59	AA		29.66
02	0451	11	FEW120 SCT200	10.00		87	30.6	59	15.0	35	1.7	16	0	000		28.50			29.59	AA		29.67
02	0551	11	SCT120 SCT200	10.00		86	30.0	59	15.2	37	2.8	18	3	120		28.52	3	004	29.62	AA		29.69
02	0651	11	SCT120	10.00		89	31.7	60	15.8	37	2.8	16	5	360		28.53			29.63	AA		29.70
02	0751	11	FEW100 SCT120	10.00		92	33.3	62	16.7	39	3.9	16	0	000		28.55			29.65	AA		29.72
02	0851	11	FEW100 SCT120 BKN160	10.00		94	34.4	62	16.8	37	2.8	14	0	000		28.55	3	017	29.65	AA		29.72
02	0951	11	SCT120 SCT160 BKN230	10.00		102	38.9	65	18.2	37	2.8	11	0	000		28.55			29.65	AA		29.72
02	1051	11	SCT120 SCT160 BKN230	10.00		107	41.7	68	19.8	41	5.0	11	7	080		28.54	8	002	29.64	AA		29.71
02	1151	11	FEW120 SCT160 SCT200	10.00		110	43.3	69	20.8	44	6.7	11	6	170		28.53			29.62	AA		29.70
02	1251	11	FEW120 SCT200	10.00		113	45.0	70	21.1	43	6.1	10	8	150	16	28.51			29.60	AA		29.68
02	1351	11	FEW120 SCT200	10.00		113	45.0	70	20.9	42	5.6	9	0	000		28.48	8	019	29.58	AA		29.65
02	1451	11	FEW120 SCT200	10.00		115	46.1	70	21.2	42	5.6	9	9	280		28.46			29.56	AA		29.63
02	1530	11	SCT140 SCT200 SCT250	10.00		115	46.0	71	21.4	43	6.0	9	9	090		28.45			M	SP		29.62
02	1551	11	SCT140 SCT200 SCT250	10.00		114	45.6	69	20.6	39	3.9	8	16	070	22	28.44	6	018	29.54	AA		29.61
02	1651	11	SCT140 SCT200 SCT250	10.00		114	45.6	69	20.6	39	3.9	8	18	060	31	28.43			29.53	AA		29.60
02	1751	11	SCT140 SCT200 SCT250	10.00		111	43.9	70	20.9	44	6.7	11	21	050	24	28.42			29.52	AA		29.59
02	1851	11	SCT140 SCT200 BKN250	10.00		109	42.8	69	20.6	44	6.7	11	18	040		28.43	5	000	29.53	AA		29.60
02	1951	11	SCT170 SCT200 BKN250	10.00		107	41.7	69	20.4	45	7.2	12	13	050		28.43			29.53	AA		29.60
02	2051	11	FEW180 SCT200 BKN250	10.00		103	39.4	68	20.0	46	7.8	14	8	090		28.45			29.54	AA		29.62
02	2151	11	FEW160 SCT200 BKN250	10.00		102	38.9	68	20.0	47	8.3	16	7	080	26	28.48	3	022	29.57	AA		29.65
02	2251	11	SCT180 SCT200 BKN250	10.00		100	37.8	68	19.7	47	8.3	17	7	080		28.50			29.59	AA		29.67
02	2351	11	SCT160 BKN200 BKN250	10.00		100	37.8	68	19.7	47	8.3	17	20	150		28.53			29.62	AA		29.70

Dynamically generated Fri Jan 20 11:24:21 EST 2012 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
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX , AZ
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Elevation: 1105 ft. above sea level
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Data Version: VER3

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						(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
03	0012	11	SCT160 BKN200 BKN250	2.00		97	36.0	70	20.8	54	12.0	24	17	160		28.53			M	SP		29.70
03	0038	11	SCT140 BKN200 BKN250	3.00		97	36.0	70	21.1	55	13.0	24	10	160		28.54			M	SP		29.71
03	0051	11	SCT140 BKN200 BKN250	5.00	BLDU	96	35.6	70	20.9	55	12.8	25	13	170	30	28.55			29.65	AA		29.72
03	0151	11	FEW140 SCT220	7.00	BLDU	94	34.4	70	20.8	56	13.3	28	6	140	22	28.57			29.67	AA		29.74
03	0251	11	FEW140 SCT220	10.00	BLDU	93	33.9	71	21.8	60	15.6	33	6	120	20	28.60	1	024	29.70	AA		29.77
03	0351	11	FEW140 SCT220	10.00		92	33.3	71	21.9	61	16.1	36	6	150		28.62			29.72	AA		29.79
03	0451	11	FEW140 SCT200 BKN250	10.00		92	33.3	71	21.9	61	16.1	36	5	110		28.63			29.73	AA		29.80
03	0551	11	FEW140 SCT200 BKN250	10.00		92	33.3	71	21.9	61	16.1	36	5	070		28.64	1	020	29.74	AA		29.81
03	0651	11	FEW130 SCT190 BKN250	10.00		93	33.9	72	22.0	61	16.1	34	7	350		28.65			29.75	AA		29.82
03	0751	11	SCT200 BKN250	10.00		94	34.4	72	22.2	61	16.1	33	6	320		28.65	1	005	29.75	AA		29.82
03	0851	11	FEW210 SCT250	10.00		96	35.6	72	22.2	60	15.6	30	7	320		28.65			29.75	AA		29.82
03	0951	11	FEW220 SCT250	10.00		98	36.7	72	22.3	59	15.0	27	0	000		28.65			29.75	AA		29.82
03	1051	11	FEW220 SCT250	10.00		100	37.8	72	22.3	58	14.4	25	7	300		28.63	8	004	29.73	AA		29.80
03	1151	11	FEW100 SCT200 SCT250	10.00		104	40.0	72	22.4	56	13.3	20	3	VR		28.61			29.71	AA		29.78
03	1251	11	FEW100 SCT250	10.00		107	41.7	73	22.6	55	12.8	18	7	VR		28.58			29.68	AA		29.75
03	1351	11	FEW100 SCT250	10.00		109	42.8	72	22.2	52	11.1	15	9	190	17	28.55	8	026	29.65	AA		29.72
03	1451	11	FEW100 SCT250	10.00		111	43.9	73	22.5	52	11.1	14	11	200	16	28.51			29.61	AA		29.68
03	1551	11	FEW100 SCT250	10.00		110	43.3	72	21.9	50	10.0	14	8	270		28.48	6	029	29.57	AA		29.65
03	1651	11	FEW100 SCT250	10.00	HZ BLDU	109	42.8	72	22.0	51	10.6	15	0	000	36	28.46			29.56	AA		29.63
03	1751	11	FEW001 SCT100 SCT250	6.00		107	41.7	73	22.8	56	13.3	19	26	250	34	28.47			29.57	AA		29.64
03	1851	11	SCT032 SCT100 SCT250	9.00		101	38.3	72	22.4	58	14.4	24	25	260		28.50	3	023	29.60	AA		29.67
03	1951	11	FEW055 SCT100 BKN250	10.00	-TSRA	97	36.1	71	21.8	58	14.4	27	17	270	32	28.53			29.63	AA		29.70
03	2008	11	FEW055 BKN090CB BKN250	10.00		97	36.0	72	22.1	59	15.0	28	24	010		28.60			M	SP	T	29.77
03	2026	11	FEW055 BKN090 BKN250	10.00		97	36.0	72	22.1	59	15.0	28	8	350		28.61			M	SP		29.78
03	2051	11	FEW055 SCT090 BKN250	10.00		93	33.9	72	22.0	61	16.1	34	11	350		28.61	1	037	29.71	AA		29.78
03	2151	11	FEW120 BKN250	10.00		93	33.9	71	21.5	59	15.0	32	10	290		28.64			29.75	AA		29.81
03	2251	11	FEW120 BKN250	10.00		91	32.8	71	21.4	60	15.6	35	9	250		28.65			29.75	AA		29.82
03	2351	11	FEW120 BKN250	10.00		91	32.8	71	21.7	61	16.1	37	7	280		28.65			29.75	AA		29.82

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX , AZ
(07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
Data Version: VER3

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
04	0051	11	FEW120 BKN250	10.00		90	32.2	71	21.6	61	16.1	38	11	280		28.66			29.77	AA		29.84
04	0151	11	FEW120 BKN250	10.00		89	31.7	72	22.0	63	17.2	42	18	290		28.66			29.76	AA		29.83
04	0251	11	FEW130 SCT250	10.00		85	29.4	73	23.0	68	20.0	57	17	270		28.68	0	006	29.78	AA		29.85
04	0351	11	FEW130 SCT250	10.00		84	28.9	74	23.1	69	20.6	61	10	270		28.68			29.78	AA		29.85
04	0451	11	FEW130 SCT250	10.00		83	28.3	73	23.0	69	20.6	63	8	220		28.69			29.80	AA		29.87
04	0551	11	FEW100 SCT200	10.00		83	28.3	73	22.6	68	20.0	61	0	000		28.69	3	010	29.80	AA		29.87
04	0651	11	FEW130 SCT210 SCT250	10.00		85	29.4	73	23.0	68	20.0	57	6	230		28.69			29.81	AA		29.87
04	0751	11	FEW090 SCT110 SCT210	10.00		88	31.1	73	22.8	66	18.9	48	9	200		28.72			29.84	AA		29.90
04	0851	11	FEW090 SCT110 SCT210	10.00		89	31.7	72	22.3	64	17.8	44	8	270		28.72	3	012	29.83	AA		29.90
04	0951	11	FEW090 SCT110 BKN220	10.00		92	33.3	72	22.2	62	16.7	37	7	310		28.70			29.81	AA		29.88
04	1051	11	SCT220 BKN250	10.00		94	34.4	73	22.5	62	16.7	35	5	VR		28.68	8	016	29.79	AA		29.85
04	1151	11	FEW075 SCT220 BKN250	10.00		96	35.6	73	22.8	62	16.7	32	0	000		28.66			29.77	AA		29.83
04	1251	11	FEW080 SCT220 SCT250	10.00		98	36.7	74	23.1	62	16.7	31	7	220		28.64			29.75	AA		29.81
04	1351	11	FEW085 SCT220 SCT250	10.00		100	37.8	74	23.1	61	16.1	28	6	250	23	28.62	8	022	29.72	AA		29.79
04	1451	11	FEW085 SCT220 SCT250	10.00		103	39.4	74	23.2	60	15.6	24	11	290	23	28.58			29.68	AA		29.75
04	1551	11	FEW085 SCT220 SCT250	10.00		103	39.4	74	23.5	61	16.1	25	14	260	25	28.54			29.65	AA		29.71
04	1651	11	FEW085 SCT160 SCT250	10.00		103	39.4	74	23.2	60	15.6	24	17	260	25	28.53	6	028	29.63	AA		29.70
04	1751	11	FEW085 SCT160 SCT250	10.00		102	38.9	74	23.4	61	16.1	26	15	260	24	28.53			29.63	AA		29.70
04	1851	11	FEW085 SCT160 SCT250	10.00		102	38.9	74	23.1	60	15.6	25	17	260		28.55	3	020	29.65	AA		29.72
04	1951	11	FEW085 SCT160 SCT250	10.00		99	37.2	73	22.9	61	16.1	29	15	250		28.59			29.70	AA		29.76
04	2051	11	FEW085 SCT160 SCT250	10.00	TS	97	36.1	73	22.6	61	16.1	30	10	250		28.62			29.72	AA		29.79
04	2151	11	SCT100 BKN150 BKN250	10.00	TS	97	36.1	73	22.7	61	16.1	30	9	140	30	28.68			29.78	AA		29.85
04	2221	11	SCT100CB BKN150 BKN250	8.00		91	33.0	72	22.3	63	17.0	39	17	120		28.69	1	030	M	SP		29.86
04	2251	11	SCT100CB BKN150 BKN250	10.00		90	32.2	72	22.2	63	17.2	41	11	110		28.68			29.79	AA		29.85
04	2332	11	SCT100 BKN150 BKN250	10.00		91	33.0	71	21.7	61	16.0	37	7	340		28.65			M	SP		29.82
04	2351	11	SCT100 BKN150 BKN250	10.00		91	32.8	71	21.7	61	16.1	37	14	330		28.63			29.73	AA		29.80

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
(may be updated)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX , AZ
(07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
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
05	0051	11	SCT120 BKN150 OVC250	10.00		89	31.7	72	22.3	64	17.8	44	8	090		28.66			29.78	AA		29.84
05	0151	11	SCT120 BKN150 BKN250	10.00		90	32.2	71	21.9	62	16.7	39	8	110		28.66			29.76	AA		29.83
05	0251	11	SCT120 BKN150 OVC250	10.00		90	32.2	72	22.2	63	17.2	41	7	140		28.65			29.75	AA		29.82
05	0351	11	SCT120 BKN150 BKN250	10.00		89	31.7	71	21.4	61	16.1	39	0	000		28.65			29.75	AA		29.82
05	0451	11	BKN140 BKN250	10.00		87	30.6	72	22.0	64	17.8	46	9	140		28.66	6	007	29.77	AA		29.84
05	0551	11	BKN200 BKN250	10.00		87	30.6	71	21.7	63	17.2	45	11	110		28.69			29.80	AA		29.86
05	0651	11	SCT210 SCT250	10.00		88	31.1	72	22.1	64	17.8	45	8	100		28.70	3	002	29.82	AA		29.88
05	0751	11	FEW150 SCT210	10.00		89	31.7	73	22.6	65	18.3	45	5	100		28.72			29.83	AA		29.90
05	0851	11	FEW100 SCT210	10.00		92	33.3	73	22.8	64	17.8	40	0	000		28.73			29.84	AA		29.91
05	0951	11	FEW210	10.00		94	34.4	74	23.1	64	17.8	37	6	VR		28.71	1	020	29.83	AA		29.89
05	1051	11	FEW070 SCT210	10.00		96	35.6	74	23.4	64	17.8	35	7	350		28.69			29.81	AA		29.87
05	1151	11	FEW075 SCT210	10.00		98	36.7	75	23.7	64	17.8	33	6	VR		28.68			29.78	AA		29.85
05	1251	11	FEW080 SCT180 SCT210	10.00		100	37.8	75	23.6	63	17.2	30	5	VR		28.65	8	009	29.75	AA		29.82
05	1351	11	FEW080 SCT180 SCT210	10.00		102	38.9	75	23.9	63	17.2	28	8	230		28.62			29.72	AA		29.79
05	1451	11	FEW080 SCT180 SCT210	10.00		103	39.4	74	23.5	61	16.1	25	6	VR		28.58	8	027	29.69	AA		29.75
05	1551	11	FEW080 SCT140 BKN220	10.00		104	40.0	75	23.9	62	16.7	25	6	VR	16	28.57			29.67	AA		29.74
05	1554	11	FEW080 SCT140 BKN220	10.00		102	39.0	75	23.9	63	17.0	28	10	300	16	28.57			M	SP		29.74
05	1651	11	FEW080 SCT140 BKN220	10.00		105	40.6	75	23.8	61	16.1	24	10	290	18	28.54			29.65	AA		29.71
05	1751	11	FEW080 SCT140 BKN220	10.00		105	40.6	75	23.8	61	16.1	24	8	260		28.54	6	026	29.64	AA		29.71
05	1851	11	FEW080 SCT140 BKN180	10.00		104	40.0	75	23.6	61	16.1	24	8	250		28.54			29.64	AA		29.71
05	1951	11	FEW080 SCT140 BKN180	3.00		100	37.8	73	22.6	59	15.0	26	20	180	24	28.65	3	036	29.75	AA		29.82
05	1953	11	FEW080 SCT140 BKN180	0.75	+DSs	97	36.0	73	22.7	61	16.0	30	20	190	28	28.65			M	SP		29.82
05	1955	11	VV002	0.25s	-RA +DS	93	34.0	73	22.6	63	17.0	37	31	170	44	28.66			M	SP		29.83
05	2005	11	VV003	0.12	-RAs	86	30.0	71	21.8	64	18.0	48	22	200	53	28.68			M	SP		29.85
05	2012	11	VV001	0.12s	-RAs	82	28.0	71	21.8	66	19.0	58	18	190	38	28.68			M	SP		29.85
05	2016	11	VV002	0.25s	-RAs	82	28.0	74	23.2	70	21.0	67	20	190	31	28.68			M	SP		29.85
05	2030	11	VV003	0.50s	-RA BLDU	79	26.0	73	22.7	70	21.0	74	26	200	38	28.66			M	SP		29.83
05	2041	11	OVC004	1.25	-RA BLDU	81	27.0	73	23.0	70	21.0	69	20	200	34	28.65			M	SP		29.82
05	2045	11	FEW004 BKN011	2.00	BLDU	81	27.0	72	22.3	68	20.0	65	13	200	25	28.65			M	SP		29.82
05	2049	11	FEW004 BKN022	5.00		81	27.0	72	22.3	68	20.0	65	16	220	25	28.65			M	SP	0.04	29.82
05	2051	11	FEW004 BKN027 BKN180	6.00		81	27.2	72	22.3	68	20.0	65	13	230	23	28.65			29.76	AA		29.82
05	2113	11	OVC050	10.00	HZ	84	29.0	70	21.2	63	17.0	49	9	240		28.66			M	SP		29.84
05	2151	11	SCT070 SCT095 BKN210	10.00	BLDU	86	30.0	72	22.1	65	18.3	50	11	350	23	28.70			29.82	AA		29.88
05	2220	11	BKN075 BKN095 OVC210	3.00	BLDU	84	29.0	71	21.5	64	18.0	51	17	060		28.74			M	SP		29.92
05	2223	11	BKN075 BKN095 OVC210	1.75	BLDU	84	29.0	71	21.5	64	18.0	51	16	060		28.74			M	SP		29.92

05	2231	11	BKN009 BKN090 OVC210	0.75	BLDUs	84	29.0	70	21.2	63	17.0	49	16	080		28.75	1	041	M	SP		29.93
05	2248	11	BKN009 BKN090 OVC210	1.25	BLDU	82	28.0	71	21.8	66	19.0	58	11	030		28.76			M	SP		29.94
05	2251	11	BKN009 BKN090 OVC210	1.25	BLDU	82	27.8	71	21.8	66	18.9	58	10s	030		28.76			29.88	AA		29.94
05	2258	11	BKN009 BKN090 OVC210	1.75		82	28.0	71	21.8	66	19.0	58	11	360		28.76			M	SP		29.94
05	2328	11	BKN012 BKN090 OVC210	2.50		81	27.0	71	21.6	66	19.0	60	13	330		28.73			M	SP		29.91
05	2342	11	BKN012 BKN090 OVC210	10.00		81	27.0	71	21.6	66	19.0	60	15	300		28.73			M	SP		29.91
05	2351	11	BKN012 BKN090 OVC210	10.00		81	27.2	70	21.0	64	17.8	56	14	280		28.74			29.85	AA		29.92

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
(may be updated)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX , AZ
(07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
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	0015	11	BKN150 OVC210	10.00		81	27.0	70	21.0	64	18.0	56	13	300		28.73			M	SP		29.91
06	0051	11	FEW100 BKN150 OVC210	10.00		80	26.7	71	21.5	66	18.9	62	6	270		28.74			29.86	AA		29.92
06	0151	11	BKN180 OVC230	10.00		81	27.2	71	21.6	66	18.9	60	9	310		28.72			29.84	AA		29.90
06	0251	11	OVC250	10.00		79	26.1	72	22.0	68	20.0	69	5	210		28.72	6	014	29.84	AA		29.90
06	0351	11	BKN250	10.00		80	26.7	71	21.8	67	19.4	65	5	240		28.71			29.83	AA		29.89
06	0451	11	BKN250	10.00		80	26.7	71	21.8	67	19.4	65	6	230		28.71			29.83	AA		29.89
06	0551	11	FEW130 BKN250	10.00		80	26.7	71	21.8	67	19.4	65	6	230		28.73	5	003	29.85	AA		29.91
06	0651	11	FEW250	10.00		82	27.8	71	21.8	66	18.9	58	3	280		28.75			29.86	AA		29.93
06	0751	11	CLR	10.00		83	28.3	72	22.0	66	18.9	57	3	360		28.77	1	017	29.88	AA		29.95
06	0851	11	FEW250	10.00		85	29.4	72	22.3	66	18.9	53	0	000		28.77			29.90	AA		29.95
06	0951	11	FEW250	10.00		87	30.6	72	22.3	65	18.3	48	0	000		28.76			29.88	AA		29.94
06	1051	11	FEW250	10.00		93	33.9	73	22.9	64	17.8	38	5	130		28.75	8	006	29.86	AA		29.93
06	1151	11	CLR	10.00		93	33.9	73	22.6	63	17.2	37	0	000		28.72			29.84	AA		29.90
06	1251	11	CLR	10.00		97	36.1	74	23.2	63	17.2	33	9	260		28.69			29.81	AA		29.87
06	1351	11	FEW250	10.00		99	37.2	74	23.5	63	17.2	31	7	290		28.68	6	024	29.79	AA		29.85
06	1451	11	FEW250	10.00		102	38.9	73	22.8	59	15.0	24	9	240		28.65			29.76	AA		29.82
06	1551	11	FEW250	9.00		102	38.9	74	23.1	60	15.6	25	13	260		28.62	6	025	29.72	AA		29.79
06	1651	11	SCT200 BKN250	10.00		101	38.3	74	23.2	61	16.1	27	13	270		28.61			29.71	AA		29.78
06	1751	11	SCT200 BKN250	10.00		101	38.3	72	22.4	58	14.4	24	14	240		28.58			29.69	AA		29.75
06	1851	11	SCT200 BKN250	10.00		99	37.2	73	22.7	60	15.6	28	15	260		28.60	5	000	29.71	AA		29.77
06	1951	11	SCT200 BKN250	10.00		97	36.1	72	22.1	59	15.0	28	11	250		28.60			29.71	AA		29.77
06	2051	11	SCT200 SCT250	10.00		96	35.6	73	22.5	61	16.1	31	13	250		28.63			29.74	AA		29.80
06	2151	11	SCT200 SCT250	10.00		94	34.4	73	22.5	62	16.7	35	10	240		28.66	1	022	29.76	AA		29.83
06	2251	11	FEW250	10.00		94	34.4	73	22.8	63	17.2	36	10	260		28.66			29.78	AA		29.84
06	2351	11	FEW250	10.00		94	34.4	73	22.8	63	17.2	36	14	270		28.66			29.77	AA		29.83

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE PHOENIX SKY HARBOR INTL AIRPORT (23183) PHOENIX , AZ (07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
Data Version: VER3

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
07	0051	11	CLR	10.00		93	33.9	73	22.6	63	17.2	37	10	270		28.64			29.75	AA		29.81
07	0151	11	SCT180 SCT250	10.00		90	32.2	72	22.2	63	17.2	41	6	250		28.64			29.75	AA		29.81
07	0251	11	SCT180 SCT250	10.00		89	31.7	72	22.0	63	17.2	42	5	190		28.66	6	009	29.77	AA		29.84
07	0351	11	SCT180	10.00		91	32.8	71	21.7	61	16.1	37	0	000		28.68			29.78	AA		29.85
07	0451	11	SCT180	10.00		90	32.2	72	22.2	63	17.2	41	5	260		28.69			29.79	AA		29.86
07	0551	11	FEW120 SCT180 SCT250	10.00		88	31.1	73	22.5	65	18.3	47	6	260		28.69	1	015	29.80	AA		29.87
07	0651	11	FEW180	10.00		87	30.6	72	22.3	65	18.3	48	14	290		28.71			29.83	AA		29.89
07	0751	11	FEW180	10.00		88	31.1	72	22.2	64	17.8	45	16	280		28.73	3	015	29.84	AA		29.91
07	0851	11	FEW160	10.00		91	32.8	73	22.6	64	17.8	41	10	260		28.72			29.83	AA		29.90
07	0951	11	FEW160	10.00		93	33.9	73	22.9	64	17.8	38	6	260		28.71			29.82	AA		29.89
07	1051	11	FEW075 SCT160	10.00		96	35.6	73	22.8	62	16.7	32	6	290		28.69	8	010	29.81	AA		29.87
07	1151	11	FEW080 SCT210	10.00		100	37.8	74	23.4	62	16.7	29	10	280		28.68			29.78	AA		29.85
07	1251	11	FEW095 SCT210 SCT250	10.00		101	38.3	73	22.7	59	15.0	25	10	270		28.65			29.75	AA		29.82
07	1351	11	FEW100 SCT210 SCT250	10.00		104	40.0	74	23.1	59	15.0	23	10	240	24	28.61	8	029	29.72	AA		29.78
07	1451	11	FEW100 SCT210 SCT250	10.00		105	40.6	72	22.0	54	12.2	18	13	260	23	28.58			29.68	AA		29.75
07	1551	11	FEW100 SCT210 SCT250	10.00		106	41.1	72	22.2	54	12.2	18	15	290	23	28.56	6	025	29.66	AA		29.73
07	1651	11	FEW100 SCT210 SCT250	10.00		106	41.1	74	23.1	58	14.4	21	17	270	22	28.54			29.64	AA		29.71
07	1751	11	FEW100 SCT210 SCT250	10.00		105	40.6	73	22.8	57	13.9	21	14	250		28.53			29.63	AA		29.70
07	1851	11	FEW100 SCT210 SCT250	10.00		103	39.4	73	22.5	57	13.9	22	15	250		28.52	5	000	29.63	AA		29.69
07	1951	11	FEW100 SCT210 SCT250	10.00		101	38.3	73	22.7	59	15.0	25	11	260		28.54			29.64	AA		29.71
07	2051	11	FEW100 SCT210 SCT250	10.00		99	37.2	73	22.9	61	16.1	29	10	240		28.56			29.67	AA		29.73
07	2151	11	FEW100 SCT210 SCT250	10.00		98	36.7	73	22.5	60	15.6	28	9	250		28.59	1	020	29.69	AA		29.76
07	2251	11	FEW100 SCT250	10.00		97	36.1	70	21.1	55	12.8	24	9	190		28.60			29.70	AA		29.77
07	2351	11	FEW100 SCT250	10.00		95	35.0	70	21.0	56	13.3	27	7	200		28.60			29.70	AA		29.77

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
PHOENIX SKY HARBOR INTL AIRPORT (23183)
PHOENIX , AZ
(07/2011)

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

Elevation: 1105 ft. above sea level
Latitude: 33.443
Longitude: -111.990
Data Version: VER3

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
08	0051	11	FEW100 SCT250	10.00		94	34.4	70	20.8	56	13.3	28	5	120		28.59			29.69	AA		29.76
08	0151	11	FEW120 BKN200	8.00		90	32.2	70	21.3	60	15.6	37	13	120		28.59			29.69	AA		29.76
08	0251	11	FEW120 BKN200	10.00		90	32.2	70	21.0	59	15.0	35	5	080		28.58	5	003	29.69	AA		29.75
08	0351	11	FEW120 BKN200	10.00		90	32.2	70	21.0	59	15.0	35	0	000		28.58			29.68	AA		29.75
08	0451	11	FEW140 BKN200	10.00		89	31.7	70	21.1	60	15.6	38	5	140		28.59			29.70	AA		29.76
08	0551	11	SCT140 BKN180 BKN250	10.00		89	31.7	70	20.8	59	15.0	36	3	090		28.60	3	001	29.70	AA		29.77
08	0651	11	FEW140 SCT180 SCT220	10.00		91	32.8	70	20.9	58	14.4	33	3	140		28.62			29.72	AA		29.79
08	0751	11	FEW140 SCT190	10.00		94	34.4	70	20.8	56	13.3	28	8	130		28.63			29.73	AA		29.80
08	0851	11	FEW140 SCT190	10.00		97	36.1	70	21.1	55	12.8	24	6	160		28.63	3	011	29.73	AA		29.80
08	0951	11	FEW095 SCT140 SCT190	10.00		98	36.7	71	21.5	56	13.3	25	6	090		28.62			29.72	AA		29.79
08	1051	11	FEW095 SCT140 SCT190	10.00		101	38.3	72	22.2	57	13.9	23	8	150		28.60			29.70	AA		29.77
08	1151	11	FEW100 SCT190 SCT250	10.00		104	40.0	72	22.4	56	13.3	20	8	170		28.58	8	009	29.68	AA		29.75
08	1251	11	FEW110 SCT190 SCT250	10.00		104	40.0	72	22.4	56	13.3	20	7	360		28.55			29.65	AA		29.72
08	1351	11	FEW110 SCT190 SCT250	10.00		106	41.1	73	22.7	56	13.3	19	10	280	16	28.52	8	026	29.62	AA		29.69
08	1451	11	FEW110 SCT190 SCT250	10.00		108	42.2	73	22.9	56	13.3	18	6	VR	20	28.49			29.59	AA		29.66
08	1551	11	SCT130 SCT190 SCT250	10.00		109	42.8	74	23.3	57	13.9	18	8	200	25	28.47			29.57	AA		29.64
08	1618	11	FEW050 SCT095CB SCT130	10.00		100	38.0	76	24.5	66	19.0	33	7	230		28.47			M	SP		29.64
08	1644	11	FEW046 SCT095 SCT190	10.00		102	39.0	74	23.3	61	16.0	26	3	120		28.47	6	019	M	SP	0.02	29.64
08	1651	11	FEW046 SCT095 SCT190	10.00		102	38.9	75	23.9	63	17.2	28	6	110		28.46			29.57	AA		29.63
08	1751	11	FEW046 SCT095 SCT190	10.00		105	40.6	72	22.3	55	12.8	19	10	310	21	28.46			29.56	AA		29.63
08	1851	11	FEW050 SCT100 SCT190	10.00		105	40.6	72	22.0	54	12.2	18	13	290		28.46	3	000	29.56	AA		29.63
08	1951	11	FEW100 SCT190 SCT250	10.00		104	40.0	72	22.1	55	12.8	20	14	300	22	28.47			29.57	AA		29.64
08	2049	11	FEW100 SCT190 SCT250	10.00		100	38.0	71	21.5	55	13.0	22	14	340	22	28.48			M	SP		29.65
08	2051	11	FEW100 SCT190 SCT250	10.00		101	38.3	71	21.7	55	12.8	22	15	340		28.48			29.58	AA		29.65
08	2058	11	FEW100 SCT190 SCT250	10.00		100	38.0	71	21.5	55	13.0	22	13	330		28.49	1	015	M	SP		29.66
08	2151	11	FEW100 SCT190 SCT250	10.00		99	37.2	71	21.6	56	13.3	24	8	340		28.50			29.60	AA		29.67
08	2251	11	FEW100 SCT190 SCT250	10.00		98	36.7	71	21.5	56	13.3	25	3	330		28.51			29.61	AA		29.68
08	2351	11	FEW190 SCT250	10.00		97	36.1	70	21.3	56	13.3	25	7	300		28.52			29.62	AA		29.69

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE WILLIAMS GATEWAY AIRPORT (23104) PHOENIX , AZ (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
02	0015	0	CLR	10.00		88	31.0	61	15.9	39	4.0	18	6	160		28.26			M	AA		29.72
02	0035	0	CLR	10.00		88	31.0	60	15.5	37	3.0	16	3	140		28.25			M	AA		29.71
02	0055	0	CLR	10.00		88	31.0	60	15.4	36	2.0	16	0	000		28.25			M	AA		29.70
02	0115	0	CLR	10.00		86	30.0	58	14.3	32	0.0	14	5	090		28.25			M	AA		29.70
02	0135	0	CLR	10.00		86	30.0	57	14.0	30	-1.0	13	7	100		28.25			M	AA		29.70
02	0155	0	CLR	10.00		84	29.0	57	13.8	32	0.0	15	6	110		28.25			M	AA		29.70
02	0215	0	CLR	10.00		82	28.0	56	13.4	32	0.0	16	6	110		28.25			M	AA		29.70
02	0235	0	CLR	10.00		82	28.0	56	13.4	32	0.0	16	7	120		28.25			M	AA		29.70
02	0255	0	CLR	10.00		81	27.0	57	13.9	36	2.0	20	7	150		28.25			M	AA		29.70
02	0315	0	CLR	10.00		82	28.0	58	14.1	36	2.0	19	7	140		28.25			M	AA		29.70
02	0335	0	CLR	10.00		81	27.0	57	14.1	37	3.0	21	7	150		28.25			M	AA		29.70
02	0355	0	CLR	10.00		81	27.0	57	14.1	37	3.0	21	6	180		28.25			M	AA		29.70
02	0415	0	CLR	10.00		81	27.0	57	14.1	37	3.0	21	7	140		28.25			M	AA		29.71
02	0435	0	CLR	10.00		81	27.0	57	14.1	37	3.0	21	7	130		28.25			M	AA		29.71
02	0455	0	CLR	10.00		81	27.0	57	14.1	37	3.0	21	5	110		28.26			M	AA		29.72
02	0515	0	CLR	10.00		82	28.0	58	14.3	37	3.0	20	6	160		28.26			M	AA		29.72
02	0647	0	SCT180	35.00		88	31.0	60	15.5	37	3.0	16	5	130		28.28			M	AA		29.74
02	0747	0	SCT150	35.00		97	36.0	64	17.6	39	4.0	13	0	000		28.29			M	AA		29.75
02	0847	0	SCT150	35.00		97	36.0	65	18.4	43	6.0	16	5	240		28.30			M	AA		29.76
02	0947	0	SCT180	35.00		102	39.0	66	18.9	41	5.0	12	6	290		28.30			M	AA		29.76
02	1047	0	SCT200	35.00		111	44.0	70	21.2	46	8.0	11	16	130		28.29			M	AA		29.75
02	1151	0	SCT200	35.00		113	45.0	71	21.5	46	8.0	11	11	130		28.28			M	AA		29.74
02	1249	0	SCT200	35.00		117	47.0	72	22.1	46	8.0	9	10	130	23	28.26			M	AA		29.72
02	1454	0	SCT120 BKN200	35.00		111	44.0	70	21.0	45	7.0	11	17	030		28.22			M	AA		29.68
02	1550	0	SCT120 BKN200	35.00		117	47.0	71	21.6	43	6.0	8	14	060	28	28.21			M	AA		29.66
02	1650	0	SCT150 BKN200	30.00		115	46.0	72	22.2	48	9.0	11	20	040	21	28.20			M	AA		29.65
02	1747	0	SCT150 BKN200	30.00	BLDU RA	117	47.0	72	22.1	46	8.0	9	16	040	33	28.19			M	AA		29.64
02	1807	0	BKN150 BKN250	10.00		111	44.0	70	21.0	45	7.0	11	22	080		28.21			M	AA		29.66
02	1847	0	SCT150 BKN250	35.00		108	42.0	69	20.6	45	7.0	12	16	070		28.21			M	AA		29.66
02	1955	0	CLR	10.00		106	41.0	69	20.2	45	7.0	13	8	080		28.20			M	AA		29.65
02	2015	0	CLR	10.00		106	41.0	69	20.2	45	7.0	13	6	080		28.20			M	AA		29.65
02	2035	0	CLR	10.00		104	40.0	67	19.5	43	6.0	13	3	060		28.21			M	AA		29.66
02	2055	0	CLR	10.00		104	40.0	68	19.9	45	7.0	14	3	040		28.22			M	AA		29.67

02	2115	0	CLR	10.00		100	38.0	67	19.5	46	8.0	16	6	080		28.22			M	AA		29.68
02	2135	0	CLR	10.00		100	38.0	67	19.5	46	8.0	16	6	070		28.23			M	AA		29.69
02	2155	0	CLR	10.00		100	38.0	67	19.5	46	8.0	16	5	090		28.25			M	AA		29.70
02	2215	0	CLR	10.00		100	38.0	67	19.5	46	8.0	16	5	100		28.25			M	AA		29.71
02	2235	0	CLR	10.00		97	36.0	66	18.7	45	7.0	17	6	100	18	28.25			M	AA		29.71
02	2255	0	CLR	10.00	HZ	97	36.0	65	18.3	43	6.0	16	5	100	23	28.26			M	AA		29.72
02	2315	0	CLR	10.00		97	36.0	66	19.0	46	8.0	17	13	170	18	28.27			M	AA		29.73
02	2335	0	CLR	10.00		100	38.0	68	19.9	48	9.0	17	18	190		28.29			M	AA		29.75
02	2355	0	SCT018	5.00		100	38.0	69	20.8	52	11.0	20	15	190		28.31			M	AA		29.77

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE WILLIAMS GATEWAY AIRPORT (23104) PHOENIX , AZ (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
03	0015	0	SCT016 SCT026	5.00		100	38.0	71	21.5	55	13.0	22	14	190		28.31			M	AA		29.77
03	0035	0	SCT012 BKN019 BKN029	3.00		97	36.0	69	20.8	54	12.0	24	5	200		28.32			M	AA		29.78
03	0055	0	SCT012 SCT027	7.00		97	36.0	70	21.0	55	13.0	24	11	180		28.33			M	AA		29.79
03	0115	0	CLR	5.00	HZ	97	36.0	71	21.5	57	14.0	26	3	140		28.33			M	AA		29.79
03	0135	0	CLR	5.00	HZ	93	34.0	71	21.4	59	15.0	32	9	130		28.33			M	AA		29.79
03	0155	0	CLR	7.00		90	32.0	70	21.0	59	15.0	35	8	130	16	28.34			M	AA		29.80
03	0215	0	CLR	10.00	HZ	90	32.0	70	21.0	59	15.0	35	5	130		28.35			M	AA		29.81
03	0235	0	CLR	10.00	HZ	88	31.0	69	20.6	59	15.0	38	7	130		28.35			M	AA		29.81
03	0255	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	6	150		28.36			M	AA		29.82
03	0315	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	5	140		28.37			M	AA		29.83
03	0335	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	6	140		28.37			M	AA		29.83
03	0355	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	6	110		28.38			M	AA		29.84
03	0415	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	3	100		28.38			M	AA		29.84
03	0435	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	5	110		28.38			M	AA		29.84
03	0455	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	6	110		28.38			M	AA		29.84
03	0515	0	CLR	10.00		86	30.0	70	20.9	61	16.0	43	7	130		28.39			M	AA		29.85
03	0535	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	5	150		28.39			M	AA		29.85
03	0547	0	SCT200	30.00		88	31.0	71	21.8	63	17.0	43	6	140		28.39			M	AA		29.85
03	0647	0	SCT200	30.00		90	32.0	72	22.1	63	17.0	41	5	090		28.40			M	AA		29.86
03	0750	0	BKN200	30.00		95	35.0	73	22.9	63	17.0	35	6	270		28.40			M	AA		29.86
03	0847	0	BKN200	30.00		97	36.0	73	22.6	61	16.0	30	6	280		28.41			M	AA		29.87
03	1047	0	BKN250	30.00		102	39.0	74	23.3	61	16.0	26	8	220		28.39			M	AA		29.85
03	1147	0	FEW120 SCT250	15.00		106	41.0	74	23.4	59	15.0	21	11	240		28.36			M	AA		29.82
03	1247	0	FEW120 SCT250	30.00		108	42.0	74	23.1	57	14.0	19	7	250		28.36			M	AA		29.82
03	1347	0	SCT120 SCT250	35.00		109	43.0	73	22.6	54	12.0	16	8	260		28.30			M	AA		29.76
03	1447	0	SCT120 SCT250	35.00		109	43.0	73	22.8	55	13.0	17	10	280		28.27			M	AA		29.73
03	1547	0	SCT120 SCT250	35.00		109	43.0	73	22.6	54	12.0	16	8	260	16	28.23			M	AA		29.69
03	1647	0	SCT100 SCT250	35.00	DS	109	43.0	73	22.6	54	12.0	16	9	250		28.22			M	AA		29.68
03	1735	0	SCT002 SCT100 SCT250	0.75	DU	109	43.0	73	22.8	55	13.0	17	28	210	30	28.23			M	AA		29.69
03	1751	0	SCT100 SCT250	1.50	BLDU	106	41.0	75	23.9	61	16.0	23	22	220	29	28.23			M	AA		29.69
03	1810	0	SCT100 SCT250	3.00	VCTS	108	42.0	76	24.7	63	17.0	23	23	220		28.23			M	AA		29.69
03	1847	0	SCT100 BKN200	10.00		102	39.0	75	23.9	63	17.0	28	25	220		28.26			M	AA		29.72
03	1910	0	SCT100 BKN200	10.00	TS	100	38.0	75	23.6	63	17.0	30	17	220	22 29	28.28			M	AA		29.74
03	1955	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	14	230		28.32			M	AA		29.78
03	2015	0	CLR	7.00		95	35.0	74	23.2	64	18.0	36	18	360		28.36			M	AA		29.82

03	2035	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	8	350		28.37			M	AA		29.83
03	2055	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	6	050		28.38			M	AA		29.84
03	2115	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	3	080		28.39			M	AA		29.85
03	2135	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	0	000		28.39			M	AA		29.85
03	2155	0	CLR	10.00		88	31.0	71	21.8	63	17.0	43	0	000		28.40			M	AA		29.86
03	2215	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	0	000		28.40			M	AA		29.86
03	2235	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	0	000		28.40			M	AA		29.86
03	2255	0	CLR	10.00		90	32.0	71	21.5	61	16.0	38	0	000		28.40			M	AA		29.86
03	2315	0	CLR	10.00		90	32.0	71	21.5	61	16.0	38	0	000		28.41			M	AA		29.87
03	2335	0	CLR	10.00		90	32.0	71	21.5	61	16.0	38	0	000		28.41			M	AA		29.87
03	2355	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	5	190		28.41			M	AA		29.87

Dynamically generated Fri Jan 20 11:16:36 EST 2012 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 (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
04	0015	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.41			M	AA		29.87
04	0035	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	3	190		28.41			M	AA		29.87
04	0055	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	0	000		28.43			M	AA		29.89
04	0115	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.41			M	AA		29.87
04	0135	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	3	350		28.41			M	AA		29.87
04	0155	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.41			M	AA		29.87
04	0215	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.43			M	AA		29.89
04	0235	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	3	060		28.42			M	AA		29.88
04	0255	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	3	360		28.42			M	AA		29.88
04	0315	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	7	340		28.42			M	AA		29.88
04	0335	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	8	320		28.42			M	AA		29.88
04	0355	0	CLR	10.00		86	30.0	74	23.1	68	20.0	55	14	310		28.43			M	AA		29.89
04	0415	0	CLR	10.00		86	30.0	75	23.8	70	21.0	59	10	310	18	28.43			M	AA		29.89
04	0435	0	CLR	10.00		86	30.0	75	23.8	70	21.0	59	6	320		28.44			M	AA		29.90
04	0455	0	CLR	10.00		86	30.0	75	23.8	70	21.0	59	6	310		28.45			M	AA		29.91
04	0515	0	CLR	10.00		86	30.0	75	23.8	70	21.0	59	7	300		28.45			M	AA		29.91
04	0547	0	FEW150 SCT200	30.00		88	31.0	77	24.8	72	22.0	59	6	320		28.45			M	AA		29.91
04	0647	0	FEW150 SCT200	30.00		88	31.0	75	24.1	70	21.0	55	0	000		28.45			M	AA		29.91
04	0747	0	SCT150	30.00		90	32.0	75	23.7	68	20.0	48	3	240		28.48			M	AA		29.94
04	0851	0	SCT120 SCT200	30.00		91	33.0	74	23.2	66	19.0	44	6	270		28.48			M	AA		29.94
04	0948	0	SCT120 SCT200	30.00		93	34.0	73	22.9	64	18.0	38	0	000		28.46			M	AA		29.92
04	1150	0	SCT150 SCT200	30.00		99	37.0	74	23.5	63	17.0	31	6	280		28.41			M	AA		29.87
04	1348	0	SCT150 SCT200	30.00		102	39.0	74	23.3	61	16.0	26	10	280		28.36			M	AA		29.82
04	1448	0	SCT150 SCT200	20.00		104	40.0	76	24.1	63	17.0	26	3	310	23	28.32			M	AA		29.78
04	1547	0	SCT150 SCT200	20.00		106	41.0	75	23.9	61	16.0	23	11	290	21	28.30			M	AA		29.76
04	1647	0	SCT150 SCT200	20.00		106	41.0	75	23.9	61	16.0	23	11	270		28.28			M	AA		29.74
04	1747	0	SCT150 SCT200	20.00		106	41.0	75	23.9	61	16.0	23	15	270		28.29			M	AA		29.75
04	1847	0	SCT120 SCT200	20.00		104	40.0	75	23.6	61	16.0	24	14	280		28.30			M	AA		29.76
04	1955	0	CLR	10.00	BLDUs	100	38.0	75	23.6	63	17.0	30	23	240	24	28.35			M	AA		29.81
04	2015	0	CLR	10.00	HZ	99	37.0	74	23.5	63	17.0	31	20	230	24	28.36			M	AA		29.82
04	2017	0	BKN120	0.50s	HZ	99	37.0	74	23.5	63	17.0	31	21	210		28.37			M	AA		29.83
04	2035	0	OVC005	1.75	HZ	97	36.0	74	23.2	63	17.0	33	15	220	14s	28.38			M	AA		29.84
04	2055	0	OVC005	2.50	VCTSHZ	97	36.0	74	23.2	63	17.0	33	10	200	34	28.41			M	AA		29.87
04	2115	0	SCT005 BKN010 BKN014	2.50	VCTS	95	35.0	74	23.2	64	18.0	36	22	140	34	28.44			M	AA		29.90
04	2135	0	SCT110	5.00		93	34.0	72	22.0	61	16.0	34	29	120	25 28	28.46			M	AA		29.92

04	2155	0	CLR	7.00		88	31.0	71	21.8	63	17.0	43	22	110		28.46			M	AA		29.93
04	2215	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	17	110		28.45			M	AA		29.91
04	2235	0	CLR	10.00	-RA	88	31.0	69	20.6	59	15.0	38	9	110		28.42			M	AA		29.88
04	2255	0	CLR	10.00		93	34.0	69	20.4	55	13.0	28	5	120		28.39			M	AA		29.85
04	2315	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	15	290		28.36			M	AA		29.82
04	2335	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	9	320		28.37			M	AA		29.83
04	2355	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	13	130		28.42			M	AA		29.88

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE WILLIAMS GATEWAY AIRPORT (23104) PHOENIX , AZ (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
05	0015	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	9	130		28.44			M	AA		29.90
05	0035	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	10	150		28.44			M	AA		29.90
05	0055	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	11	160		28.44			M	AA		29.90
05	0115	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	10	160		28.44			M	AA		29.90
05	0135	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	9	150		28.43			M	AA		29.89
05	0155	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	6	120		28.43			M	AA		29.89
05	0215	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	6	140		28.41			M	AA		29.87
05	0235	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	5	180		28.40			M	AA		29.86
05	0255	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	3	150		28.40			M	AA		29.86
05	0315	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	6	130		28.41			M	AA		29.87
05	0335	0	CLR	10.00		86	30.0	72	22.4	66	19.0	51	7	090		28.41			M	AA		29.87
05	0355	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	7	110		28.42			M	AA		29.88
05	0415	0	CLR	10.00		82	28.0	71	21.8	66	19.0	58	7	120		28.42			M	AA		29.88
05	0435	0	CLR	10.00		82	28.0	71	21.8	66	19.0	58	5	110		28.42			M	AA		29.88
05	0455	0	CLR	10.00		82	28.0	71	21.8	66	19.0	58	6	110		28.42			M	AA		29.88
05	0515	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	8	100		28.43			M	AA		29.89
05	0547	0	SCT150 BKN250	30.00		86	30.0	75	23.8	70	21.0	59	10	110		28.45			M	AA		29.91
05	0647	0	SCT150 BKN250	30.00		88	31.0	74	23.4	68	20.0	52	8	110		28.46			M	AA		29.93
05	0748	0	SCT150	30.00		88	31.0	74	23.4	68	20.0	52	8	130		28.48			M	AA		29.94
05	0847	0	FEW200	30.00		90	32.0	75	23.7	68	20.0	48	8	120		28.48			M	AA		29.95
05	0947	0	FEW200	30.00		97	36.0	78	25.3	70	21.0	42	7	100		28.46			M	AA		29.93
05	1047	0	FEW200	30.00		97	36.0	74	23.5	64	18.0	34	0	000		28.46			M	AA		29.92
05	1147	0	SCT200	30.00		100	38.0	75	23.9	64	18.0	31	9	320		28.43			M	AA		29.89
05	1249	0	SCT200	30.00		102	39.0	75	23.9	63	17.0	28	7	330		28.41			M	AA		29.87
05	1349	0	FEW120 SCT200	20.00		102	39.0	74	23.3	61	16.0	26	14	310		28.38			M	AA		29.84
05	1447	0	FEW120 SCT200	20.00		106	41.0	76	24.4	63	17.0	25	13	310		28.34			M	AA		29.80
05	1648	0	SCT120 BKN200	20.00		106	41.0	76	24.4	63	17.0	25	14	330		28.30			M	AA		29.76
05	1747	0	SCT120 BKN200	20.00	+DSs	106	41.0	74	23.4	59	15.0	21	7	320	44	28.29			M	AA		29.75
05	1847	0	SCT120 BKN200	20.00	HZ	106	41.0	75	23.9	61	16.0	23	7	280	41	28.30			M	AA		29.76
05	1919	0	VV000	0.00s	HZ	104	40.0	75	23.6	61	16.0	24	33s	150	38	28.36			M	AA		29.82
05	1955	0	OVC003	1.00	BLDU	86	30.0	71	21.8	64	18.0	48	29	200	41	28.39			M	AA		29.85
05	2015	0	BKN005 BKN011 OVC017	2.50	HZ	88	31.0	70	21.2	61	16.0	40	29	210	41	28.39			M	AA		29.85
05	2018	0	BKN010 OVC031	2.00	HZ	88	31.0	71	21.8	63	17.0	43	30	210	21	28.39			M	AA		29.85
05	2035	0	SCT007 SCT022 BKN034	4.00	TSHZ	84	29.0	71	21.5	64	18.0	51	24	220		28.41			M	AA		29.87
05	2055	0	SCT045	4.00		86	30.0	70	20.9	61	16.0	43	10	310		28.45			M	AA		29.91

05	2115	0	SCT060 SCT075	5.00		82	28.0	68	20.2	61	16.0	49	5	200		28.46			M	AA		29.92
05	2135	0	SCT090	7.00	VCTS	86	30.0	70	20.9	61	16.0	43	9	140		28.48			M	AA		29.94
05	2155	0	SCT090	7.00		86	30.0	70	20.9	61	16.0	43	10	110		28.48			M	AA		29.94
05	2215	0	SCT095	10.00		82	28.0	70	21.1	64	18.0	55	7	130		28.48			M	AA		29.95
05	2235	0	SCT095	10.00		84	29.0	71	21.5	64	18.0	51	3	020		28.48			M	AA		29.95
05	2255	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	8	340		28.48			M	AA		29.94
05	2315	0	CLR	10.00		86	30.0	71	21.8	64	18.0	48	5	360		28.48			M	AA		29.94
05	2335	0	CLR	10.00		86	30.0	71	21.5	63	17.0	46	7	360		28.46			M	AA		29.93
05	2355	0	CLR	7.00		86	30.0	71	21.5	63	17.0	46	6	350		28.46			M	AA		29.93

Dynamically generated Fri Jul 08 14:04:53 EDT 2011 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 (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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	0015	0	CLR	7.00		86	30.0	71	21.5	63	17.0	46	8	330		28.48			M	AA		29.95
06	0035	0	SCT016 BKN021 BKN028	4.00		86	30.0	71	21.5	63	17.0	46	16	310		28.48			M	AA		29.95
06	0055	0	SCT014 SCT019	5.00		82	28.0	70	21.1	64	18.0	55	11	320		28.48			M	AA		29.95
06	0115	0	CLR	7.00		82	28.0	73	22.5	68	20.0	63	11	300		28.48			M	AA		29.95
06	0135	0	CLR	7.00	HZ	82	28.0	73	22.5	68	20.0	63	13	310	22	28.46			M	AA		29.93
06	0155	0	CLR	7.00	HZ	82	28.0	74	23.1	70	21.0	67	11	310		28.48			M	AA		29.94
06	0215	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	11	310		28.48			M	AA		29.95
06	0235	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	10	300	16	28.48			M	AA		29.95
06	0255	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	8	300	18	28.48			M	AA		29.94
06	0315	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	6	290	17	28.46			M	AA		29.93
06	0335	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	0	000		28.46			M	AA		29.93
06	0355	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	5	260		28.46			M	AA		29.93
06	0415	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	3	250		28.46			M	AA		29.93
06	0435	0	CLR	10.00		82	28.0	73	22.5	68	20.0	63	3	240		28.46			M	AA		29.93
06	0455	0	CLR	10.00		81	27.0	72	22.3	68	20.0	65	5	240		28.46			M	AA		29.93
06	0515	0	CLR	10.00		81	27.0	72	22.3	68	20.0	65	6	240		28.48			M	AA		29.94
06	0549	0	BKN200	20.00		82	28.0	74	23.1	70	21.0	67	7	250		28.48			M	AA		29.95
06	0647	0	BKN200	20.00		82	28.0	73	22.5	68	20.0	63	7	260		28.50			M	AA		29.97
06	0748	0	CLRs	20.00s	HZ	84	29.0	73	22.8	68	20.0	59	6	240		28.52			M	AA		29.99
06	0847	0	CLRs	15.00s	HZ	88	31.0	74	23.4	68	20.0	52	5	290		28.44			M	AA		29.90
06	0947	0	CLRs	10.00	HZ	88	31.0	73	22.8	66	19.0	48	5	320		28.51			M	AA		29.98
06	1047	0	CLRs	10.00	HZ	90	32.0	72	22.4	64	18.0	42	9	280		28.50			M	AA		29.97
06	1154	0	CLRs	10.00	HZ	97	36.0	77	24.7	68	20.0	39	6	270		28.48			M	AA		29.94
06	1247	0	CLRs	4.00	HZ	97	36.0	74	23.5	64	18.0	34	7	230		28.46			M	AA		29.92
06	1348	0	FEW150	4.00	HZ	99	37.0	74	23.5	63	17.0	31	5	250		28.44			M	AA		29.90
06	1455	0	SCT150	5.00	HZ	102	39.0	75	23.9	63	17.0	28	9	250		28.40			M	AA		29.86
06	1650	0	SCT150	5.00	HZ	106	41.0	76	24.4	63	17.0	25	11	320		28.37			M	AA		29.83
06	1755	0	SCT150	10.00	HZ	104	40.0	75	23.6	61	16.0	24	14	280		28.34			M	AA		29.80
06	1847	0	SCT120	20.00		102	39.0	73	22.8	59	15.0	24	10	280		28.36			M	AA		29.82
06	1955	0	CLR	10.00		100	38.0	74	23.1	61	16.0	28	8	290		28.37			M	AA		29.83
06	2015	0	CLR	10.00		100	38.0	74	23.1	61	16.0	28	8	280		28.38			M	AA		29.84
06	2035	0	CLR	10.00		99	37.0	73	22.9	61	16.0	29	9	250		28.39			M	AA		29.85
06	2055	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	8	250		28.40			M	AA		29.86
06	2115	0	CLR	10.00		97	36.0	72	22.1	59	15.0	28	5	240		28.41			M	AA		29.87
06	2135	0	CLR	10.00		97	36.0	72	22.1	59	15.0	28	0	000		28.42			M	AA		29.88

06	2155	0	CLR	10.00		97	36.0	72	22.1	59	15.0	28	3	280		28.42			M	AA		29.88
06	2215	0	CLR	10.00		97	36.0	72	22.1	59	15.0	28	6	290		28.43			M	AA		29.89
06	2235	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	7	300		28.43			M	AA		29.89
06	2255	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	5	320		28.43			M	AA		29.89
06	2315	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	0	000		28.42			M	AA		29.88
06	2335	0	CLR	10.00		97	36.0	73	22.6	61	16.0	30	0	000		28.41			M	AA		29.87
06	2355	0	CLR	10.00		97	36.0	74	23.2	63	17.0	33	6	300		28.41			M	AA		29.87

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
(final)
HOURLY OBSERVATIONS TABLE
WILLIAMS GATEWAY AIRPORT (23104)
PHOENIX , AZ
(07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
07	0015	0	CLR	10.00		97	36.0	74	23.2	63	17.0	33	9	300		28.40			M	AA		29.86
07	0035	0	CLR	10.00		97	36.0	74	23.5	64	18.0	34	8	290		28.40			M	AA		29.86
07	0055	0	CLR	10.00		97	36.0	74	23.5	64	18.0	34	6	290		28.40			M	AA		29.86
07	0115	0	CLR	10.00		97	36.0	74	23.5	64	18.0	34	6	280		28.41			M	AA		29.87
07	0135	0	CLR	10.00		93	34.0	73	22.6	63	17.0	37	5	260		28.41			M	AA		29.87
07	0155	0	CLR	10.00		93	34.0	73	22.6	63	17.0	37	5	240		28.41			M	AA		29.87
07	0215	0	CLR	10.00		93	34.0	73	22.6	63	17.0	37	3	250		28.41			M	AA		29.87
07	0235	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	5	190		28.42			M	AA		29.88
07	0255	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	5	180		28.43			M	AA		29.89
07	0315	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	3	190		28.43			M	AA		29.89
07	0335	0	CLR	10.00		90	32.0	72	22.4	64	18.0	42	5	100		28.43			M	AA		29.89
07	0355	0	CLR	10.00		90	32.0	72	22.1	63	17.0	41	0	000		28.43			M	AA		29.89
07	0415	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	5	190		28.44			M	AA		29.90
07	0435	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	0	000		28.44			M	AA		29.90
07	0455	0	CLR	10.00		88	31.0	71	21.8	63	17.0	43	3	060		28.44			M	AA		29.90
07	0515	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	5	120		28.45			M	AA		29.91
07	0535	0	CLR	10.00		88	31.0	72	22.1	64	18.0	45	3	100		28.45			M	AA		29.91
07	0547	0	BKN250	5.00	HZ	88	31.0	72	22.1	64	18.0	45	5	VR		28.45			M	AA		29.91
07	0647	0	SCT250	5.00	HZ	88	31.0	73	22.8	66	19.0	48	8	090		28.46			M	AA		29.93
07	0751	0	FEW250	4.00	HZ	88	31.0	73	22.8	66	19.0	48	6	120		28.48			M	AA		29.95
07	0849	0	FEW250	10.00	HZ	91	33.0	74	23.2	66	19.0	44	6	VR		28.48			M	AA		29.94
07	0948	0	FEW250	10.00	HZ	97	36.0	77	24.7	68	20.0	39	6	240		28.46			M	AA		29.93
07	1153	0	FEW100 FEW200	15.00s	HZ	102	39.0	75	23.9	63	17.0	28	8	270		28.43			M	AA		29.89
07	1254	0	FEW100 FEW200	15.00s	HZ	102	39.0	74	23.3	61	16.0	26	10	250		28.40			M	AA		29.86
07	1347	0	FEW120 SCT200	20.00		106	41.0	75	23.9	61	16.0	23	8	280		28.37			M	AA		29.83
07	1447	0	FEW120 SCT200	20.00		106	41.0	74	23.4	59	15.0	21	10	270	20	28.34			M	AA		29.80
07	1547	0	FEW180 SCT200	20.00		108	42.0	73	22.7	55	13.0	17	9	300	21	28.32			M	AA		29.78
07	1647	0	FEW180 SCT200	30.00		108	42.0	72	22.4	54	12.0	17	10	270		28.30			M	AA		29.76
07	1847	0	SCT120 SCT200	30.00		106	41.0	73	22.9	57	14.0	20	10	280		28.29			M	AA		29.75
07	1955	0	CLR	10.00		104	40.0	72	22.1	55	13.0	20	10	250		28.31			M	AA		29.77
07	2015	0	CLR	10.00		100	38.0	70	21.2	54	12.0	21	8	240		28.32			M	AA		29.78
07	2035	0	CLR	10.00		100	38.0	71	21.5	55	13.0	22	8	250		28.32			M	AA		29.78
07	2055	0	CLR	10.00		100	38.0	73	22.5	59	15.0	26	8	230		28.33			M	AA		29.79

07	2115	0	CLR	10.00		100	38.0	74	23.0	61	16.0	28	10	220		28.34			M	AA		29.80
07	2135	0	CLR	10.00		99	37.0	71	21.3	55	13.0	23	10	240		28.36			M	AA		29.82
07	2155	0	CLR	10.00	HZ	99	37.0	71	21.3	55	13.0	23	9	240		28.36			M	AA		29.82
07	2215	0	CLR	10.00	HZ	97	36.0	70	21.0	55	13.0	24	18	240		28.36			M	AA		29.82
07	2235	0	OVC004	1.00	HZ	97	36.0	73	22.6	61	16.0	30	17	240		28.35			M	AA		29.81
07	2255	0	BKN006	1.25	HZ	91	33.0	71	21.7	61	16.0	37	16	220		28.36			M	AA		29.82
07	2315	0	M	3.00		91	33.0	70	21.1	59	15.0	34	9	200		28.37			M	AA		29.83
07	2335	0	CLR	3.00		91	33.0	70	21.1	59	15.0	34	3	150		28.37			M	AA		29.83
07	2355	0	CLR	3.00		90	32.0	70	21.0	59	15.0	35	8	110		28.38			M	AA		29.84

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final) HOURLY OBSERVATIONS TABLE WILLIAMS GATEWAY AIRPORT (23104) PHOENIX , AZ (07/2011)

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

Elevation: 1382 ft. above sea level
Latitude: 33.308
Longitude: -111.650
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
08	0015	0	CLR	4.00		90	32.0	71	21.5	61	16.0	38	10	110		28.37			M	AA		29.83
08	0035	0	CLR	7.00		90	32.0	71	21.5	61	16.0	38	9	110		28.36			M	AA		29.82
08	0055	0	CLR	7.00		90	32.0	70	21.0	59	15.0	35	8	120		28.36			M	AA		29.82
08	0115	0	CLR	10.00	HZ	88	31.0	69	20.6	59	15.0	38	8	130		28.36			M	AA		29.82
08	0135	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	8	130		28.36			M	AA		29.82
08	0155	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	8	100		28.35			M	AA		29.81
08	0215	0	CLR	10.00		90	32.0	70	21.0	59	15.0	35	9	070		28.32			M	AA		29.78
08	0235	0	CLR	7.00		91	33.0	70	21.1	59	15.0	34	8	090		28.33			M	AA		29.79
08	0255	0	CLR	7.00		91	33.0	70	21.1	59	15.0	34	5	100		28.33			M	AA		29.79
08	0315	0	CLR	7.00		90	32.0	70	21.0	59	15.0	35	0	000		28.33			M	AA		29.79
08	0335	0	CLR	7.00		88	31.0	69	20.6	59	15.0	38	0	000		28.33			M	AA		29.79
08	0355	0	CLR	7.00		88	31.0	69	20.6	59	15.0	38	5	200		28.34			M	AA		29.80
08	0415	0	CLR	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.34			M	AA		29.80
08	0435	0	CLR	10.00		86	30.0	70	20.9	61	16.0	43	0	000		28.34			M	AA		29.80
08	0455	0	CLR	10.00		86	30.0	69	20.3	59	15.0	40	3	270		28.34			M	AA		29.80
08	0515	0	CLR	10.00		88	31.0	69	20.6	59	15.0	38	0	000		28.36			M	AA		29.82
08	0547	0	BKN150 BKN250	10.00		88	31.0	70	21.2	61	16.0	40	0	000		28.36			M	AA		29.82
08	0649	0	BKN150 BKN250	10.00		90	32.0	71	21.5	61	16.0	38	0	000		28.38			M	AA		29.84
08	0747	0	BKN150 BKN250	10.00		91	33.0	70	21.1	59	15.0	34	6	110		28.39			M	AA		29.85
08	0847	0	SCT150 BKN250	10.00		93	34.0	71	21.5	59	15.0	32	6	100		28.39			M	AA		29.85
08	0947	0	SCT150 BKN250	10.00		99	37.0	72	22.4	59	15.0	27	6	140		28.38			M	AA		29.84
08	1047	0	FEW120 SCT250	15.00		102	39.0	74	23.3	61	16.0	26	7	160		28.36			M	AA		29.82
08	1147	0	FEW120 SCT250	15.00		106	41.0	74	23.4	59	15.0	21	6	290		28.34			M	AA		29.80
08	1247	0	FEW120 SCT250	15.00		106	41.0	73	22.9	57	14.0	20	8	320	18	28.31			M	AA		29.77
08	1347	0	FEW120 SCT250	15.00		108	42.0	73	22.7	55	13.0	17	9	280		28.29			M	AA		29.75
08	1447	0	FEW120 SCT250	15.00		108	42.0	72	22.4	54	12.0	17	7	280		28.25			M	AA		29.71
08	1548	0	FEW120 SCT250	15.00		108	42.0	70	21.1	48	9.0	13	11	240		28.23			M	AA		29.69
08	1747	0	FEW120 SCT250	20.00		108	42.0	74	23.1	57	14.0	19	8	250		28.22			M	AA		29.67
08	1847	0	FEW120 SCT250	20.00		108	42.0	74	23.1	57	14.0	19	13	300		28.22			M	AA		29.67
08	1955	0	CLR	7.00		104	40.0	71	21.8	54	12.0	19	6	310		28.23			M	AA		29.69
08	2015	0	CLR	10.00		104	40.0	71	21.8	54	12.0	19	6	320		28.23			M	AA		29.69
08	2035	0	CLR	10.00		104	40.0	72	22.1	55	13.0	20	9	310		28.25			M	AA		29.70
08	2055	0	CLR	10.00		104	40.0	72	22.1	55	13.0	20	9	300		28.25			M	AA		29.70

08	2115	0	CLR	10.00		102	39.0	71	21.8	55	13.0	21	8	300		28.25			M	AA		29.70
08	2135	0	CLR	10.00		100	38.0	71	21.5	55	13.0	22	7	290		28.25			M	AA		29.70
08	2155	0	CLR	10.00		100	38.0	71	21.5	55	13.0	22	9	340		28.26			M	AA		29.72
08	2215	0	CLR	10.00		100	38.0	72	22.0	57	14.0	24	5	350		28.26			M	AA		29.72
08	2235	0	CLR	10.00		99	37.0	70	21.3	55	13.0	23	5	340		28.27			M	AA		29.73
08	2255	0	CLR	10.00		97	36.0	70	21.0	55	13.0	24	5	350		28.27			M	AA		29.73
08	2315	0	CLR	10.00		97	36.0	70	21.0	55	13.0	24	5	350		28.27			M	AA		29.73
08	2335	0	CLR	10.00		97	36.0	70	21.0	55	13.0	24	0	000		28.27			M	AA		29.73
08	2355	0	CLR	10.00		97	36.0	70	21.0	55	13.0	24	0	000		28.27			M	AA		29.73

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APPENDIX D

NOTICE OF PUBLIC COMMENT PERIOD

PUBLIC NOTICE
Arizona Department of Environmental Quality
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 air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event, and therefore exclude these data from consideration in air quality planning, if EPA concurs with the demonstration submitted by the flagging agency 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 PM_{10} in the Greater Phoenix area during July 3rd through 5th and on July 7th and 8th, 2011 and ADEQ's decision to flag these episodes based on these analyses. Copies of the demonstrations are available for review beginning Monday, February 6, 2012 on the ADEQ website at www.azdeq.gov/environ/air/plan/. Interested parties can submit written comments throughout the comment period which will end at 5:00 p.m. on Tuesday, March 6, 2012. Any comments received will be 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, a copy of the analyses is available for review at the following location:

> Arizona Department of Environmental Quality, Records Retention Center, First Floor, 1110 W. Washington Street, Phoenix, Arizona 85007, Attn: Christina Silva, (602) 771-4380.

Persons with a disability may request reasonable accommodations, such as a sign language interpreter, 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.

APPENDIX E

PHOTOS AND EXAMPLES OF MEDIA COVERAGE OF 2011 MONSOON EVENTS AND JULY 2-8 EVENTS

Video Links

Numerous news reports and articles were written throughout the week of July 2-8, 2011. As the monsoon season progressed and the dust storms continued, additional news reports and articles were created that discussed the uniqueness of the 2011 monsoon season in central Arizona. Below are several links to various videos that describe the dust storms that occurred in 2011.

http://www.azdeq.gov/function/about/videos/index.html

http://bcove.me/krh3qk29

http://bcove.me/tc6otk0h

http://bcove.me/c3189kkd

http://bcove.me/pb5lmh1s

http://www.abc15.com/dpp/weather/weather_news/raw-video%3A-haboob-rolls-into-phoenix

http://www.abc15.com/dpp/news/region_phoenix_metro/central_phoenix/video%3A-cloud-of-dust-engulfs-camelback-mountain

http://www.abc15.com/dpp/weather/weather_news/video%3A-dust-wall-hits-valley-homes

http://www.myfoxphoenix.com/dpp/weather/big-dust-storm-rolls-into-valley-7-5-2011

http://www.msnbc.msn.com/id/21134540/vp/43655453#43655453

http://www.cnn.com/2011/US/07/06/arizona.dust.storm/index.html?hpt=hp_t2

http://www.weather.com/outlook/videos/time-lapse-amazing-phoenix-dust-storm-21209

http://asunews.asu.edu/20110706_video_haboob#

Articles and Links

http://www.weather.com/outlook/weather-news/news/articles/phoenix-haboob_2011-07-06?s_oid=http://www.weather.com/outlook/weather-news/news/articles/phoenix-haboob_2011-07-06&s_oidt=0

7/6/2011 4:26 PM

Ariz. washes away dust deposited by massive storm

By AMANDA LEE MYERS Associated Press

Arizonans are calling it the mother of all dust storms. The mile-high wall of ominous, billowing dust that appeared to swallow Phoenix and its suburbs is all that locals can talk about.

It moved through the state around sundown Tuesday, halting airline flights, knocking out power to nearly 10,000 people, turning swimming pools into mud pits and caking cars with dirt.

The sky was still filled with a hazy shade of brown Wednesday as residents washed their cars and swept sidewalks.

Because dust storms, also known by the Arabic term "haboobs," are so hard to predict, Tuesday's took everyone by surprise.

Seemingly out of nowhere, the 100-mile-wide storm moved like a giant wave, the dust roiling as it approached at up to 60 mph. Once it hit, visibility dropped to zero in some areas, the sky turned nearly black, trees blew sideways, and even downtown Phoenix skyscrapers became invisible.

"Just the height of it looked like a special-effect scene from a movie, like a dust storm out in Africa," said Charlotte Dewey, a National Weather Service meteorologist in Phoenix. "It looked so huge, looking at the city down below, it was just specks of light and miniature buildings.

"I have a feeling that people will be talking about this for another week or two, at least," Dewey said.

She said meteorologists were still trying to get exact measures from satellite and radar to figure out how big the dust storm was and compare it with previous ones, but they estimate it was more than a mile high and more than 100 miles wide.

"People who've lived here their whole lives, 30 or 40 years, are saying they've never seen a storm this large," Dewey said.

She said winds from separate thunderstorms in the eastern and southern parts of the state collided somewhere between Phoenix and Tucson and combined with a severe lack of moisture to create the wall of dust. The storm also hit the Yuma area in southwestern Arizona, and far western Arizona.

Haboobs only happen in Arizona, the Sahara desert and parts of the Middle East because of dry conditions and large amounts of sand, Dewey said.

"It's a pretty rare thing to be able to see," she said.

While some Arizonans revel in the strange weather, many were unlucky enough to be outside when the storm rolled in. The storm blasted them with dust that went up their noses, behind their contact lenses and in their mouths, leaving behind a gritty taste.

Holly Ward, a spokeswoman at the Maricopa County Air Quality Department, said pollution levels skyrocketed.

During the storm, the amount of particulate matter in the air reached 375 micrograms per cubic meter, more than double the level federal standards consider healthy.

"You didn't have to go far anywhere in the dust storm to feel the remnants of that dust in your throat and in your nose," Ward said. "If someone already has breathing problems like asthma and bronchitis, this is an incredible health challenge and serious health threat for those folks."

The dust storm also grounded flights at Phoenix's Sky Harbor International Airport for 45 minutes. At least three flights were canceled and more than a dozen were delayed, while several incoming flights were diverted to Tucson and Ontario, Calif., said airport spokesman Julie Rodriguez.

Federal Aviation Administration spokesman Lynn Lunsford said planes need to be grounded during dust storms because of the low visibility, high winds and potential damage from the dirt.

"If you think about it, glass is made from sand that has been melted, and if you think about the temperature inside a jet engine, it's hot enough to melt sand," he said. "If you can't see through it, you definitely don't want to fly through it."

He likened the storm to volcanic ash that wreaked havoc in the skies in April 2010, when an eruption grounded flights across Europe for days, disrupting travel for 10 million people.

Arizona's dust storm annoyed others who couldn't see out of their car windows or found their pools filthy in the morning. But that created pay dirt at local businesses.

"It's crazy here," said Margaret Viloria, manager of Los Olivos Hand Car Wash near downtown Phoenix. "When we opened this morning cars were lined up outside. It's just been nonstop."

On a typical day, the car wash cleans about 25 to 30 cars an hour. It was averaging 55 an hour Tuesday, Viloria said.

Joe Pinelli, owner of The Pool Service in Phoenix, was also having an "absolutely chaotic" day.

"I don't think I've been off the phone since about 6 a.m.," he said.

Dewey, the weather service meteorologist, said there was a slight chance of blowing dust in the Phoenix area Wednesday and Thursday and a slight chance of thunderstorms the rest of the week.

"As far as if it would be of any magnitude we saw Tuesday, I don't know," she said.

 http://www.ksro.com/news/article.aspx?id=3133782

Arizona dust storm leaves big mess, health fears in its wake

Car washes and pool firms cash in; health fears lingering

28 comments by **Jim Walsh and Elvina Nawaguna-Clemente** - Jul. 7, 2011 12:00 AM
The Arizona Republic

- **Graphic: More information on the huge dust storm**

An enormous wall of dust that barreled across the Valley during a monsoon storm left so much dirt behind on the ground and in the air that it didn't just coat cars and clog up pools, it prevented pilots approaching Sky Harbor International Airport from seeing the runways a day later.

The windstorm that took Valley residents by surprise Tuesday around sunset was a rare monster that reached theatrical proportions. It spawned a 100- to 150-mile-wide plume of dust more than 5,000 feet high, moving at 50 mph to 60 mph from northwest Tucson along Interstate 10 through the Valley before petering out in Yavapai County, according to Elizabeth Padian, a National Weather Service spokeswoman.

"The magnitude of it, how high it was, how wide it was, how dense it was, this is remarkable," she said.

The storm was all anyone could talk about Wednesday after it cut power to 10,000 Valley customers, grounded flights and left people cleaning up cars and pools caked with dirt and mud.

Ken Waters, a warning-coordination meteorologist with the Weather Service, said the storm hung together like a weather front of its own. "This is like special effects from a Hollywood movie," he said. "It's kind of once in a lifetime."

The aftereffects forced the Federal Aviation Administration to reduce aircraft arrivals at Sky Harbor on Wednesday from about 78 per hour to 48 an hour because of poor visibility caused by a layer of dust still hanging around at 4,000 to 6,000 feet.

Pilots compensated by using instrument-arrival equipment, similar to that used to land during a thunderstorm, said Lynn Lunsford, an FAA spokesman in Fort Worth, Texas. Although conditions were improving late Wednesday afternoon, planes were still "descending through the dust," he said.

Randy Cerveny, an Arizona State University professor of geographical sciences who has studied Arizona's weather for decades, said the Valley used to have more frequent dust storms like Tuesday's before development paved over the desert. But this one was impressive, he said.

"It's the biggest I've seen in 10 or 15 years," he said.

Cerveny and the Weather Service said the winds were created by a powerful downdraft as thunderstorms near Marana and Oro Valley fell apart. Rain forced the winds to ground level, and they quickly swept up dust because of the extremely dry conditions. The amount of dust grew larger as the storm blew northwest toward the Valley.

"It's kind of like a bomb blast," Cerveny said, adding that most of the winds headed northwest toward Phoenix while a spur went west through Tacna, eventually passing through Yuma and crossing the Colorado River.

Cervany theorized that unkempt yards in houses abandoned during the economic downtown created more dust that fed the storm.

Mark Shaffer, a spokesman for the Arizona Department of Environmental Quality, said the testing station on 15th Avenue, between Thomas and Indian School roads in Phoenix, recorded an astronomical reading of 6,349 micrograms per cubic meter at 10 p.m. Tuesday. The federal EPA standard is 150.

Because of the dust that lingered through Wednesday, those with respiratory issues were warned to stay inside.

"It's a little bit frantic today," Dr. Laura Ispas-Ponas said. "Patients are calling complaining of symptoms that seem to be, but aren't necessarily, allergy-related."

The specialist at Sonoran Allergy and Asthma Center in Scottsdale said dust particles act as irritants, mimicking allergy symptoms such as nasal drainage, dry cough and itchy, watery eyes.

Dust also can cause serious reactions in people with asthma, chronic obstructive pulmonary disease and other respiratory conditions, Ispas-Ponas said.

Residents caught in the dust storm could end up with valley fever, a usually harmless lung infection that occasionally spreads to the spinal fluid, bones and other parts of the body, with potentially devastating effects, said Dr. Rick Helmers, a pulmonologist at Mayo Clinic in Scottsdale. Valley fever is caused by inhaling spores of the fungus coccidioides, which grows in the soil in the Southwest. The spores become airborne when stirred by wind, construction or farming and can cause fatigue, fever, coughs and muscle and joint aches.

Across the Valley, many people were busy cleaning up cars, pools and yards Wednesday.

Scottsdale's Eldorado Aquatic and Fitness Center was expected to reopen today after workers spent most of the day cleaning up a "huge mud hole" in the swimming pool, employee Joyce Shorr said.

Car-washing and pool-cleaning services were inundated.

Quick N Clean car wash saw about a 50 percent increase in customers, with anywhere from six to 15 cars lined up at several Valley locations before opening time, company President Richard Karle said.

"Our car-wash business was good today," he said. "It will be a nice little run for the next week or so. There are a lot of dirty cars out there."

For pool-cleaning businesses, the storm brought a mix of good and bad.

"The new-service requests are coming in hot and heavy," said Chip Bury, owner of Splish Splash Pool Service in Phoenix. But on the down side, companies face a lot more work cleaning up existing customers' pools.

"You have to take the good with the bad," Bury said. "We don't pray for storms. It's such a tremendous burden."

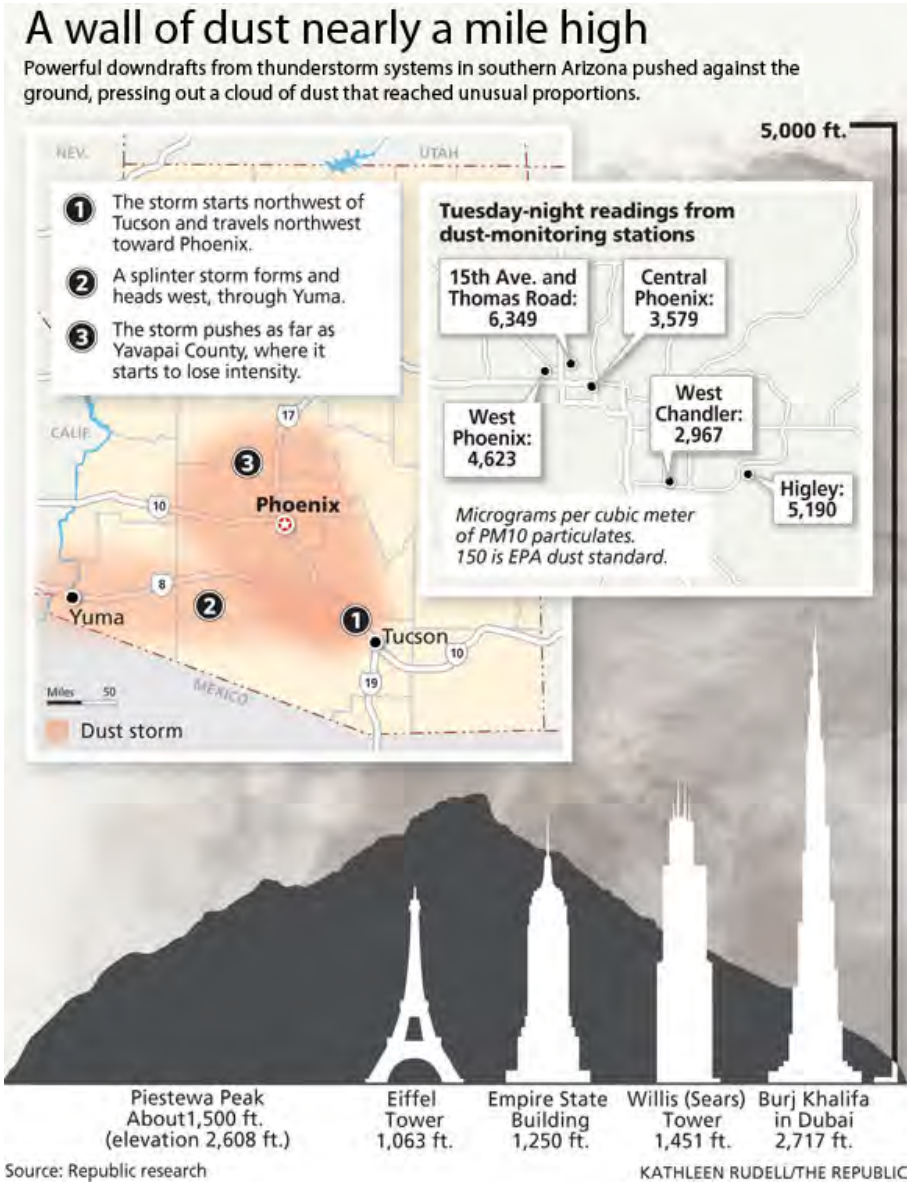
For auto dealers with cars out on open lots, the "haboob" was a big inconvenience. Dealerships opened with cars covered in dirt and debris.

Mark Gruwell, co-owner of Courtesy Chevrolet knew he was in for a long day as he watched the storm move in Tuesday night.

"I was like, 'Oh, my gosh, this is just going to make a big mess for the next day.' I knew it was going to be a lot of work," Gruwell said.

The company hired two extra workers to help clean up for the next two days. "I've lived here my whole life, and I have never seen anything like that," he said. "It was just unbelievable."

Republic reporter Connie Midey contributed to this article.



Read more:
http://www.azcentral.com/community/phoenix/articles/2011/07/07/20110707arizona-dust-storm-mess-health-fears.html#ixzz1RRB6i5IN

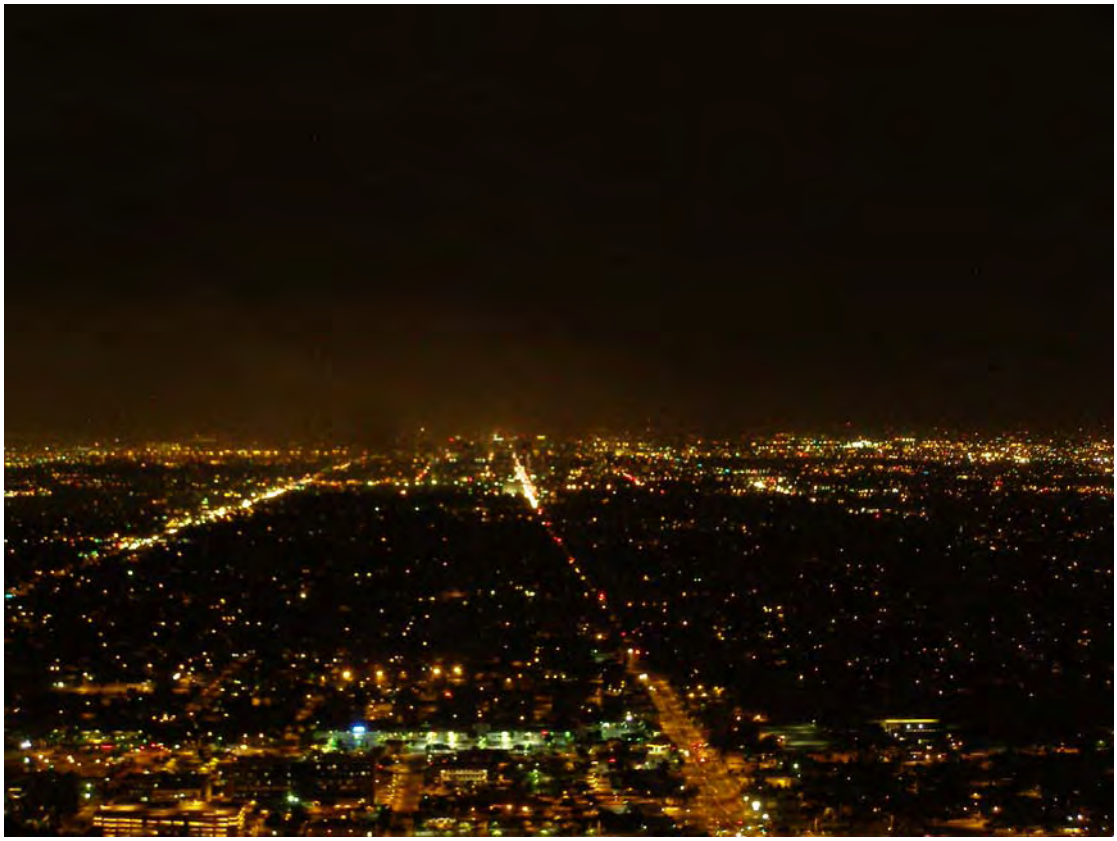
Images

Images captured from the Phoenix Visibility Camera network are provided in this section. Clear images of all of the dust storms that occurred during the week of July 2-8 were not available due to the timing of the storms. Many of the dust storms occurred during the night-time hours, making them difficult to see in a photograph. Time lapse photography loops using these images are also available. See Section II of the main document for further details.

18:00 July 3rd – Image looking south towards downtown Phoenix and south mountain. The wall of dust can be seen approaching from the south / southwest.

20:55 July 4th – Image looking east towards Superstition mountains. Despite the time of day, the approaching wall of dust can be faintly seen off in the distance. 4th of July fireworks can also be seen in front of the approaching dust storm.

22:10 July 4th – Image looking south towards downtown Phoenix and South Mountain. Despite the time of day, the approaching wall of dust can be faintly seen off in the distance as it propagates towards the northeast.

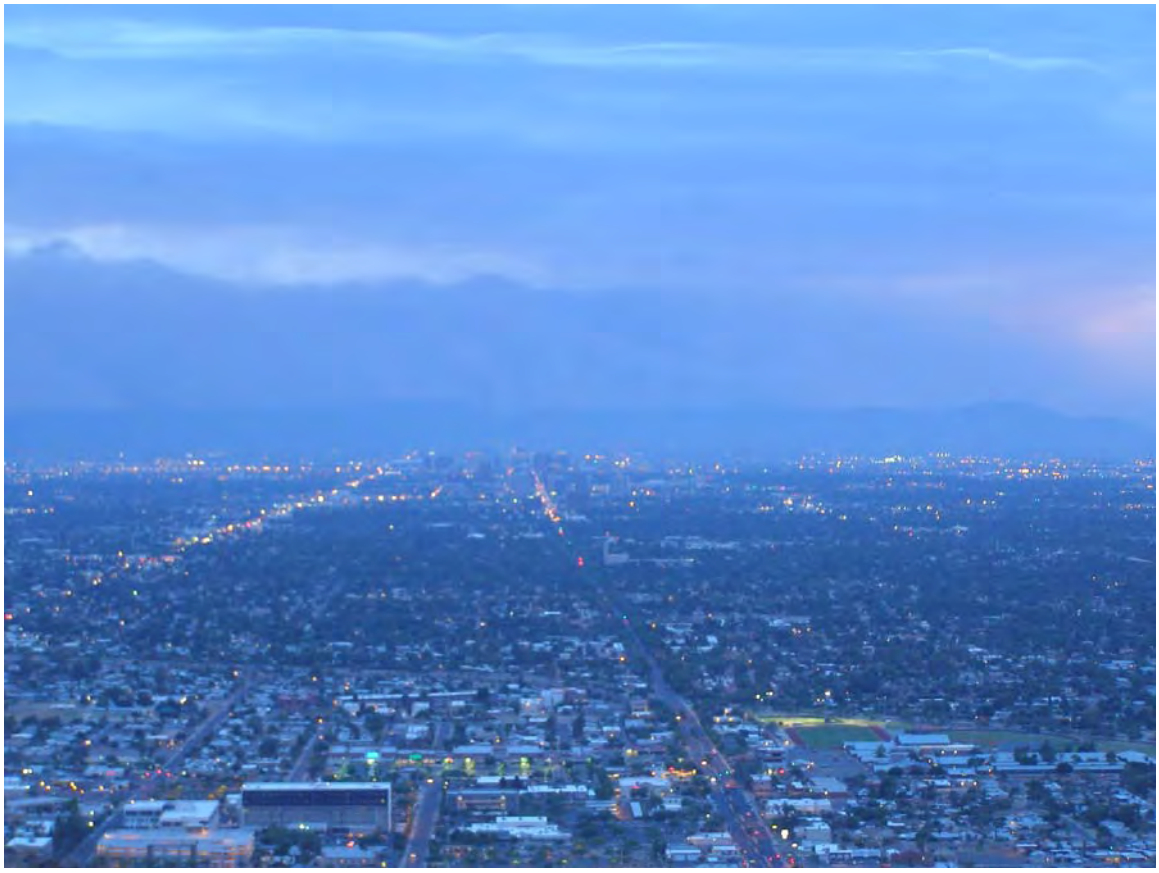


18:45 – 10:15, July 5th – Photo taken near Ocotillo and Gilbert roads in Chandler, AZ (southeast Maricopa County). The approaching wall of dust can be seen as it advances from the south to the north.

18:45 – 19:15, July 5th – Photo taken near Ocotillo and Gilbert roads in Chandler, AZ (southeast Maricopa County). The approaching wall of dust can be seen as it advances from the south to the north.

19:30 July 5th – Image looking east towards Superstition mountains. The approaching wall of dust can be seen as it advances from the south to the north.

19:45 July 5th – Image looking south towards downtown Phoenix and South Mountain. The approaching wall of dust can be seen as it advances from the south to the north. At this time, the wall of dust has not passed South Mountain.



19:50 July 5th – Image looking south towards downtown Phoenix and South Mountain. The approaching wall of dust can be seen as it advances from the south to the north. At this time, the wall of dust has passed South Mountain. From this photo and the prior photo, the height of the dust wall can be approximated at 3-4 times that of South Mountain, resulting in an estimated height of 4300-5800 feet (approximately a mile high).

20:05 July 5th – Image looking south towards downtown Phoenix and South Mountain. The approaching wall of dust can be seen as it advances from the south to the north, just before it passes downtown Phoenix.

20:10 July 5th – Image looking south towards downtown Phoenix and South Mountain. The approaching wall of dust can be seen as it advances from the south to the north as downtown Phoenix disappears from the photo.