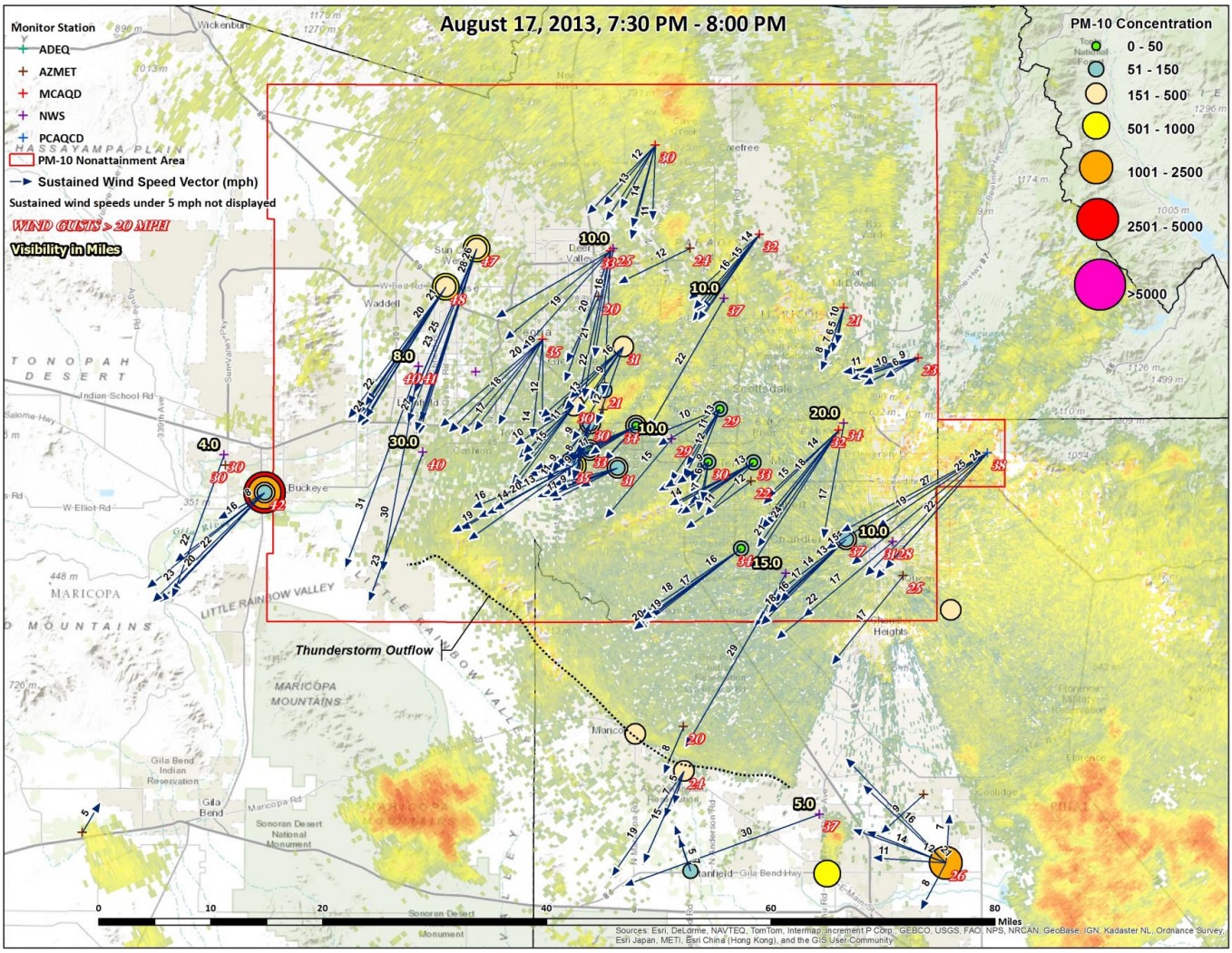
State of Arizona Exceptional Event Documentation for August 17, 2013, for the Buckeye Monitor

Produced by:

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

FINAL Report
December, 2013



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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 on August 17, 2013. More information on ADEQ's forecasting program can be found in Section IV. The forecast products that were issued for August 17, 2013 are included in Appendix A.

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 submitted a letter to EPA Region 9 Air Division Director, Deborah Jordan, on September 11, 2013, notifying EPA of ADEQ's intent to flag data in AQS and submit documentation to EPA by February 2014 for multiple exceptional events. EPA was later notified with subsequent communication

via email that the August 17, 2013, exceptional event would be added to the other exceptional events specified in the September 11, 2013, letter. This assessment report serves as the demonstration supporting the flagging of these data. One Maricopa County monitor has been flagged as exceeding the 24-hour PM10 standard as a result of the high wind exceptional event:

Buckeye (04-013-4011-81102-1).

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 01/13/2014. 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 C 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, 2016.

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 a thunderstorm outflow wind event that transpired on August 17, 2013, providing a background narrative of the exceptional event and an overall explanation that 'the event affected air quality'. Further evidence that 'the event affected air quality' is provided in Section V.

Section IV of this assessment details the existing area control measures and demonstrates that despite the presence and enforcement of these controls, the event on August 17, 2013, was not reasonably controllable or preventable.

Section V of this assessment establishes a clear causal connection between the natural event on August 17, 2013, and the exceedances of the 24-hour PM10 standard. The evidence in this section (and the previous section on historical fluctuations) also confirms that the event in question both affected air quality and was the result of a natural event.

Section III of this assessment provides data summaries and time series graphs which help illustrate that the event on August 17, 2013, 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 exceedance and concludes there would have been no exceedance on August 17, 2013, but for the presence of the natural event.

II. CONCEPTUAL MODEL

Geographic Setting and Climate

Geographic Setting

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 Mazatzal (~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 2–2 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.

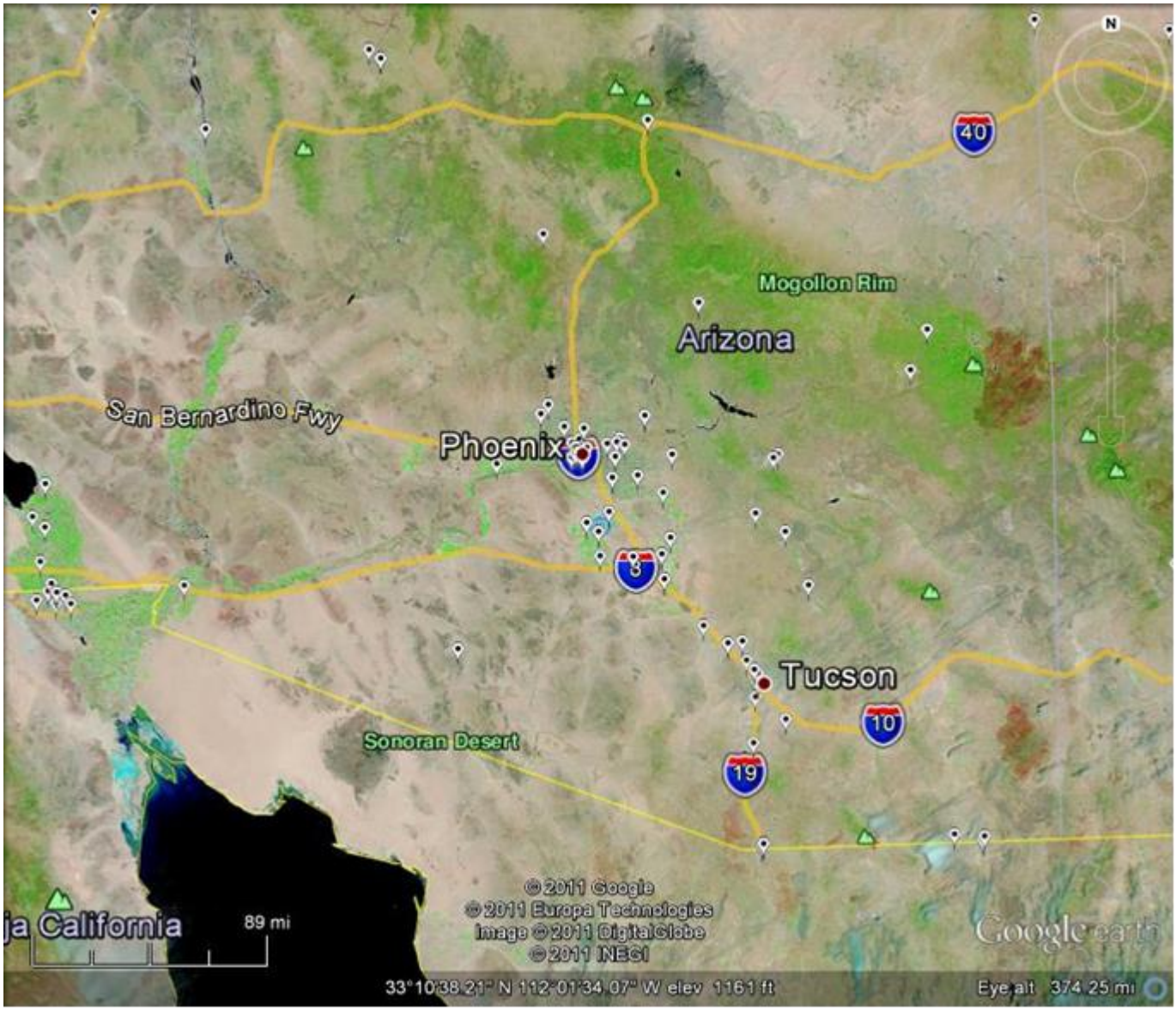

Figure 2-1. Phoenix Geographic Setting and PM10 Monitor Locations (source: EPA AQS DataMart, NASA MODIS Satellite, and Google Earth). PM10 monitor locations are indicated by white markers.

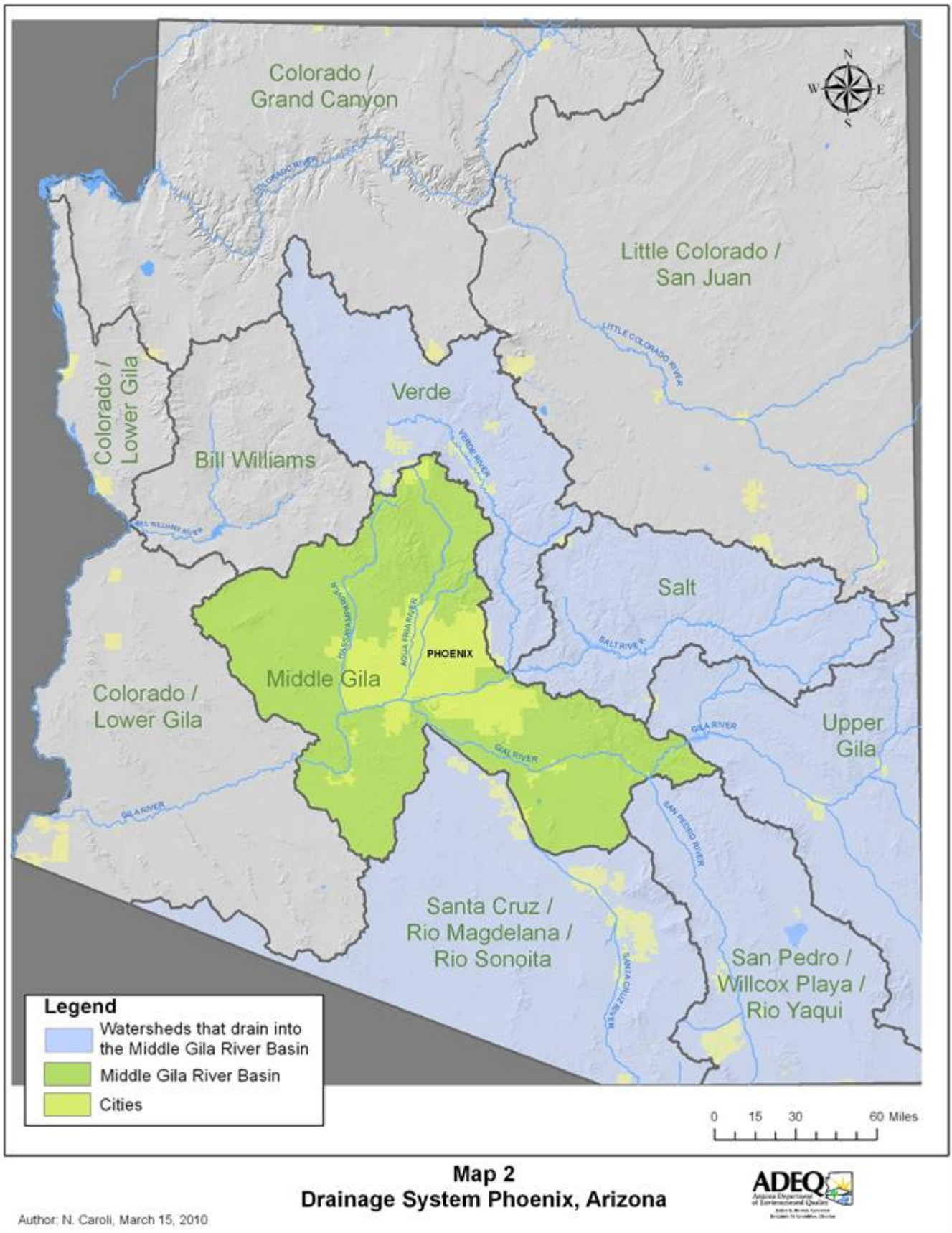

Figure 2-2. Drainage System of Phoenix, Arizona.

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 bring strong winds, blowing dust and 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.

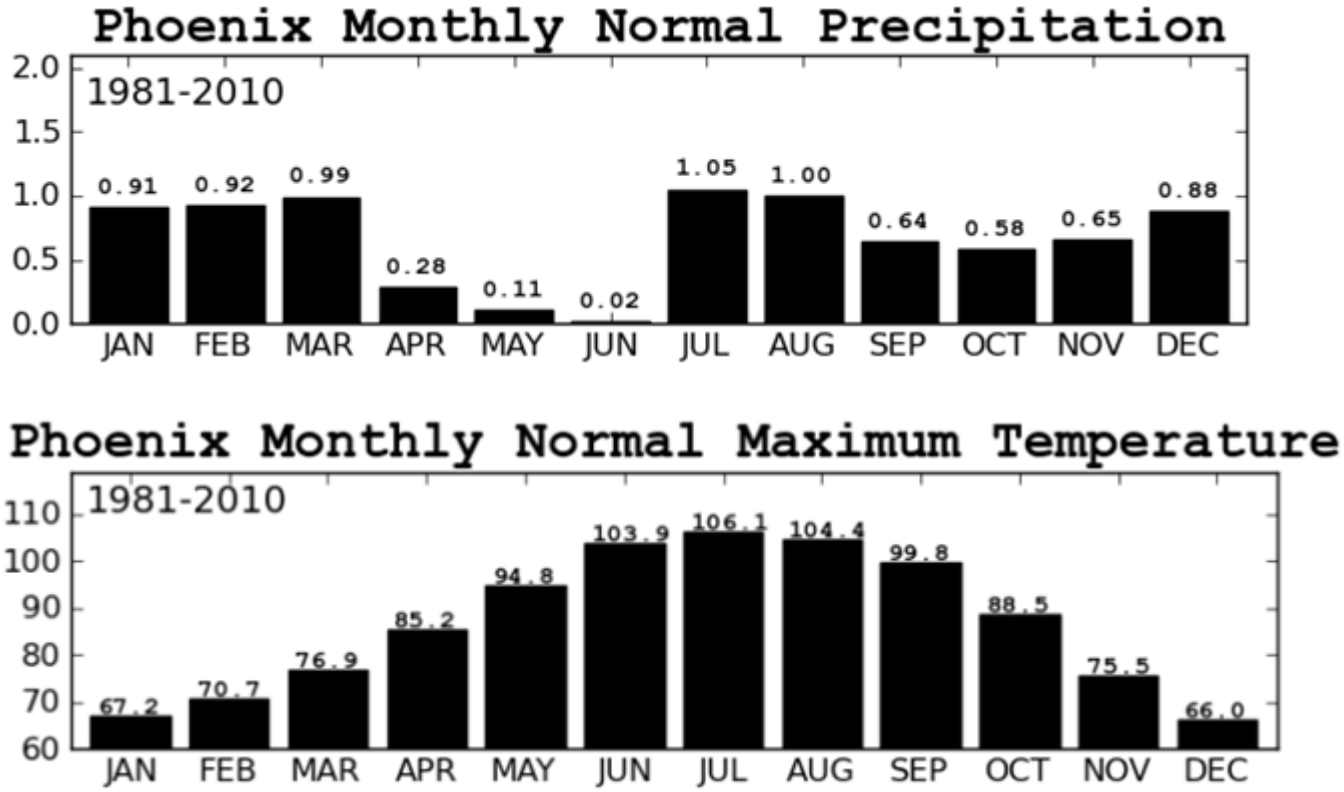

Figure 2-3 Phoenix Monthly Precipitation (top) and Maximum Temperature (bottom) Climatology (source: National Weather Service).

Monsoon Season Thunderstorm Outflow Dust Storm Event Summary

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. 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. 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.

In addition to bringing precipitation, active thunderstorms can produce downbursts, or sometimes more concentrated and severe microbursts, which are rapidly descending bursts of air spreading away from the thunderstorm clouds. 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 generate large walls of dust, sometimes called haboobs, and transport that dust for long distances from the initiating thunderstorms (see Figure 2–4).

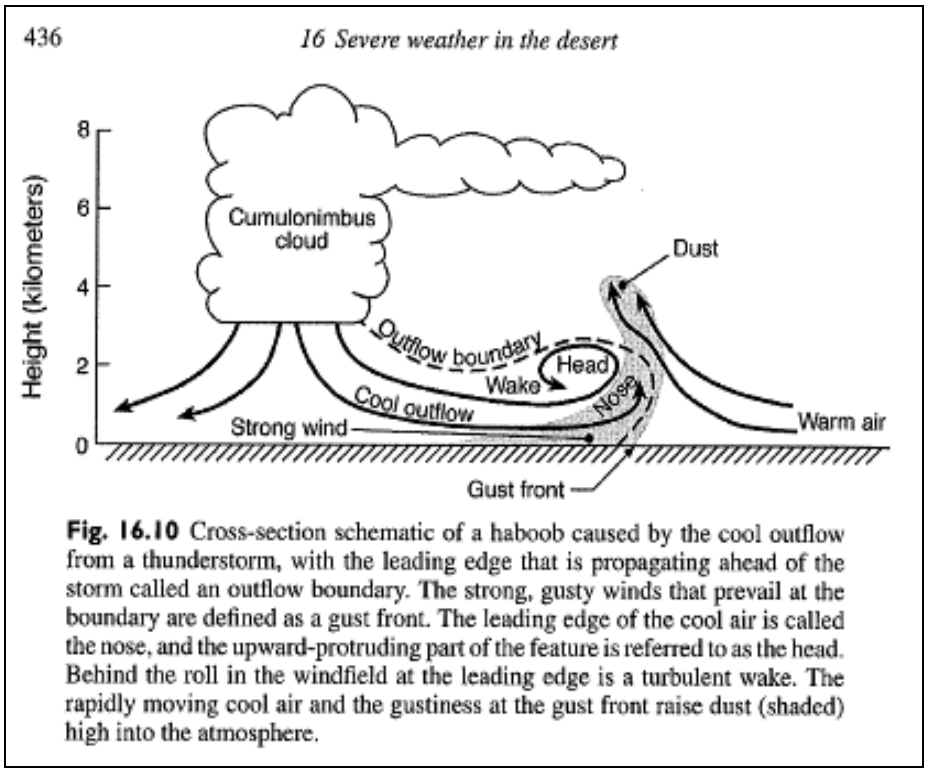

Figure 2-4. Cross-section of a thunderstorm creating an outflow boundary and haboob (Source: Desert Meteorology. Thomas T. Warner. 2004.)

On the evening of August 17, 2013, thunderstorm outflows north of Maricopa County produced very strong outflow winds that generated a significant dust storm. Beginning at approximately 5:30 pm, the thunderstorm outflow is clearly visible on National Weather Service (NWS) base reflectivity radar near the border of Maricopa and Yavapai counties. The outflow progressed south-southwest across Maricopa County, generating wind gusts up to 52 mph and sustained winds as high as 40 mph. Visibilities were reduced to two and three miles at multiple airports in the western portions of Maricopa County as a result of the dust storm passing through. Some scattered precipitation from the thunderstorm outflow was recorded (between 0.01–0.06 inches) beginning at approximately 9:15 pm. However, the precipitation occurred after the monitors had been subject to over one and a half hours of windblown dust emissions. The precipitation likely helped to speed the return of PM10 concentrations to normal levels, but did not occur early enough or frequently enough to prevent an exceedance of the PM10 standard.

Outflow winds from the thunderstorm produced wind speeds that easily overwhelmed controls designed to reduce PM10 from high winds. Five-minute average PM10 concentrations during the high wind dust storm event reached 3,605 $\mu g/m^3$ in response to gusty winds from the outflow event. The Maricopa County monitors most impacted by the event were located on the western and northern edges of the urbanized boundary. As such, wind speeds were greatest at these monitors and there was more open and natural desert areas available upwind of these monitors, allowing for greater generation of windblown dust emissions compared to monitors located within the urbanized core. The PM10 from the dust storms ultimately caused the western-most Maricopa County monitor (Buckeye) to exceed the 24-hour PM10 standard on August 17, 2013, and caused the northern-most Maricopa County monitor (Zuni Hills) to record a 24-hour concentration within 7 $\mu g/m^3$ of exceeding the standard.

A contributing factor that led to this dust storm was the on-going drought across the region. The U.S. Drought Monitor as of August 13, 2013, categorized the source area of the thunderstorm winds as either D1 (Moderate), D2 (Severe) or D3 (Extreme) drought level. This level of drought helps to show how the natural desert areas of Maricopa County are vulnerable to dust storms generated by thunderstorm outflow winds.

A more detailed explanation and time series visualization of the thunderstorm outflow dust storm event is available in Section V, describing the clear causal connection between the approaching outflow and the exceeding PM10 concentrations recorded in Maricopa County.

As a summary of the event, Figure 2–6 displays an hourly graph of the PM10 concentrations throughout Maricopa County. Table 2–1 contains PM10 concentration data from all recorded monitors throughout the State of Arizona.

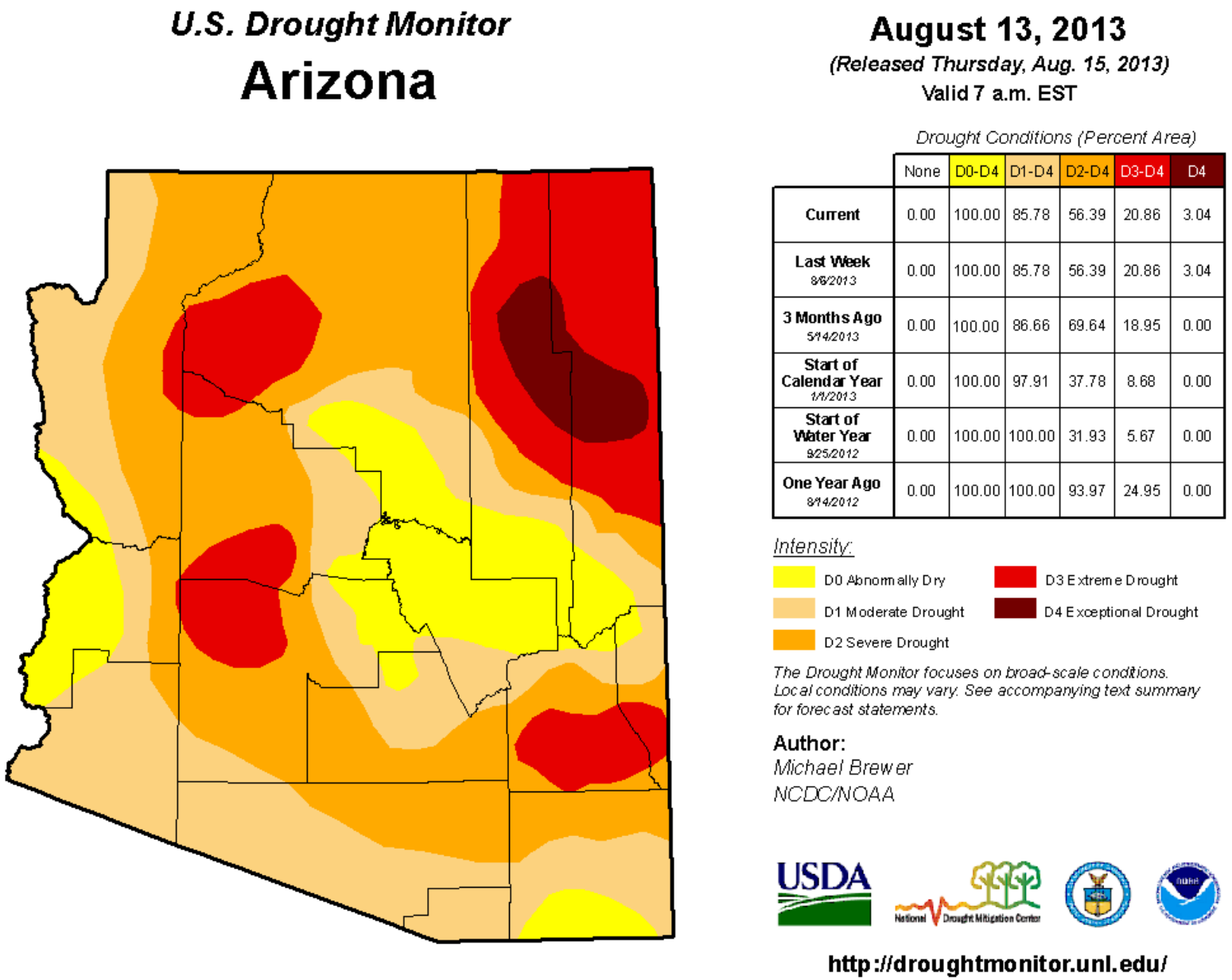

Figure 2-5. U.S. Drought Monitor analysis of Arizona released around the time period of the exceedance described in this report.

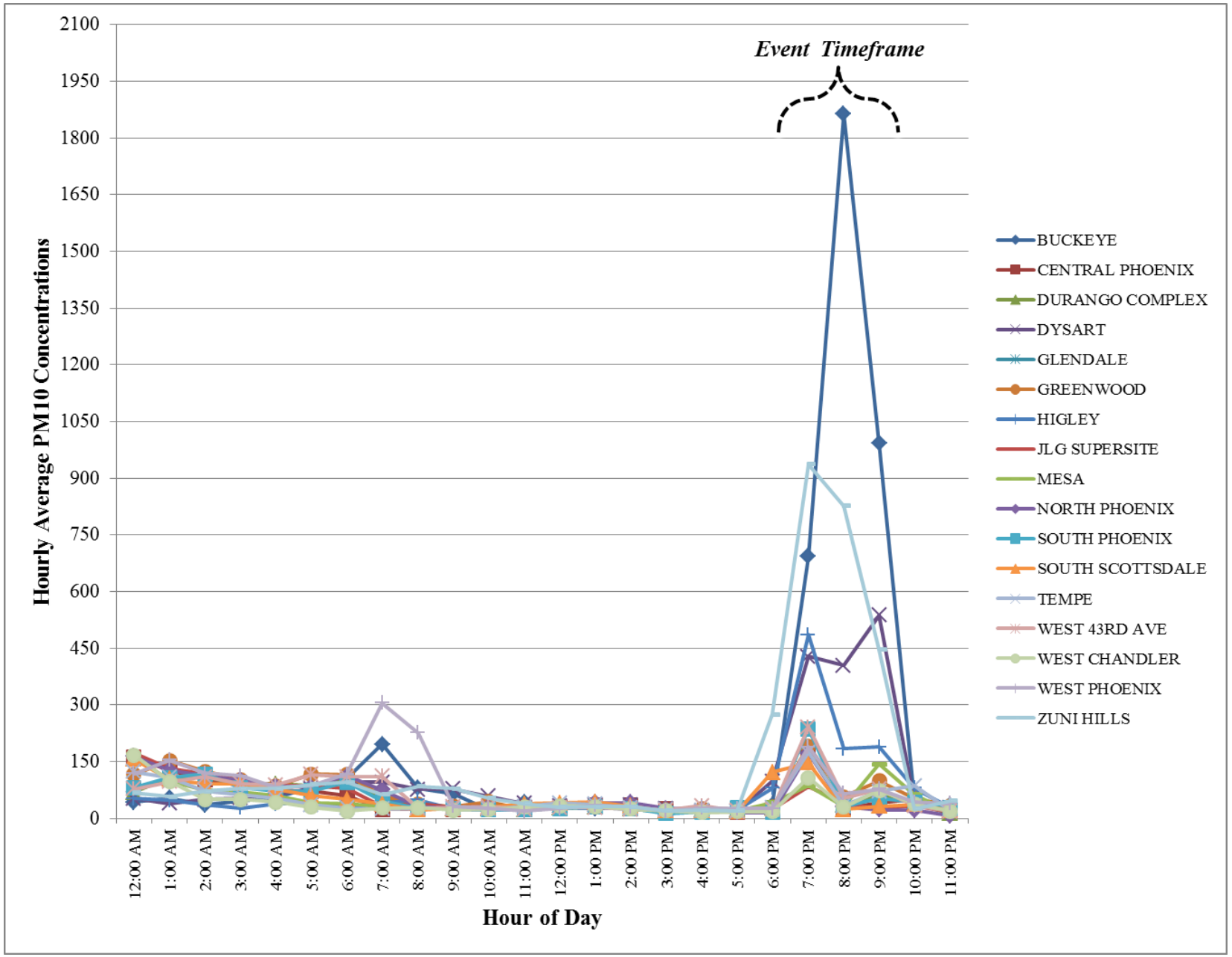

Figure 2-6. Timeline of PM10 concentrations at monitors in Maricopa County on August 17, 2013.

Table 2-1. Summary of Statewide PM10 Measurements for August 17, 2013.

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[1]							
N/A	N/A	WMAT	04-001-1003-81102-1	8	30	2200	
Coconino County							
N/A	N/A	ADEQ	04-005-1237-81102-1	N/A	N/A	N/A	
Gila County[2]							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	52	354	1800	
Maricopa County[1]							
Buckeye	**TEOM**	**MC**	**04-013-4011-81102-1**	**193**	**1,863**	**2000**	**RJ**
Central Phoenix	TEOM	MC	04-013-3002-81102-4	54	185	1900	
Durango Complex	TEOM	MC	04-013-9812-81102-1	54	175	1900	
Dysart	TEOM	MC	04-013-4010-81102-1	103	537	2100	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	N/A	N/A	N/A	
Glendale	TEOM	MC	04-013-2001-81102-1	N/A	N/A	N/A	
Greenwood	TEOM	MC	04-013-3010-81102-1	67	191	1900	
Higley	TEOM	MC	04-013-4006-81102-1	67	485	1900	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	55	173	0000	
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	N/A	N/A	N/A	
Lehi Air Monitoring Station	N/A	SRP-MIC	04-013-7022-81102-1	N/A	N/A	N/A	
Mesa	TEOM	MC	04-013-1003-81102-1	52	168	0000	
North Phoenix	BAM	MC	04-013-1004-81102-1	58	172	1900	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-1	N/A	N/A	N/A	
Senior Center Air Monitoring Station	N/A	SRP-MIC	04-013-7020-81102-2	N/A	N/A	N/A	
South Phoenix	TEOM	MC	04-013-4003-81102-1	54	236	1900	
South Scottsdale	TEOM	MC	04-013-3003-81102-1	55	157	0000	
Tempe	TEOM	MC	04-013-4005-81102-1	49	174	1900	
West Chandler	TEOM	MC	04-013-4004-81102-1	42	167	0000	
West Forty Third	TEOM	MC	04-013-4009-81102-1	62	241	1900	
West Phoenix	TEOM	MC	04-013-0019-81102-1	83	304	0700	
Zuni Hills	TEOM	MC	04-013-4016-81102-1	148	936	1900	
Navajo County[1]							
N/A	N/A	WMAT	04-017-1002-81102-1	12	25	0600	
Pima County[2]							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	21	70	2300	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	N/A	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	19	52	0300	
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	N/A	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	N/A	N/A	N/A	
Pinal County[3]							
Apache Junction Fire Station	FRM	PCAQCD	04-021-3002-81102-1	N/A	N/A	N/A	
Bapchule	FRM	GRIC	04-021-7004-81102-1	N/A	N/A	N/A	
Bapchule	FRM	GRIC	04-021-7004-81102-2	N/A	N/A	N/A	
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	114	1,522	2000	
Combs School	TEOM	PCAQCD	04-021-3009-81102-3	55	325	2000	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	96	680	2000	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	75	476	2000	
Pinal Air Park	TEOM	PCAQCD	04-021-3007-81102-1	28	240	1800	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	95	1,367	1900	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	111	1,235	2000	
Santa Cruz County[2]							

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
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	34	109	2300	
Yuma County[2]							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	20	60	2000	

SOURCE: [1]EPA's Air Quality System (AQS) database. [2]ADEQ's AZURITE database. [3]Pinal County Air Quality Control District (PCAQCD). AZURITE and PCAQCD data are preliminary and should not be considered final until entered into AQS.

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

III. HISTORICAL FLUCTUATIONS

PM10 concentrations measured at the Buckeye monitor on August 17, 2013, were unusual and in excess of normal historical fluctuations. Figure 3–1 displays a time series plot of the 24-hour PM10 concentrations for the period of January 1, 2008, through September 30, 2013, for the Buckeye monitor. The figure indicates that the PM10 concentrations seen at the Buckeye monitor on August 17, 2013, were in excess of normal historical fluctuations.

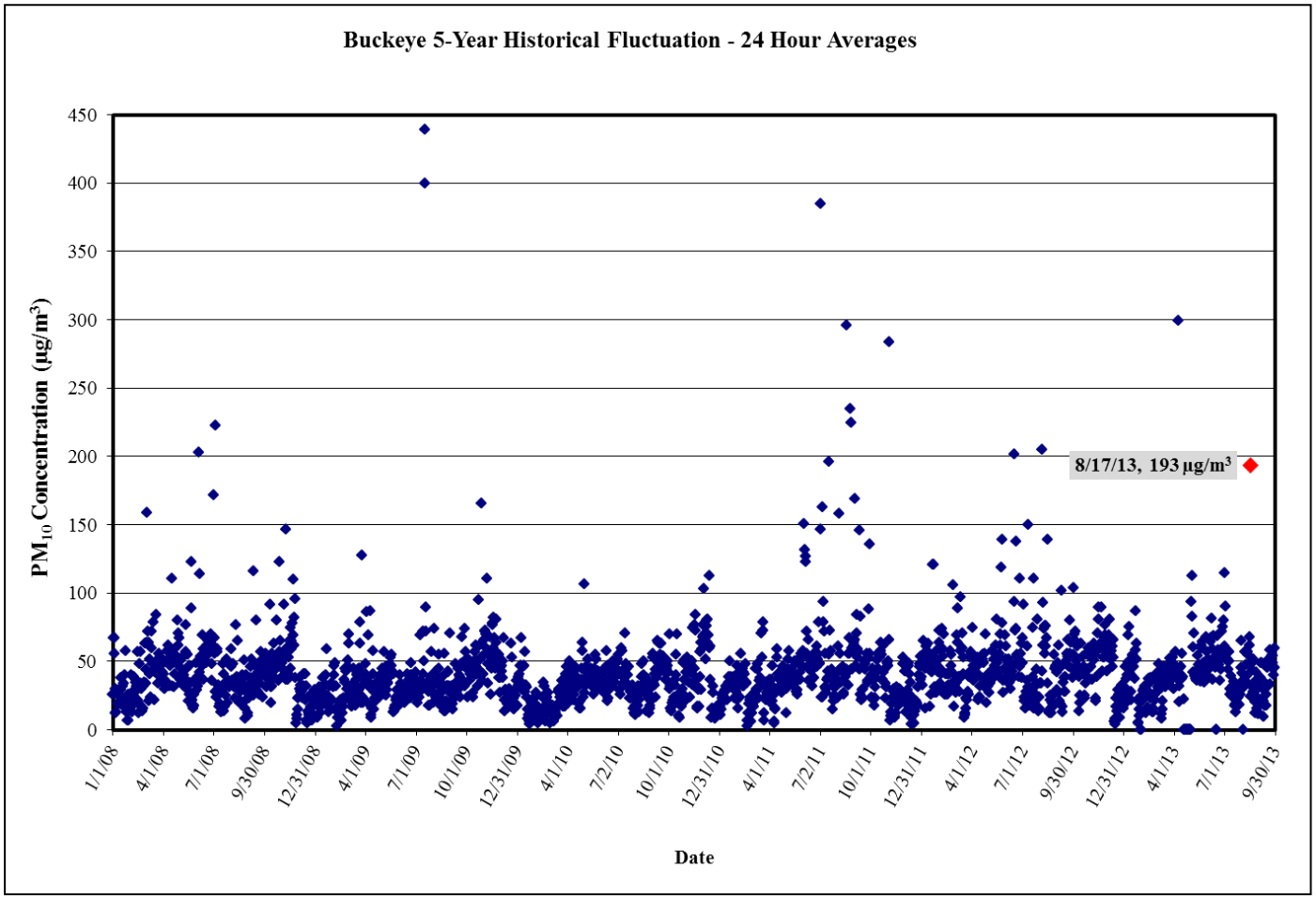

Figure 3-1. Plot of 24-hour average PM10 concentrations (2008 – September 2013) at the Buckeye monitor.

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, high wind conditions overwhelmed all reasonably available controls. The event occurring on August 17, 2013, was directly related to strong and gusty winds generated by thunderstorm outflows. The gusty outflow winds overwhelmed all reasonably available controls within Maricopa County. As shown in section V, the open and natural desert areas of Maricopa County were source regions for the dust created by the thunderstorm outflow wind event that occurred on August 17, 2013. Strict controls on local sources of fugitive dust were in place and enforced during the event on August 17, 2013, but were not capable of controlling dust and PM10 generated by the gusty and turbulent thunderstorm outflow winds on this date.

The following sections describe the BACM- and MSM-level PM10 control measures in place on August 17, 2013, and the robustness of the programs designed to enforce these measures. Inspections of local sources performed before, during, and after August 17, 2013, confirmed that no unusual anthropogenic PM10-producing activities contributed to the exceedance on August 17, 2013.

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[1]. 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.

[1] The exceedance on August 17, 2013, occurred at the Buckeye monitor which is located just west (approximately 0.75 miles) of the Maricopa County PM10 nonattainment area boundary. Fugitive dust rules issued by MCAQD are not just applicable to the nonattainment area, but have county-wide applicability and enforceability. Some fugitive dust ordinances are limited to "Area A", but the Buckeye monitor is within Area A and subject to those ordinances. Additionally, the ADEQ AgBMP program applies to Area A.

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[2] . 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.

[2] 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 R18-2-610.0,1 **Agricultural PM10 Genral 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 source compliance rates. The rule effectiveness 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 sources that did not receive a PM10 emissions-related violation during calendar year 2007 was 76% for sources subject to Rule 310, 85% for sources subject to Rule 310.01, and 40% for sources subject to Rule 316. In early 2008, Rules 310, 310.01, and 316 were strengthened and new ordinances (covering additional source categories such as leaf blowers, vacant lots, and off-road vehicles) were adopted. These enhancements resulted from MCAQD's obligations under such agreements as the 2005 Revised PM10 State Implementation Plan for the Salt River Area and the Maricopa Association of Governments (MAG) 2007 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area. 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.

Rule effectiveness 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, to 95% (from 85%) for Rule 310.01 sources, and to 65% (from 40%) for Rule 316 sources. These improvements continued into calendar year 2010 with rule effectiveness rates of 94% for Rule 310 sources, 96% for Rule 310.01, and 73% for Rule 316 sources.

Additional rule effectiveness increases were observed for Rule 310.01 and Rule 316 in calendar year 2012. The increase in rule effectiveness for Rule 310.01 was attributed to ADEQ's Dust Action General Permit, which was a new dust measure contained in the 2012 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area. The rule effectiveness for Rule 310.01 was 98%, an increase of 2% in 2012. The rule effectiveness for Rule 316 had a considerable increase to 83%, which is an increase of 10% compared to 2010.

The timeline below illustrates the improvements in rule effectiveness over the last several years, and also points out significant revisions to previous rules, as well as newly adopted rules, ordinances and measures. Since the first study of 2007, the rule effectiveness has increased for Rule 310, Rule 310.01, and Rule 316 by 17%, 13%, and 43%, respectively.

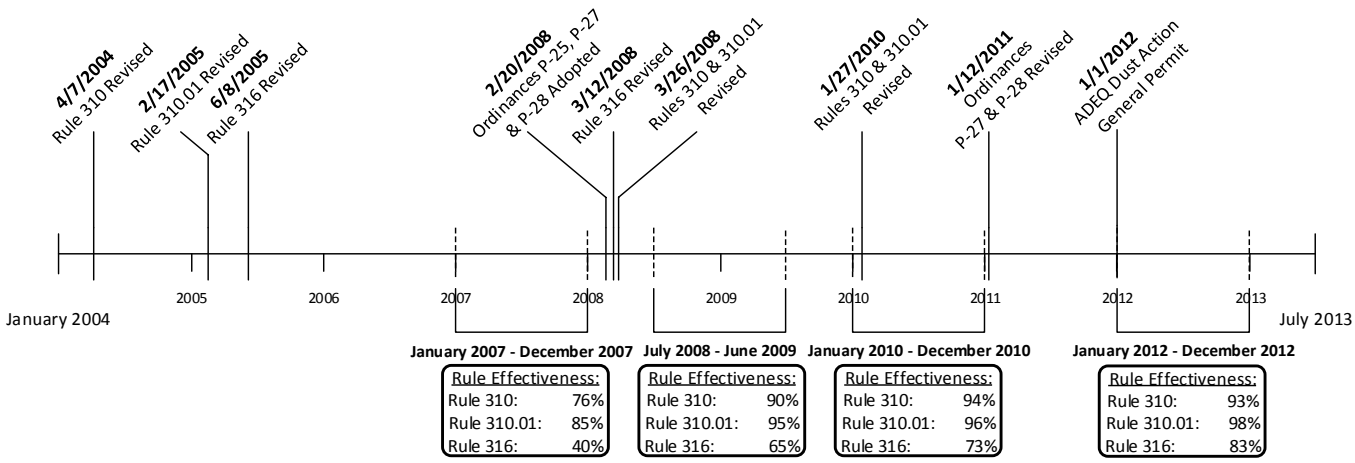

Figure 4-1. Timeline of Maricopa County fugitive dust rules and ordinances.

Compliance and Enforcement Activities

MCAQD is prepared to proactively respond to high wind events and protect human health and well-being. MCAQD's approach consists of two primary components: routine proactive inspections, as well as surveillance inspections, conducted both during and after significant events. MCAQD routinely inspects dust control-permitted sites and increases the frequency of inspections for permits covering areas of ten acres or more. Non-metallic surface mining sources under Rule 316 are also regularly inspected multiple times every year. Maricopa County also responds to the majority of air quality 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 increased surveillance before, during, and after the forecast event(s). MCAQD also conducts event surveillance and post-event activities after an exceptional event that had not been forecast (i.e., those instances in which an HPA had not been issued).

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

Currently, a total of 16 MCAQD air monitoring sites were upgraded with new equipment to allow the monitoring sites to automatically report monitored readings at five-minute intervals. Previously, hourly readings were only available. The real-time data reporting system includes a mechanism to alert MCAQD inspectors when PM10 concentrations are elevated. The system allows MCAQD inspectors to review concentrations at the monitor and to consult the National Weather Service website to check for weather event activity. This capability allows the MCAQD responder to identify regional events and monitor specific issues. If necessary, the MCAQD responders can inform nearby stakeholders and local governments of the elevated PM10 concentrations.

For August 17, 2013, a Maricopa County Dust Control Forecast was issued indicating a low risk level for unhealthy PM_{10}. The Dust Control Forecast indicated southwest winds of 5 mph.

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. During the time period of August 14 through August 20, 2013, MCAQD inspectors conducted a total of 320 inspections of permitted facilities, of which 206 were at fugitive dust sources. Additionally, MCAQD conducted 104 inspections on vacant lots and unpaved parking lots during this period.

During this seven-day period, a total of 67 violations were issued county-wide for PM_{10} and non-PM_{10}-related violations. No violation was issued for PM_{10} emissions within a four-mile radius of the Buckeye monitor.

MCAQD was prepared for any complaints received due to the high wind event. During the seven-day period from August 14 through August 20, 2013, MCAQD received ten complaints, of which one was windblown dust or PM10 related. Each complaint was assigned to and investigated by a MCAQD inspector. A review of all pertinent records from this period indicates that MCAQD inspectors observed no PM_{10} violations of local, state, or federal regulations resulting from complaints within a four-mile radius of the exceeding monitor.

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 or significant PM10 emissions. From August 14 through August 20, 2013, the ADEQ Ag BMP inspector received no complaints. One site inspection occurred on August 14, 2013, in response to a hay fire in Mesa, Arizona. Emissions from this fire would not have impacted the high wind dust exceptional event that occurred on August 17, 2013.

Conclusions

The thunderstorm outflow event on August 17, 2013, produced strong gusts and turbulent wakes that generated dust and PM10 in Maricopa County. The source region of the outflow winds that caused the exceedance were the open and natural desert areas of Maricopa County. 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 outflow winds overwhelmed controls

within Maricopa County. Strong thunderstorm outflows with gusts up to 52 mph, and sustained winds up to 40 mph, were more than enough to overwhelm all available efforts to limit PM10 concentrations from the event. The fact that this was a natural event involving strong thunderstorm outflow winds that generated PM10 emissions within Maricopa County provides strong evidence that the event and exceedance of August 17, 2013, recorded at the Buckeye monitor, was not reasonably controllable or preventable.

V. CLEAR CAUSAL RELATIONSHIP

Introduction

A demonstration of the clear causal connection between windblown dust generated by thunderstorm outflow winds and the exceedance at the Buckeye monitor on August 17, 2013, is provided in this section. The high wind event dust storm produced wind gusts as high as 52 mph and sustained winds as high as 40 mph, and reduced visibilities to two to three miles at multiple locations in western Maricopa County. The Buckeye monitor exceeded the 24-hour PM10 standard as a result of the PM10 generated by the thunderstorm outflow winds, with one other Maricopa County monitor (Zuni Hills) recording 24-hour average PM10 concentrations within 7 $\mu g/m^3$ of the standard. Drought conditions in Maricopa County likely exacerbated the amount of the dust the thunderstorm outflow was able to entrain.

A detailed description of the meteorology that caused the natural windblown dust exceedance event at the Buckeye monitor is described below in a series of time-stamped maps. Time series videos of visibility photos on the day of the high wind dust event provide additional evidence of the dust storm impacts on Maricopa County monitors. The weight of evidence presented in this section provides the clear causal connection between the windblown dust generated by thunderstorm outflow winds and the exceedance at the Buckeye monitor on August 17, 2013.

Time Series Maps and Visibility Photos

Figures 5–1 through 5–11 provide a time series GIS-based visualization of the meteorology and PM10 concentrations associated with the thunderstorm outflows. 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. Table 5–1 displays the types of data used from each agency in creating the maps. Figure

Table 5-1. Data Sets Used in the Creation of Time Series GIS 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, Wind Direction, and Wind Gusts (hourly data used when 5-minute was unavailable)
Pinal County Air Quality Control District (PCAQCD)	Hourly PM10 Concentrations, 5-Minute and Hourly Wind Speed, Wind Direction and Wind Gusts
National Weather Service (NWS)	Point in Time Wind Speed, Wind Direction, Wind Gusts, Visibility and Base Reflectivity Radar

Map Description

A description of each time series map is provided to highlight important data in each map and explain the progression of the meteorology and PM10 concentrations through time. Taken as a whole, the maps and associated explanatory text describe the clear causal connection between the windblown dust generated by the thunderstorm outflow winds and the PM10 exceedance at the Buckeye monitor.

August 17, 5:30 PM – 6:00 PM

Base reflectivity radar reveals the approach of a thunderstorm outflow from the border of Maricopa and Yavapai counties. PM10 concentrations, wind speeds and visibilities are currently normal throughout Maricopa County.

August 17, 6:00 PM – 6:30 PM

As the thunderstorm outflow progresses south-southwest across Maricopa County, wind speeds are elevated in the northern portions of the county. Gusts as high as 38 mph and sustained winds as high as 20 mph are recorded. While not completely visible on base reflectivity radar as this point, the extent of the thunderstorm outflow is wide, elevating wind speeds across Maricopa County. The northern-most PM10 monitor (Zuni Hills) begins recording elevated PM10 concentrations in response to the approaching dust storm generated by the thunderstorm outflow winds.

August 17, 6:30 PM – 7:00 PM

Winds from the over 100-mile wide thunderstorm outflow continue to increase as they progress south-southwest across Maricopa County. Gusts as high as 41 mph and sustained wind speeds as high as 26 mph are recorded. The densest PM10 concentrations are recorded in the northwest portion of Maricopa County, due to the larger availability of open and natural desert areas upwind of the northwest monitors. However, sporadic pockets of high PM10 concentrations are recorded throughout Maricopa County, as evidenced by reduced visibility (3.0 miles) at the Scottsdale Airport and PM10 concentrations over 500 $\mu g/m^3$ at the South Scottsdale and Higley monitors.

August 17, 7:00 PM – 7:30 PM

Wind speeds continue to increase as the thunderstorm outflow is now centrally located over Maricopa County. Gusts as high as 47 mph and sustained winds as high as 31 mph are generated during this period. PM10 concentrations over 1,800 $\mu g/m^3$ are recorded at the Zuni Hills monitor. Visibility has been reduced to 2.5 miles at Luke Air Force Base. All monitors throughout Maricopa County except the western-most Buckeye monitor show elevated PM10 concentrations in response to the dust storm generated by the thunderstorm outflow.

August 17, 7:30 PM – 8:00 PM

The thunderstorm outflow first reaches the exceeding Buckeye monitor during this period. Winds from the outflow have not decreased and are still generating gusts as high as 48 mph and sustained wind speeds as high as 31 mph. The Zuni Hills and Dysart monitors still record PM10 concentrations over 500 $\mu g/m^3$, despite the fact that it has been over an hour since dust from the thunderstorm outflow first impacted the monitors. This indicates that the dust storm behind the thunderstorm outflow front is large and continues to generate PM10 under very gusty and turbulent winds. Visibility at the Buckeye Airport has been reduced to 4.0 miles in response to the arrival of the dust storm, and the Buckeye monitor records PM10 concentrations over 2,500 $\mu g/m^3$.

August 17, 8:00 PM – 8:30 PM

Despite the thunderstorm outflow front nearly exiting Maricopa County, strong and gusty winds behind the front continue to generate dust and PM10. Gusts as high 52 mph are recorded (51 mph at the

exceeding Buckeye monitor) along with sustained winds as high as 37 mph. Visibilities are reduced in the western portion of Maricopa County, pointing to widespread windblown dust in those areas. PM10 concentrations at the Buckeye monitor are still very high, with concentrations over 2,500 µg/m^3. The central and eastern portions of Maricopa County have largely returned to normal PM10 concentrations. This is due to reduced wind speeds as compared to the western portion of Maricopa County and also due to a lack of open and natural desert areas upwind of these urbanized monitors.

August 17, 8:30 PM – 9:00 PM

The thunderstorm outflow has left Maricopa County, but turbulent winds still persist in the county creating fresh PM10 emissions. Gusts remain as high as 52 mph with sustained winds as high as 33 mph. Visibilities remain poor throughout the western portion of Maricopa County, with Luke Air Force Base reporting 2.5 miles, Phoenix Goodyear Airport reporting 3.0 miles, and the Buckeye Airport reporting 6.0 miles. PM10 concentrations remain high at the Buckeye, Dysart and Zuni Hills monitors, with both Buckeye and Zuni Hills recording concentrations above 1,000 µg/m^3. In addition to the dominant south-southwest wind direction, fresh winds blowing to the west in the eastern portions of Maricopa County have occurred. These winds will help push suspended PM10 out of Maricopa County to the west in the next few hours and help return PM10 concentrations to normal levels throughout Maricopa County before 11:00 pm.

August 17, 9:00 PM – 9:30 PM

The first signs of precipitation from the turbulent monsoon thunderstorm activity are recorded at Luke Air Force Base and the Buckeye Airport. The precipitation is light and scattered, and it is unknown whether any precipitation fell in the areas immediately around the western PM10 monitors. Winds remain very strong with gusts as high as 49 mph and sustained wind speeds as high as 29 mph. The Zuni Hills and Buckeye monitors continue to record PM10 concentrations above 1,000 µg/m^3, suggesting that it is unlikely any precipitation fell near those monitors at this time.

August 17, 9:30 PM – 10:00 PM

Easterly winds have become more prominent and have begun to push some of the suspended PM10 out of Maricopa County to the west. PM10 concentrations remain high at the Buckeye monitor under gusts up to 51 mph and sustained winds as high as 40 mph. Precipitation continues to be recorded at the Buckeye Airport and Luke Air Force Base, though light in quantity.

August 17, 10:00 PM – 10:30 PM

The strongest winds have finally diminished and almost all of the Maricopa County monitors are recording concentrations under 150 µg/m^3. Winds remain turbulent near the Buckeye monitor, with gusts as high as 40 mph and sustained winds as high as 29 mph. PM10 concentrations have dropped significantly at the Buckeye monitor and are now under 500 µg/m^3. Light rain continues to fall at the Buckeye Airport, but has ceased at Luke Air Force Base.

August 17, 10:30 PM – 11:00 PM

Breezy conditions continue throughout Maricopa County, which continues to help blow out any remaining PM10 suspended by the thunderstorm outflow dust storm. All Maricopa County monitors record PM10 concentrations below 150 µg/m^3, with the exceeding Buckeye monitor now recording concentrations less than 50 µg/m^3.

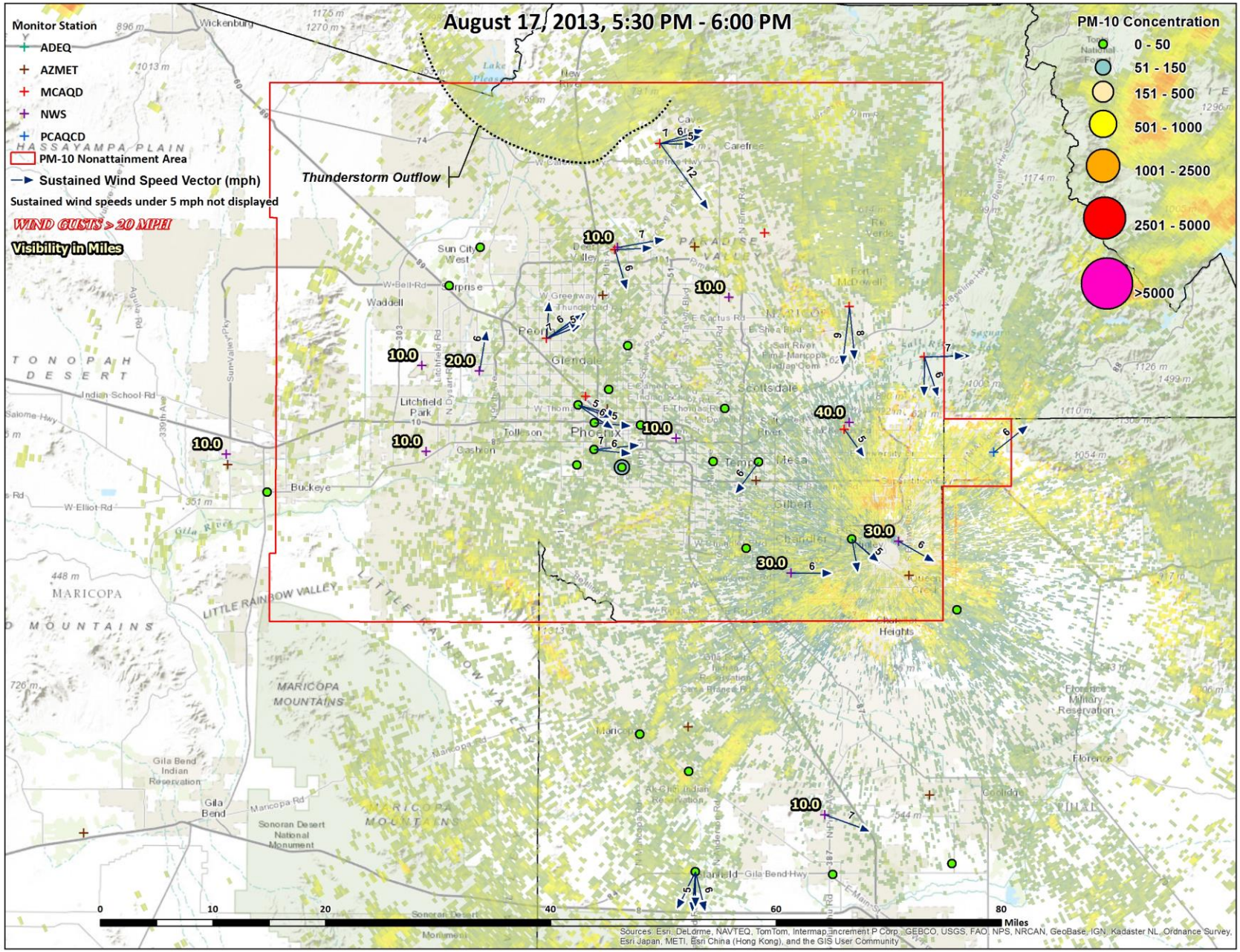

Figure 5-1. August 17, 2013, 5:30 PM – 6:00 PM.

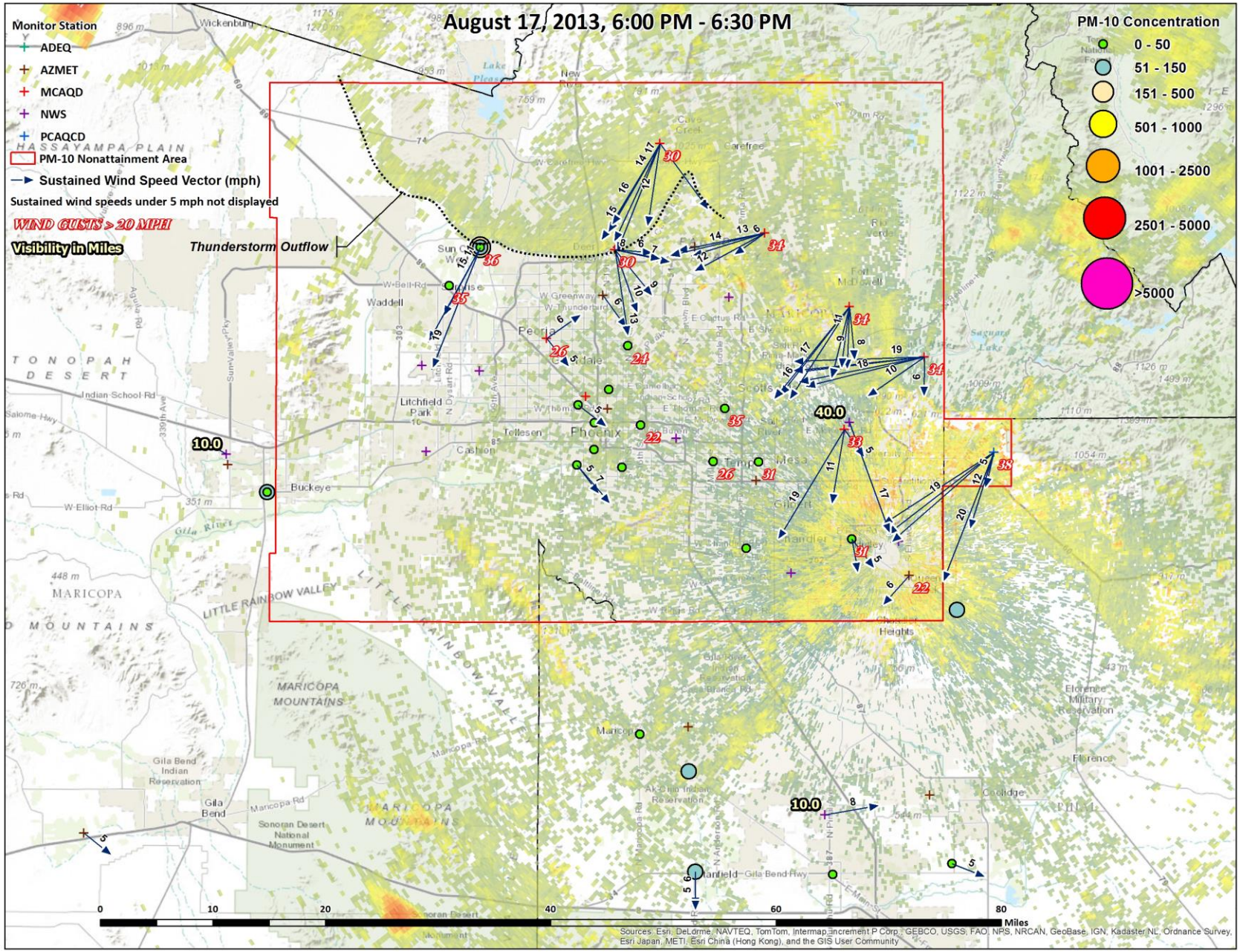

Figure 5-2. August 17, 2013, 6:00 PM – 6:30 PM.

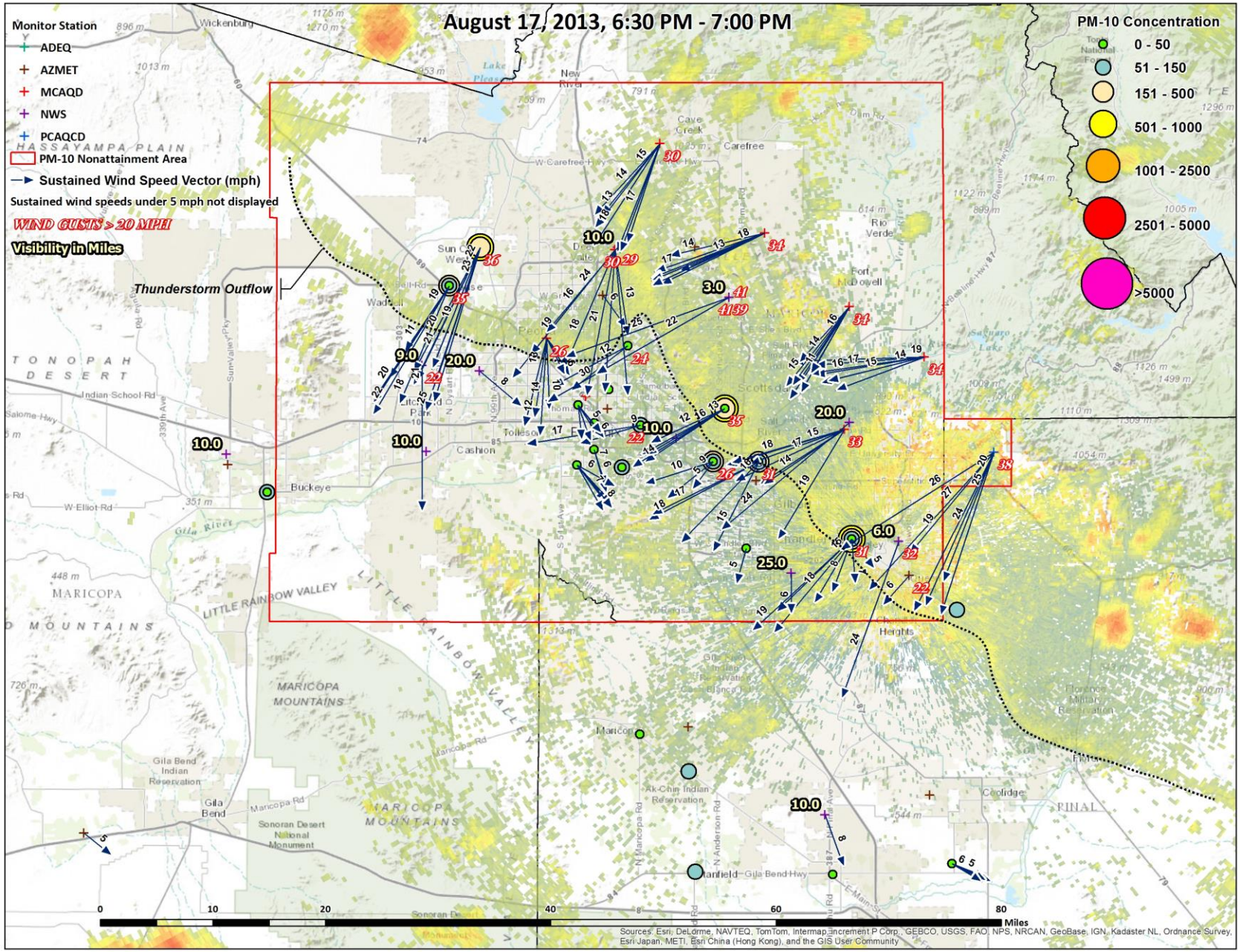

Figure 5-3. August 17, 2013, 6:30 PM – 7:00 PM.

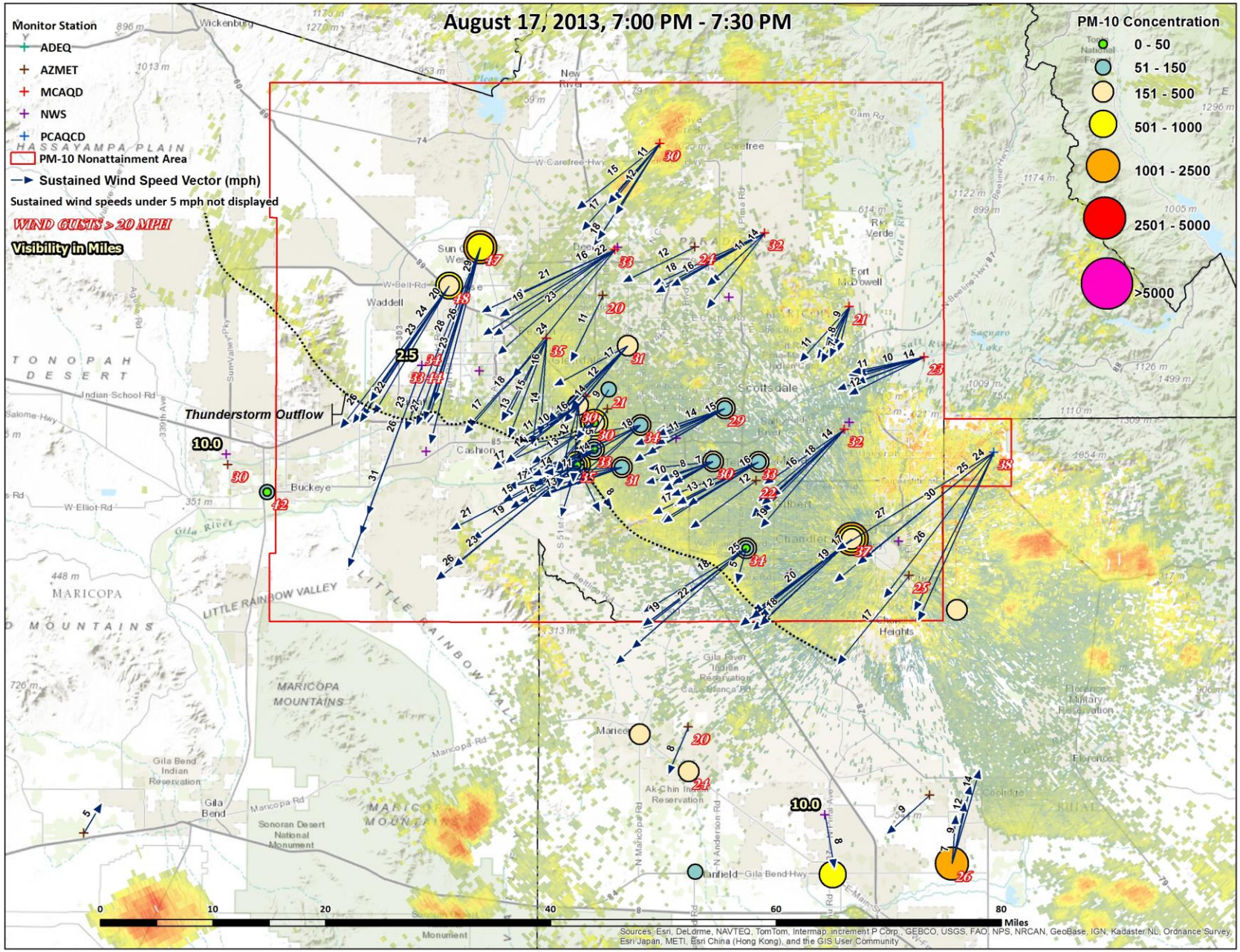

Figure 5-4. August 17, 2013, 7:00 PM – 7:30 PM.

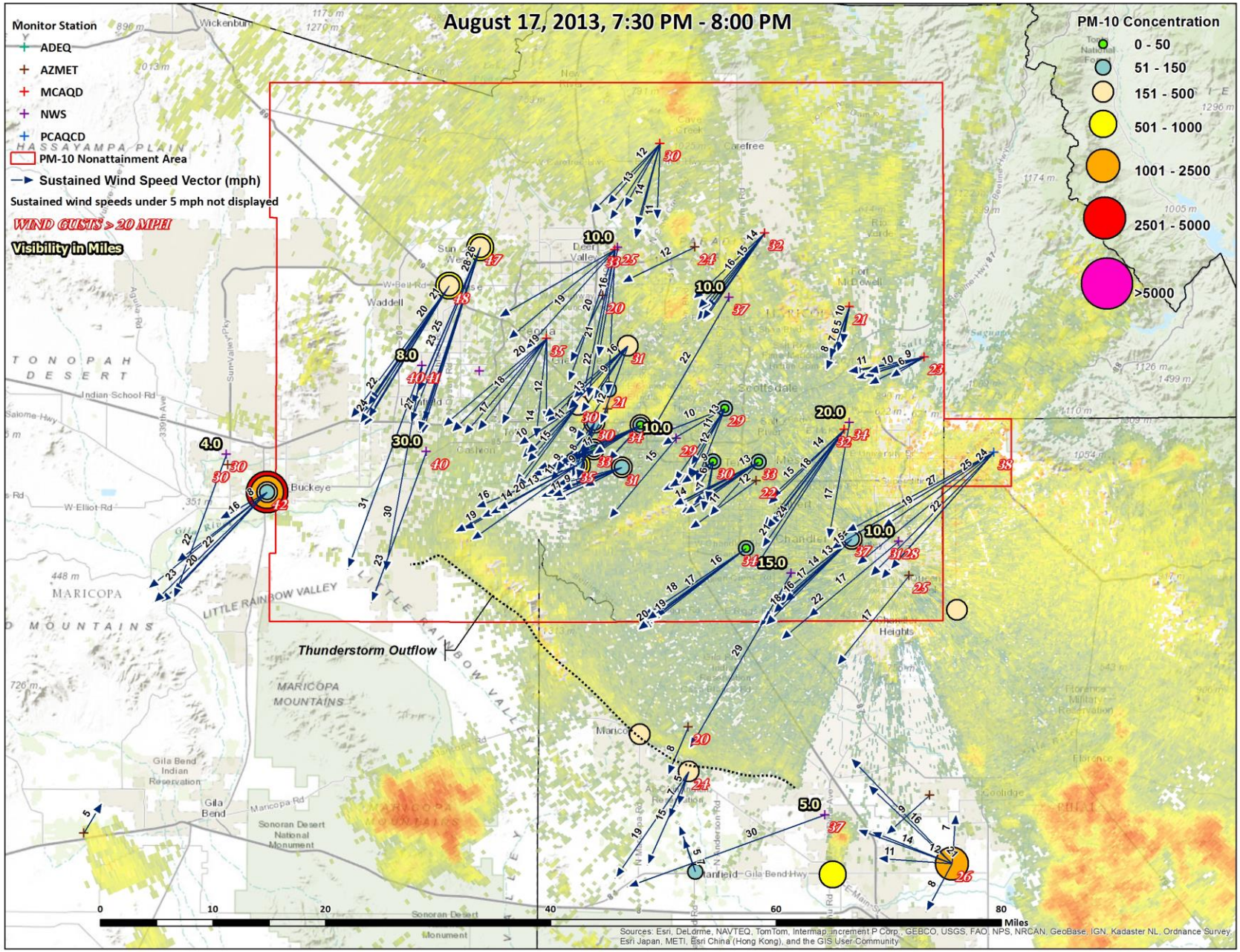

Figure 5-5. August 17, 2013, 7:30 PM – 8:00 PM.

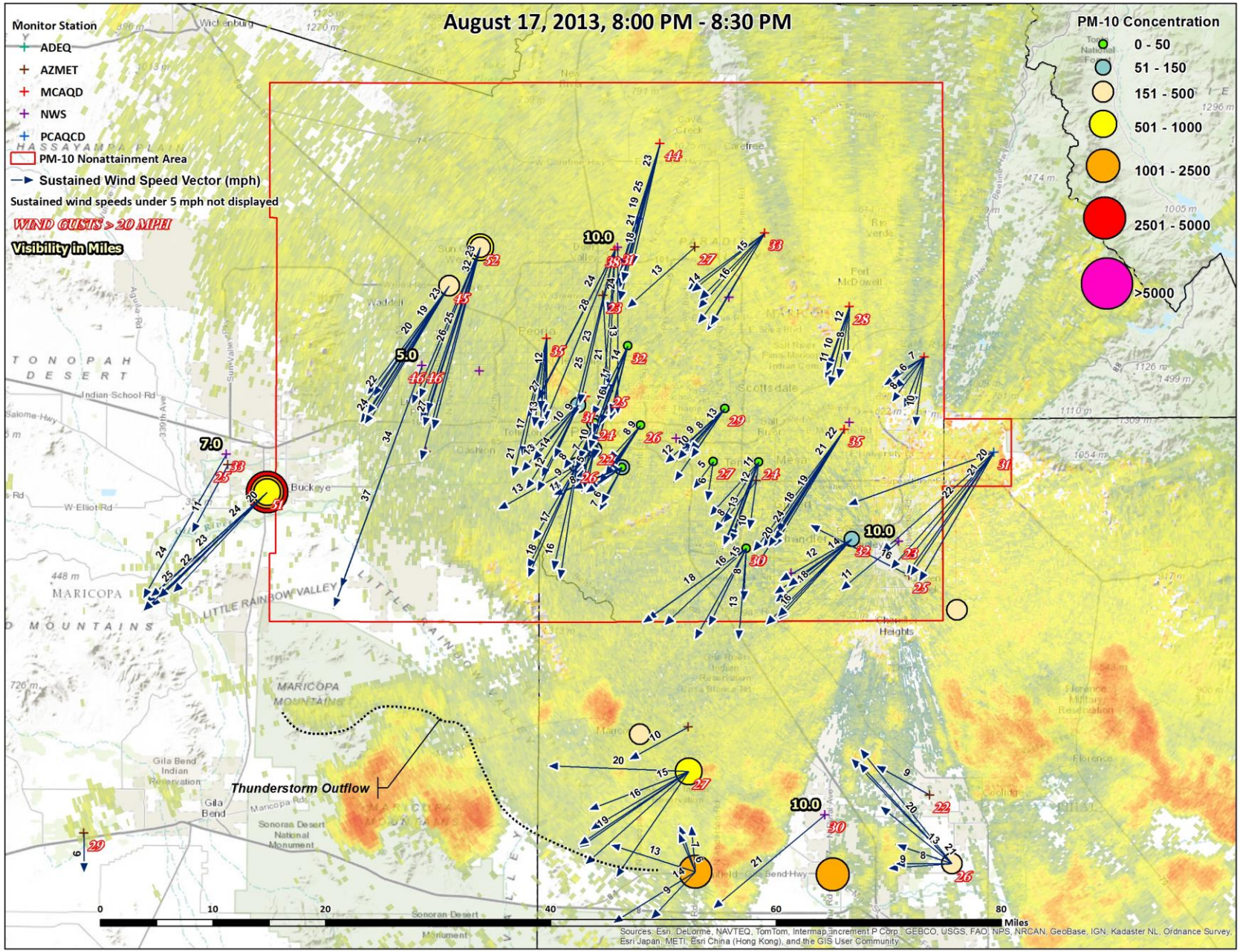

Figure 5-6. August 17, 2013, 8:00 PM – 8:30 PM.

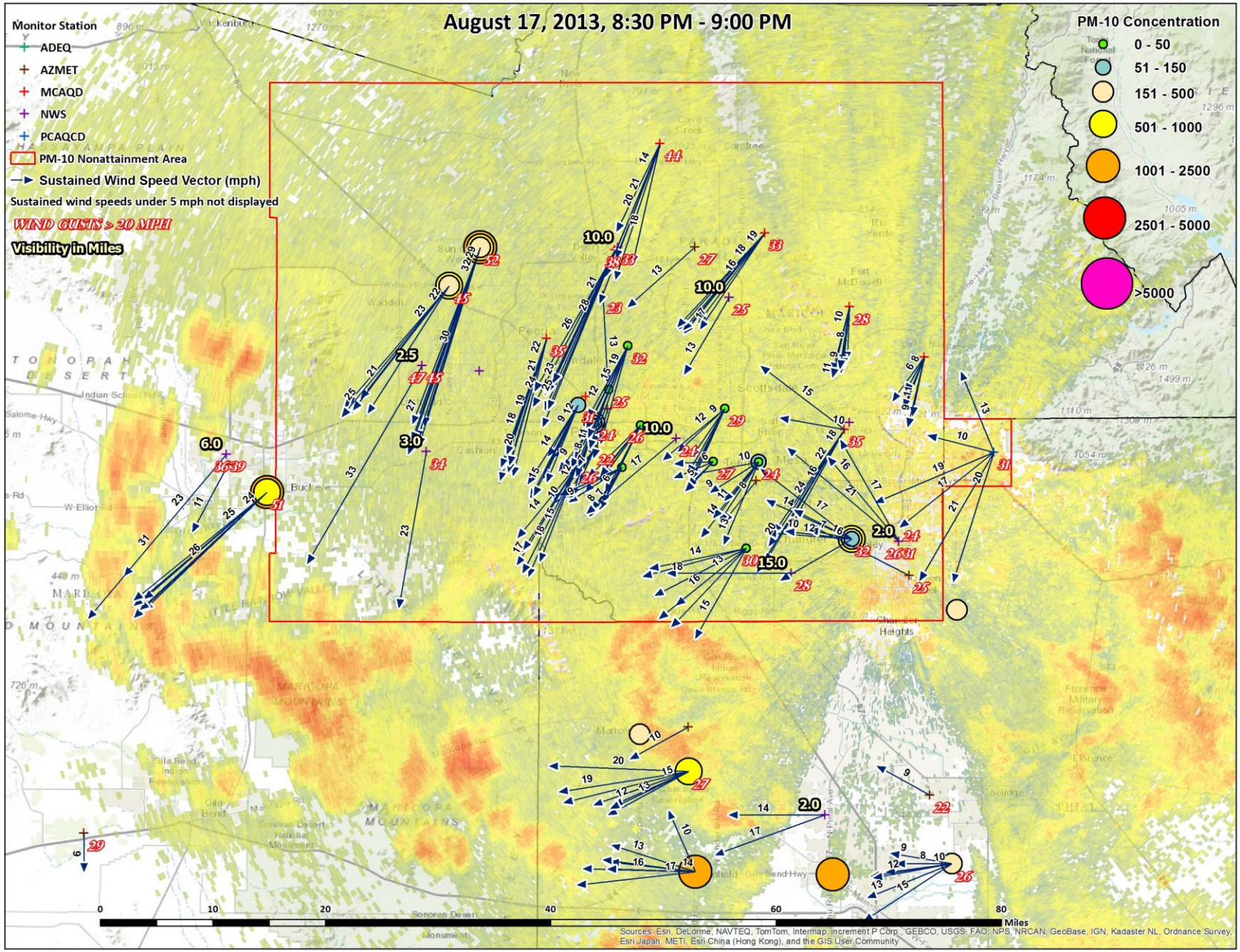

Figure 5-7. August 17, 2013, 8:30 PM – 9:00 PM.

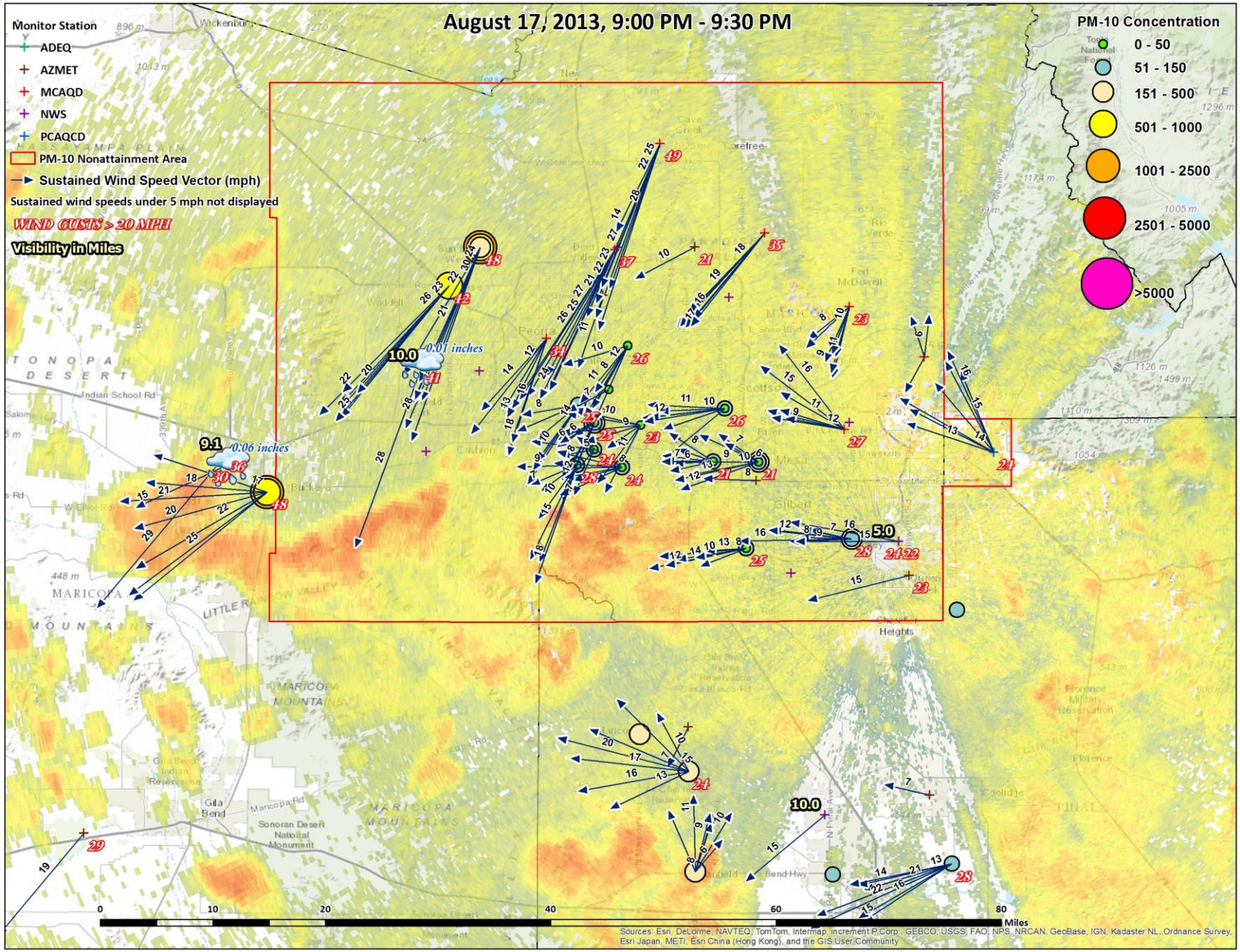

Figure 5-8. August 17, 2013, 9:00 PM – 9:30 PM.

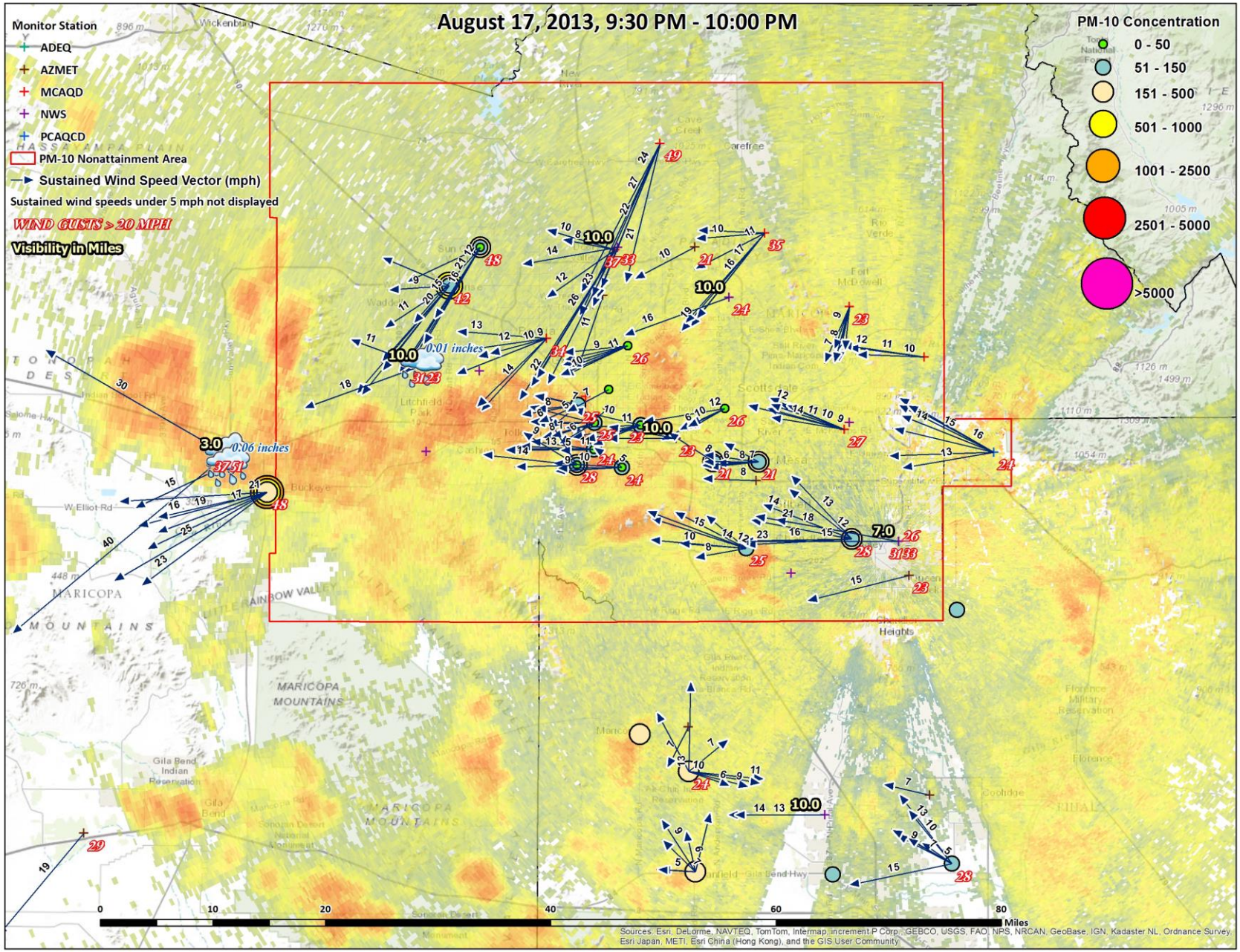

Figure 5-9. August 17, 2013, 9:30 PM – 10:00 PM.

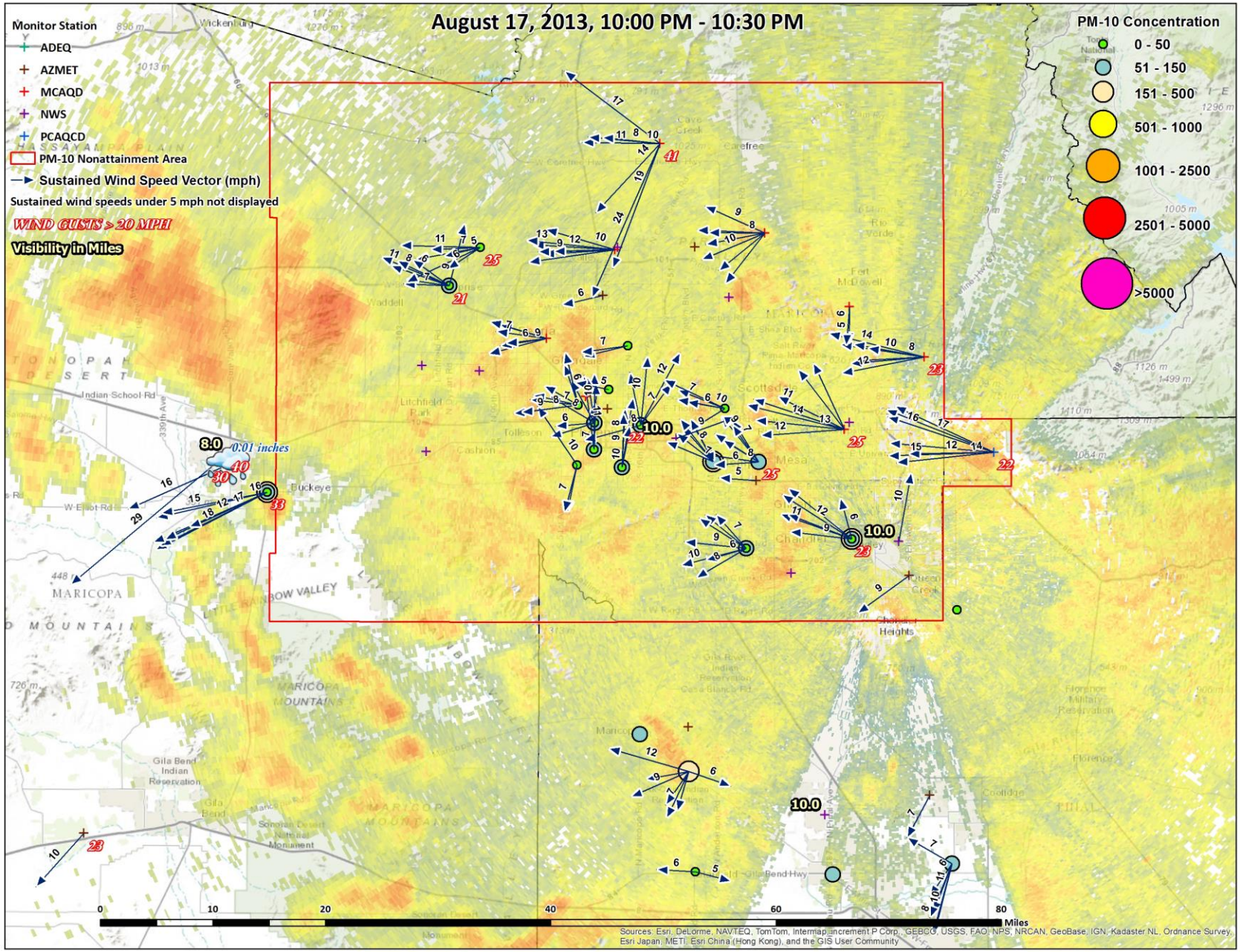

Figure 5-10. August 17, 2013, 10:00 PM – 10:30 PM.

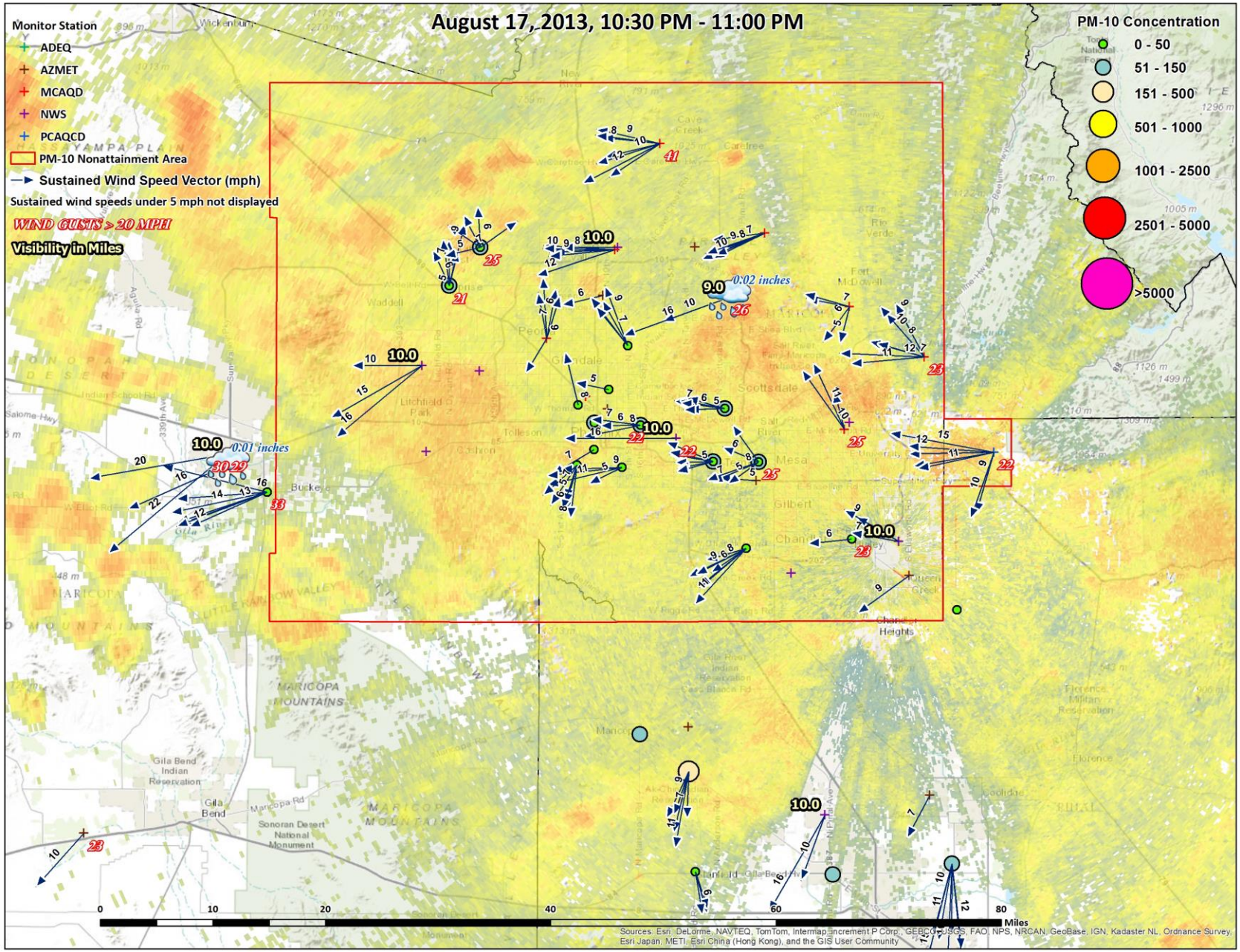

Figure 5-11. August 17, 2013, 10:30 PM – 11:00 PM.

Visibility Photos

While the event occurred mainly after dark on August 17, 2013, time series videos of visibility photos taken on the day of the event facing the White Tank Mountains (link #1) do show the approach of the thunderstorm outflow and decreased visibility due to the dust storm associated with the thunderstorm outflow. Locations for visibility cameras positioned in the Phoenix area are shown in link #2.

1.) http://www.phoenixvis.net/tlapse_camera.aspx?site=WHTM1

2.) http://www.phoenixvis.net/

Conclusion

The information presented within this section has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedance measured at the Buckeye monitor. The maps provided in this section contain an illustration of the event as it unfolded. The series of maps for the event show a spatial and temporal representation of the thunderstorm outflow winds and associated windblown dust as they move throughout Maricopa County. These maps show a clear causal connection between the windblown dust generated by the thunderstorm outflow winds and the exceedance at the Buckeye monitor. Visibility photos help show the approach of the thunderstorm outflow and the reduced visibilities associated with the dust storm generated by the outflow. It is clear from these data that thunderstorm outflow winds generated uncontrollable windblown PM10 emissions at the Buckeye monitor, demonstrating a clear causal connection between the event and the exceedance.

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 exceedance on August 17, 2013, was not reasonably controllable or preventable and that there is a clear causal relationship between the windblown dust generated by thunderstorm outflow winds and the exceedance at the Buckeye monitor. The weight of evidence in these sections demonstrates that but for the existence of windblown dust emissions generated by thunderstorm outflow winds, there would have been no exceedance 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 on August 17, 2013. Inspection and compliance data of local fugitive dust sources during this time period revealed that PM10 from anthropogenic activities was well controlled and constant. Real-time surveillance of PM10 monitoring stations during the event established a clear link between rapidly rising PM10 concentrations and the arrival of the thunderstorm outflow winds. Figure 6–1 shows that PM10 concentrations in the hours before the event at the exceeding Buckeye monitor were at normal levels, indicating no significant anthropogenic activities. PM10 concentrations in the hours after the event show a quick return to low levels once generated dust from the thunderstorm outflows passed the monitoring station.

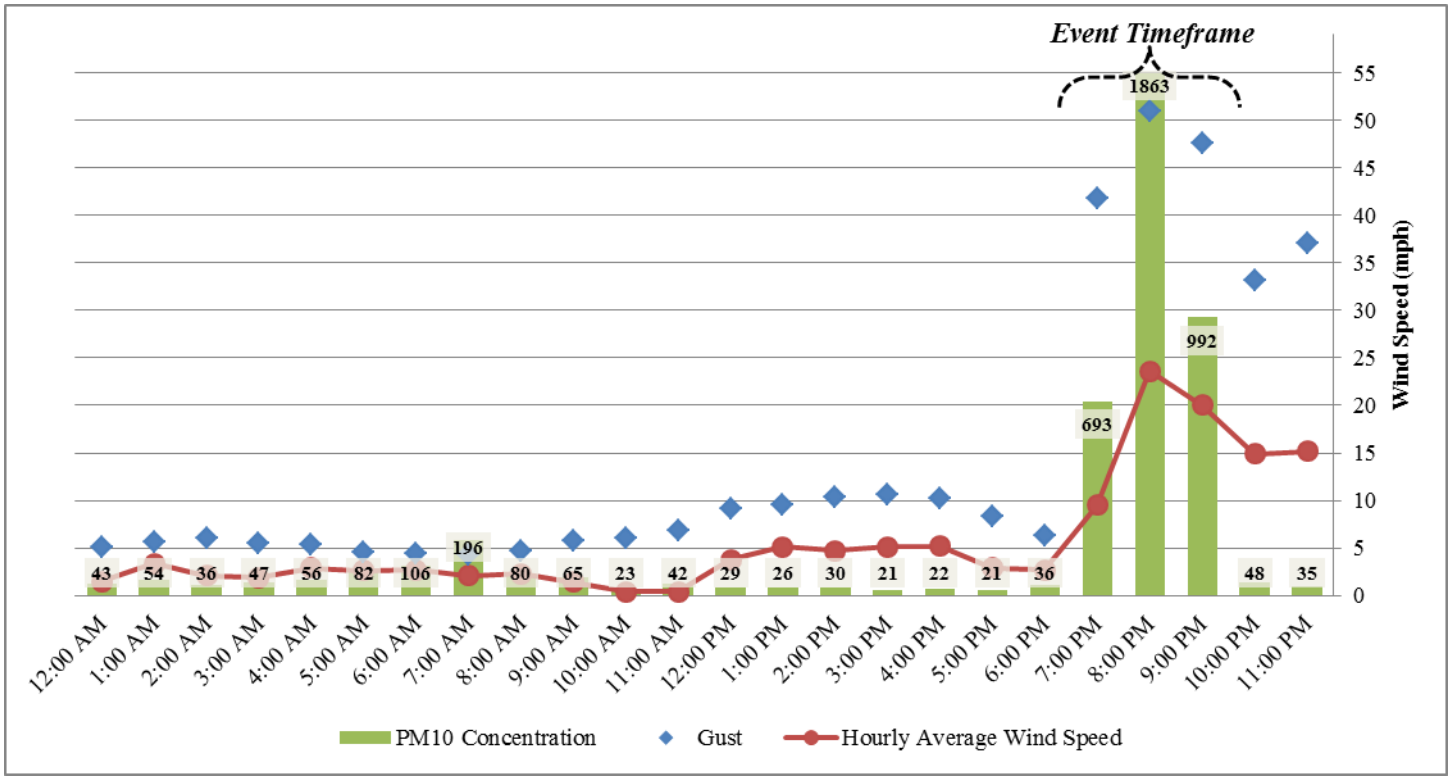

Figure 6-1. Hourly PM10 concentration, wind gust, and average wind speed as recorded at the Buckeye monitor.

As shown in Section V, detailed, time series maps establish a clear causal relationship between the arrival of windblown dust generated by thunderstorm outflow winds and elevated PM10 concentrations at the Buckeye monitor. The body of evidence presented in this submittal confirms that the exceedance on August 17, 2013 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the thunderstorm outflow winds.

VII. CONCLUSIONS

The exceedance that occurred on August 17, 2013, 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 measured concentrations in excess of normal historical fluctuations. Given the information presented in Sections II, III, IV and V, it is reasonable to 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, 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 generated high concentrations of PM10 emissions in Maricopa County. The event discussed in this document that caused the exceedances in this request (see Sections II and V) was caused by thunderstorm driven outflow winds that generated dust in Maricopa County from open and natural desert areas. The fact that this was a natural event involving strong thunderstorm outflow winds that generated PM10 emissions in Maricopa County provides strong evidence that the event and exceedance of August 17, 2013, recorded at the Buckeye monitor was not reasonably controllable or preventable.

C. Natural Event

As discussed above, the event shown to cause the exceedance was emissions of PM10 generated by high winds caused by thunderstorm activity and related outflow boundaries on August 17, 2013. The event therefore qualifies as a natural event.

In summary, the exceedance of the federal 24-hour PM10 standard on August 17, 2013, would not have occurred but for the monsoonal thunderstorm driven high winds and windblown dust generated in Maricopa County, based on the following weight of evidence:

- Historical Fluctuation data in Section III showing five years of 24-hour average data for the exceeding Buckeye monitor demonstrates that the value on August 17, 2013, was atypical and in excess of normal historical fluctuations.

- Section IV discusses rules that are in place in Maricopa County as well as inspections that were conducted in the area to verify compliance with those rules in order to show that the event was not reasonably controllable or preventable. Visibility camera imagery displayed in Section V indicates the widespread nature of the windblown dust caused by the low pressure system winds and provides evidence that high PM10 concentrations are linked to natural sources as opposed to specific anthropogenic sources of dust.

- The exceedance of the PM10 standard recorded on August 17, 2013, was 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 the event are consistent with the timing of elevated PM10 concentrations recorded at the monitoring locations in Maricopa County.

- Wind directions, thunderstorm generated outflow boundary propagation, and concentration patterns showing elevated levels of PM10 in Maricopa County help to show that the monitors that recorded the highest PM10 concentrations were downwind of large, open and natural desert areas.

- Visibility camera imagery displayed in Section V indicates the widespread nature of the windblown dust transported by thunderstorm outflow winds and provides evidence that high PM10 concentrations are linked to natural sources as opposed to specific anthropogenic sources of dust.