Assessment of Qualification for Treatment under the Federal Exceptional Events Rule: High Particulate (PM_{10}) Concentration Event in the Phoenix Area on March 14, 2008

Air Quality Division

August 16, 2010

EXECUTIVE SUMMARY
Assessment of Qualification for Treatment under the Federal Exceptional Events Rule: High Particulate (PM_{10}) Concentration Event in the Phoenix Area on March 14, 2008

This document is a reengineering and repackaging of the information and data related to an exceptional event in order to assist the Environmental Protection Agency's (EPA) Region 9 staff and the public with a better understanding of the nature of that exceptional event. The first example using this format was prepared for the event that occurred on June 4, 2008, as a comprehensive analysis of the documentation sent to EPA on November 17, 2009. This document provides a similar treatment for the March 14, 2008, exceptional event. The materials contained in this Report respond to feedback received from EPA beginning in May 2010 and to criticisms made in the EPA Region 9 May 21, 2010, finding that this exceedance did not qualify for treatment as an exceptional event under 40 CFR 51.14. The Arizona Department of Environmental Quality (ADEQ) contends, however, that the materials sent to EPA in 2009 were sufficient to meet all the requirements of the Exceptional Events Rule (EER) and make adequate demonstrations that all the events qualified under the Rule.

Background

The ADEQ issues Dust Control Action Forecasts for the Phoenix area as part of their Natural Events Action Plan (NEAP). On Thursday, March 13, 2008, in response to a tightening pressure gradient ahead of a low pressure system and associated cold front approaching Arizona from the west, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast which called for a moderate risk of wind-blown dust for Friday, March 14th. In addition, ADEQ air quality forecasters issued a PM_{10} Health Watch for Friday. March 14th, due to the possibility of strong winds and blowing dust throughout Maricopa County stating that "Areas of blowing and suspended dust are therefore likely as is the potential for transported dust from desert areas upwind of the metro area. Since PM_{10} (coarse particle) levels may approach unhealthy levels, a PM_{10} Health Watch has been issued for Friday." The forecasts and advisories satisfy the requirement in 40 CFR 51.930(a)(1).

The forecast for March 14th called for strong winds capable of producing wind-blown dust. This potential wind-blown dust event equated to a moderate risk of exceeding the PM_{10} National Ambient Air Quality Standards (NAAQS) in Maricopa County. During the late morning / early afternoon hours of March 14th, strong, gusty winds moved into the Phoenix Metro area from the west. A detailed review of inspections in the vicinity of the exceeding monitors in Maricopa County was performed (see Appendix P and Section 5.2). No significant compliance deviations were found in the inspection reports. All appropriate State Implementation Plan (SIP) control measures were in place during the event, demonstrating, per 40 CFR 50.1(j), that the event "is not reasonably controllable or preventable." A discussion of commonly employed Best Available Control Measures (BACM) for dust in Maricopa County can be found in "High Wind Exceptional Events and Control Measures for PM_{10} Areas" (Appendix G, see also Section 5.2 and Appendix E).

Strong winds were observed throughout portions of Maricopa County and the Phoenix Metro area on March 14, 2008. The start of the wind-blown dust event is evident in the Phoenix visible

camera images as well as the Arizona Meteorological Network (AZMET), Maricopa County (MC), and National Weather Service (NWS) monitors (see Appendices L, M, & N). Gusty winds greater than 20 mph were reported between 9:00 a.m. and 5:00 p.m. at several Phoenix area monitoring locations. In addition, Phoenix Goodyear Airport reported reduced visibility and a wind gust of 43 mph during the event. Blowing dust was also reported by the NWS stations at El Centro and Yuma.

The high wind event brought elevated ambient concentrations of PM_{10} to the Phoenix area, especially along the Salt River channel. Due to the spatial variability of PM sources, both within and outside of the Phoenix urban core, the PM_{10} NAAQS was only exceeded at the West 43rd Ave. monitor operated by Maricopa County. This monitor is located on the bank of the Salt River channel. The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event "affects air quality." The following are the most significant PM_{10} monitor readings for the monitors examined in this report (the Phoenix monitors are organized from south of the Salt River to north of the Salt River in the order of distance from the Salt River, with the West 43rd Ave. being on the bank of the Salt River channel). The PM_{10} concentration gradient emanating to the north and south from the Salt River channel is evident from the data presented in the table.

Monitor (Operator/Type)	AQS ID	24-hr Avg PM_{10}	1-hr Max PM_{10}	Max Time	Flag**
BUCKEYE AREA					
Buckeye (MC/TEOM)	04-013-4011	79	423	1200	None
PHOENIX METRO AREA					
South Phoenix (MC/TEOM)	04-013-4003	119	461	1300	None
West 43rd Ave. (MC/TEOM)	**04-013-4009**	**251**	**1286**	**1300**	**RJ**
Durango Comp.(MC/TEOM)	04-013-9812	92	310	1300	None
Central Phoenix (MC/TEOM)	04-013-3002	69	231	1300	None
Greenwood (MC/TEOM)	04-013-3010	71	151	1300	None
West Phoenix (MC/TEOM)	04-013-0019	57	126	1300	None
JLG Supersite (ADEQ/TEOM)	04-013-9997	40	62	1300	None

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

The preliminary findings from the original analysis of this event were presented at stakeholder meetings on November 19, 2008, and March 19, 2009, in Phoenix, Arizona. Following the stakeholder meetings, ADEQ supplemented and finalized the analysis and a public comment period was held from October 15, 2009, through November 13, 2009. No comments were received during the public comment period. The final report and public process documentation were submitted to EPA on November 17, 2009 to satisfy the requirements in 40 CFR 50.14(c)(3)(i). This supplemental report will undergo a similar public process.

Assessment under the Federal Exceptional Events Rule

Procedural Requirements. A review of the procedural requirements described in EPA's *Treatment of Data Influenced by Exceptional Events* rule (codified in 40 CFR 50) can be found in Section 1.1 of this document. These procedural requirements include a public notification that an event was occurring, the placement of informational flags on data in the Air Quality System, 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. All of these procedural requirements are covered in detail in Section 1.1 and are met, or will be met, with the submittal of this demonstration document.

Documentation Requirements. A description of the documentation requirements required by EPA's *Treatment of Data Influenced by Exceptional Events* rule (codified in 40 CFR 50) can be found in Section 1.2 of this document.

1. Evidence is provided to show that the event satisfies "exceptional event" criteria. These criteria are comprised of four main parts:

a. Affects air quality – Section 5.1 presents information demonstrating the event affected air quality;
b. Is not reasonably controllable or preventable – Section 5.2 presents an analysis of fugitive dust produced along the back trajectory of winds impacting the West 43rd Ave. monitor and shows that during high wind hours the anthropogenic sources contributing to the exceedance of the PM_{10} standard on March 14, 2008, were vacant areas (43.9%), riverbeds (22.9%), sand and gravel operations (28.8%), construction (3.4%) and passive restricted space (1.0%). Documentation is presented demonstrating the EPA-approved Serious Area PM_{10} Plan and the 2007 Five Percent Plan for PM_{10} control measures were in place for these sources. This confirms that the sources upwind of the West 43rd Ave. monitor were reasonably controlled during the high wind hours on March 14, 2008;
c. Is caused by either (1) human activity that is unlikely to recur at a particular location or (2) a natural event – Section 5.3 presents an analysis of wind speeds recorded on March 14, 2008, showing that both the gusts and averages recorded during the high wind hours equaled or exceeded the 95th percentile values recorded during spring months in 2005 – 2008 at the West 43rd Ave. monitoring site. This demonstrates the winds which caused the exceedance of the standard were unusually high and qualify as a natural event; and,
d. Is determined by EPA to be in accordance with 40 CFR 50.14 to be an exceptional event (pending EPA concurrence upon receipt of this document).

2. There is a clear, causal relationship between the measurement under consideration and the event (*40 CFR 50.14(c)(3)(iv)(B)*). The demonstration of a clear causal relationship is evident in the description of the meteorological setup over the southwestern U.S. as well as the various reports of high winds and associated windblown dust. Section 7 shows comparisons between monitored winds and the PM_{10} levels measured at the West 43rd Ave. monitor. With the arrival of high winds came elevated PM_{10} levels.

In Section 4, the meteorology of the event is described, and supplemented with data in Appendix M. Appendix I contains the advisories for the high wind event. The NWS issued a wind

advisory for the Lower Colorado River Valley, Southeast California Deserts and Joshua Tree National Park (see Appendix J). Unlike other events assessed using this template, there were no news stories of interest related to this event (normally found in Appendix K). Blowing dust was noted at the NWS El Centro Naval Air Station (NAS), and Yuma Marine Corp Air Station (MCAS). The high wind event throughout southeastern California and much of Arizona produced only local areas of blowing dust/sand. Section 7 demonstrates that high afternoon concentrations do not typically occur unless unusually high winds are present. Data presented in Section 5.2 demonstrate that unusually high winds were recorded on the late morning and afternoon of March 14, 2008, at the West 43rd Ave. monitoring site relative to the historical record for spring months. Data presented in Section 7 show that PM_{10} concentrations recorded during the high wind hours of March 14, 2008, were unusually high relative to the historical record for spring months. Collectively, this information demonstrates a clear causal relationship between elevated winds and elevated concentrations recorded on the day of the event. Further evidence of this relationship is available from time-lapse photographs of the area adjacent to the monitor documenting diminished visibility as the afternoon progressed and winds and PM_{10} concentrations increased.

3. Evidence is provided to show that the event was associated with a measured PM_{10} concentration in excess of normal, historical fluctuations (*40 CFR 50.14(c)(3)(iv)(C)*). ADEQ developed a "Historical Distribution" table to show that the 24-hour values fell above the 95th percentile of historical data encompassing the previous five years of data for the West 43rd Ave. monitor. All flagged 24-hr PM_{10} values were well above the 95th percentile when considering both annual and seasonal (spring) data. Further evidence of the severity of the concentrations recorded on this date are presented in an analysis of the average concentrations recorded during the high wind hours related to the historical record for 2005 – 2009. It shows the March 14, 2008, values ranked 2nd (99.8 percentile) relative to spring observations. An additional analysis was completed to compare the values recorded at other monitors in the network to their five year historical values. Many of the other monitors showed PM_{10} levels exceeding the 75th & 95th percentile. These data are described in more detail in Section 3 of this document and provide further evidence that the event was associated with concentrations in excess of normal historical fluctuations.

4. Evidence is provided to show that there would have been no exceedance or violation "but-for" the event (event contribution analysis) (*40 CFR 50.14(c)(3)(iv)(D)*). Section 6 presents an "Event Contribution Analysis" to show there would not have been an exceedance "but for" the event. Using local measurements of the threshold velocity at which winds could initiate entrainment of PM_{10} impacting monitors in the Salt River area, the event day was divided into periods with low and high wind hours. Alternative estimates of the daily concentrations were made by substituting spring average and 95th percentile concentrations recorded during the high wind hours in 2005 – 2008. The resulting daily average concentrations were well below the ambient 24-hour PM_{10} standard, thus demonstrating that "but-for" the concentrations recorded during the high wind hours, the exceedance would not have occurred at the West 43rd Ave. monitoring site. A similar calculation using data available for days in 2003 – 2008 showed the resulting daily average concentrations on March 14, 2008, exceeded the 99th percentile, providing further evidence of the elevated nature of the concentrations recorded during the high wind hours on that date.

Additionally, descriptions of Air Pollution Control Programs for the Phoenix area are included in Section 2.2 of this document. Section 5.2 discusses the inspections and violations that were reported during the period March 11-17, 2008, and documents the control measures that were in place during that period. The violations noted during March 11-17, 2008, were minor and insufficient to contribute to an exceedance of the PM_{10} NAAQS at the magnitude recorded for the March 14, 2008, event. Thus, despite a demonstration that control measures were in place for upwind anthropogenic sources impacting the West 43rd Ave. monitor on March 14, 2008, a high wind event caused the NAAQS exceedance.

Conclusion

The high wind event that caused elevated PM_{10} on March 14, 2008, in Maricopa County caused the transport of dust and soils from winds that suspended natural soils and soils from areas where all control measures were in place and should be flagged for air quality planning purposes. The "high wind" (RJ) flag should be applied to the monitor readings.

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Section 1: Meeting Federal Requirements for Exceptional Events

This document is a reengineering and repackaging of the information and data related to an exceptional event in order to assist the Environmental Protection Agency's (EPA) Region 9 staff and the public with a better understanding of the nature of that exceptional event. The first example using this format was prepared for the event that occurred on June 4, 2008, as a comprehensive analysis of the documentation sent to EPA on November 17, 2009. This document provides a similar treatment for the March 14, 2008, exceptional event. The materials contained in this Report respond to feedback received from EPA beginning in May 2010 and to criticisms made in the EPA Region 9 May 21, 2010, finding that this exceedance did not qualify for treatment as an exceptional event under 40 CFR 51.14. The Arizona Department of Environmental Quality (ADEQ) contends, however, that the materials sent to EPA in 2009 were sufficient to meet all the requirements of the Exceptional Events Rule (EER) and make adequate demonstrations that all the events qualified under the Rule.

EPA's *Treatment of Data Influenced by Exceptional Events* rule (40 CFR 50.14) describes the requirements for exceptional events flagging and documentation. The Arizona Department of Environmental Quality (ADEQ) meets all of these procedural and documentation requirements.

1.1 Procedural Requirements

Public notification that event was occurring (40 CFR 50.14(c)):

The ADEQ issues Dust Control Action Forecasts for the Phoenix area as part of their Natural Events Action Plan (NEAP). On Thursday, March 13, 2008, in response to a tightening pressure gradient ahead of a low pressure system and associated cold front approaching Arizona from the west, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast which called for a moderate risk of wind-blown dust for Friday, March 14th. In addition, ADEQ air quality forecasters issued a PM_{10} Health Watch for March 14, 2008, due to the possibility of strong winds and blowing dust throughout Maricopa County stating that "Areas of blowing and suspended dust are therefore likely as is the potential for transported dust from desert areas upwind of the metro area. Since PM_{10} (coarse particle) levels may approach unhealthy levels, a PM_{10} Health Watch has been issued for Friday." The forecasts/advisories satisfy the requirement in 40 CFR 51.930(a)(1). Copies of these advisories have been included in Appendix I.

Place informational flag on data in the Air Quality System (AQS) (40 CFR 50.14(c)(2)(i)):

ADEQ and other operating agencies in Arizona submit data into the U.S. Environmental Protection Agency (EPA) Air Quality System (AQS). Data from both filter-based and continuous monitors operated in Arizona are submitted to AQS.

When ADEQ or another agency operating monitors in Arizona suspects that data may be influenced by an exceptional event, ADEQ 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 the agency submits the data into AQS. ADEQ and other operating

agencies also submit data from continuous monitors into AQS after quality assurance is complete.

If ADEQ or the operating agency has 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 July 1st (or starting in 2010 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 on June 30, 2009, listing the days ADEQ, and other operating agencies in Arizona, intended to analyze under the Exceptional Events Rule. The March 14, 2008, PM_{10} high wind event was included on this list. One monitor was identified as being qualified, the West 43rd Ave. monitor operated by Maricopa County Air Quality Department (MCAQD). A copy of the transmittal letter and preliminary assessment report are included in Appendix Q.

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv)):

ADEQ updated the assessment report and released it for a formal 30-day public comment period in October 2009. The updated document was submitted to EPA on November 17, 2009. A copy of the transmittal letter, public notice certification, and assessment report are included in Appendix R.

ADEQ is submitting this document in an effort to engage EPA in consultation about the March 14, 2008, event. This document is intended to add additional clarification requested by EPA on the event. This document will be available for a formal 30-day comment period and re-submitted to EPA, along with any comments received, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

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

Prior documentation submitted on November 17, 2009, was intended to accomplish this. This supplemental report is intended to resolve any other outstanding issues.

1.2 Documentation Requirements

Provide evidence that the event satisfies "exceptional event" criteria set forth in 40 CFR 50.1(j) (40 CFR 50.14(c)(3)(iii)(A)):

See Section 5 of this document. According to 40 CFR 50.1(j) and Clean Air Act (CAA) Section 319, an exceptional event meets all of the following criteria:

a. Affects air quality (See Section 5.1 of this document);
b. Is not reasonably controllable or preventable (See Sections 5.2 of this document);
c. Is caused by either (1) human activity that is unlikely to recur at a particular location or (2) a natural event (See Section 5.3 of this document); and,
d. Is determined by EPA to be in accordance with 40 CFR 50.14 to be an exceptional event (Pending EPA concurrence upon receipt of this document).

There is a clear, causal relationship between the measurement under consideration and the event (40 CFR 50.14(c)(3)(iii)(B)):

See Section 7 of this document.

Provide evidence that the event is associated with a measured concentration in excess of normal, historical fluctuations (40 CFR 50.14(c)(3)(iii)(C)):

See Section 3 of this document.

Provide evidence that there would have been no exceedance or violation but for the event (event contribution analysis) (40 CFR 50.14(c)(3)(iii)(D)):

See Section 6 of this document.

Section 2: Background on Geographic Setting and Control Programs

This section describes the geographic and climatic setting of the monitors and the control programs in place to protect air quality in the area.

2.1 Geographic Setting of Monitors

Phoenix

Geographic Setting

Phoenix is located in the Salt River Valley in south-central Arizona (see Figure 2-1). It lies at a mean elevation of 1,090 feet above mean sea level (msl) in the northern reaches 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 and west and south into Pinal County.

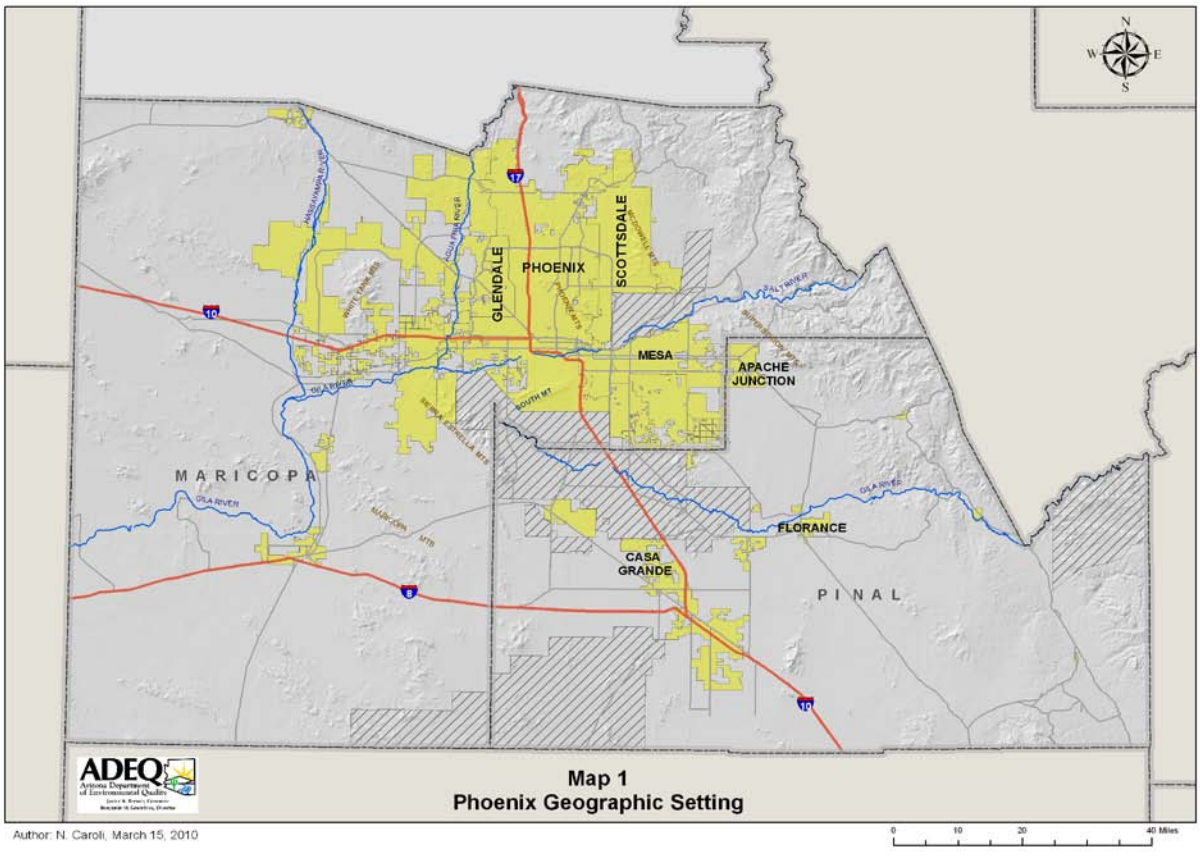


Figure 2-1. Map of Phoenix Geographic Setting

The 2000 census revealed that Phoenix had a population of 1,321,045 people and the Phoenix-Mesa-Scottsdale Metropolitan Statistical Area (MSA), comprised of Maricopa and Pinal counties, had a population of 3,251,876. The official 2008 estimate by the U.S. Bureau of the Census placed the population of Phoenix at 1,567,928 and the population of the MSA at 4,281,899.

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 PM_{10} loadings during high wind events. Much of this alluvial matter and fine soils have been deposited in the Valley of the Sun in the vicinity of the confluence of the Gila and Salt River channels and the confluence of the Gila and Agua Fria River channels.

This alluvial material and these fine soils contribute significantly to the PM_{10} loading associated with elevated PM_{10} events at the West 43rd Ave. monitor in Phoenix when winds are being directed up the Gila and Salt River channels from the west during high wind events. This can also be true for the Buckeye and Coyote Lakes monitors, which are located adjacent to dry riverbeds.

Figure 2-2 also reveals that the Phoenix airshed and the Yuma airshed are linked by the Gila River channel. The alluvial material and fine soils in the Gila River channel can provide a source of particulate matter to the Greater Phoenix Area, especially to the West Valley if the winds are oriented along the direction of the channel.

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 a large 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. March is the wettest month of the year with June being the driest. 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 surges in from the Gulf of California. These can bring strong winds, large hail, or rarely, tornadoes. Winter storms moving inland from the Pacific Ocean occasionally produce significant rains but occur less frequently.

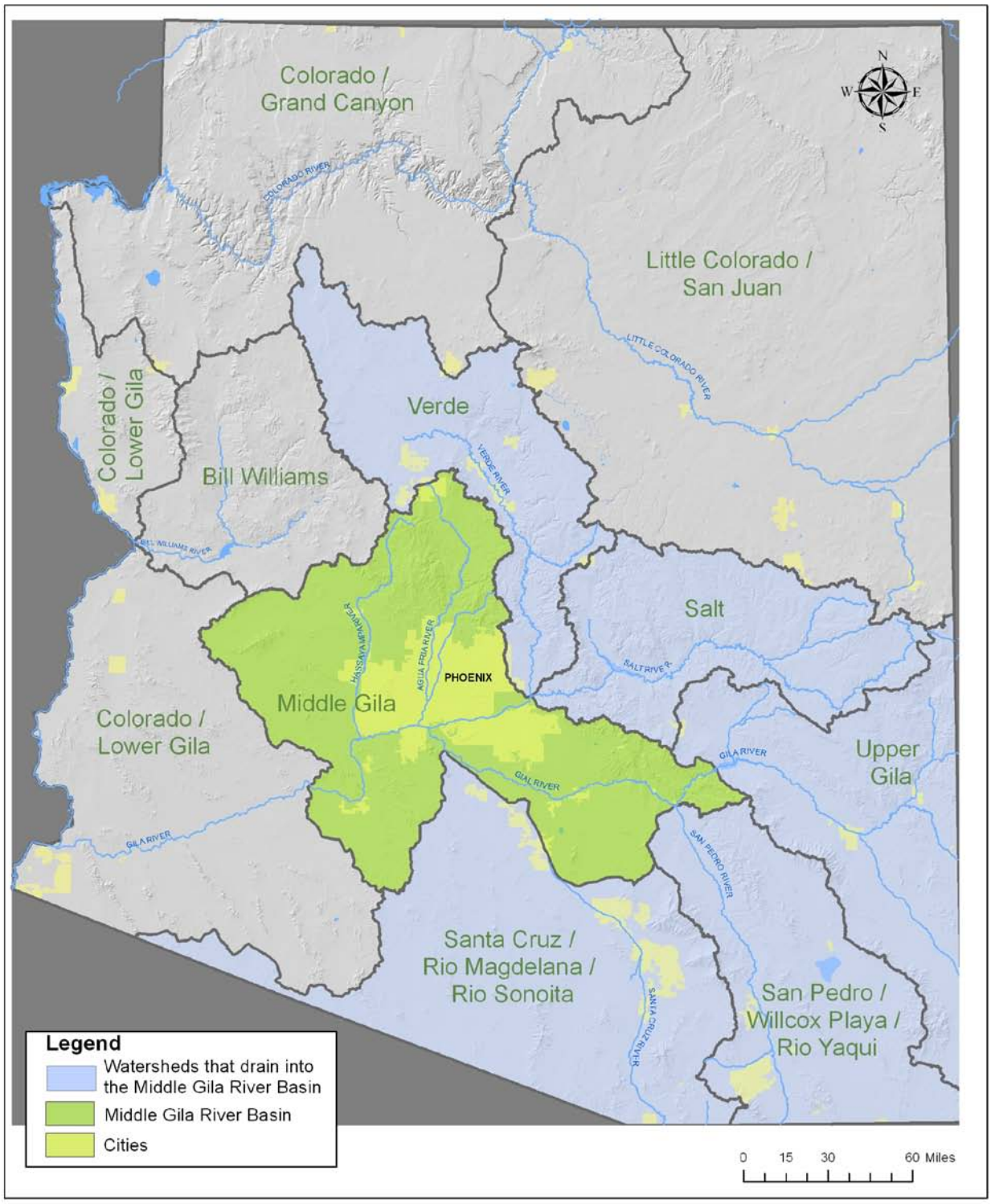


Figure 2-2. Map of Drainage System in Arizona

2.2 Air Pollution Control Programs

Phoenix Area

Two programs provide air pollution control measures for the Phoenix area:

- Arizona Department of Environmental Quality (ADEQ) Agricultural Best Management Program or AgBMP (see http://www.azdeq.gov/environ/air/prevent/pcp.html#bmp) under Arizona Administrative Code R18-2-610 and 611 (see http://www.azsos.gov/public_services/Title_18/18-02.htm#Article_6); and
- Maricopa County Air Quality Department, which implements a suite of rules listed in Table 2-1.

In addition to routine inspections and inspections driven by complaints, inspections are often increased when a pollution advisory, high wind advisory or dust forecast is issued. For March 14, 2008, a PM_{10} health watch had been issued and the Dust Control Action Forecast identified a moderate potential for blowing dust.

Upon the flagging of an event that could be classified as exceptional, a control measures report is completed. The report contains any complaints or inquiries made, any inspections conducted, and any enforcement actions issued for a period of time 72 hours prior to the day of the event, the day of the event, and 72 hours after the event within a two mile radius of the monitor (see Appendix P). Upon the issuance of an advisory, additional inspections are often conducted, particularly in areas where reduced compliance or PM_{10} generating activities have historically been an issue.

Table 2-1. Rules Regulating Particulate Matter Emissions in Maricopa County

Rule Number and Title	Rule 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 313: Incinerators, Burn-Off Ovens, and Crematories	Establishes standards for incinerators that are used for refuse disposal and limits particulate emissions from incinerator burning.
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 315: Spray Coating Operations	Establishes limits for the emissions of particulate matter to the atmosphere from spray coating operations.

Table 2-1. Rules Regulating Particulate Matter Emissions in Maricopa County	
Rule Number and Title	**Rule Description**
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 318: Approval of Residential Woodburning Devices	Establishes standards for approval of residential woodburning devices.
Rule 319: Ginning Operations	Establishes limits for the emissions of particulate matter from ginning operations.
Rule 322: Power Plant Operations	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from existing power plants and cogeneration plants.
Rule 323: Fuel Burning Equipment from Industrial/Commercial/Institutional (ICI) Sources	Establishes limits for the emissions of nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter from ICI sources.
Rule 324: Stationary Internal Combustion (IC) Engines	Establishes limits for the emissions of carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds, and particulate matter from stationary internal combustion engines, including stationary IC engines used in cogeneration.
Rule 325: Brick and Structural Clay Products (BSCP) Manufacturing	Establishes limits for particulate matter emissions from the use of tunnel kilns for curing in the brick and structural clay product (BSCP) manufacturing processes.
P-25: Leaf Blower Restriction Ordinance	Establishes restrictions for leaf blowers in incorporated and unincorporated sections of Area A in Maricopa County.
P-26: Residential Woodburning Restriction Ordinance	Establishes restrictions for residential woodburning.
P-27: Vehicle Parking and Use on Unstabilized Vacant Lots Ordinance	Establishes restrictions for vehicle parking and use on unstabilized vacant lots in unincorporated sections of Area A in Maricopa County.
P-28: Off-Road Vehicle Use in Unincorporated Areas of Maricopa County Ordinance	Establishes restrictions for operating vehicles on unpaved property in unincorporated areas of Maricopa County.

Dust Control Information:
http://www.maricopa.gov/aq/divisions/compliance/dust/Default.aspx

Rule 310, Rule 310.01, Rule 316:
http://www.maricopa.gov/aq/divisions/planning_analysis/AdoptedRules.aspx

Additional Information Rule 316:
http://www.maricopa.gov/aq/divisions/compliance/dust/implementation_resources.aspx

Section 3: Concentrations Were In Excess of Normal, Historical Fluctuations

In order to qualify as an exceptional event, the concentration must be shown to be in excess of the normal, historical fluctuation of measurements at the site. This section examines this issue and provides the basis that this criterion has been met for the monitor at West 43rd Ave.

The historical concentration and meteorological data used in this Section (and in Sections 5 through 7) is limited by the availability of data. Due to different data collection parameters (i.e., hourly data vs. filter data vs. 5-minute data) historical time periods vary between sections depending on the type of analysis being conducted, monitoring sites being considered and/or compared, and the availability of quality assured data.

3.1 Flagged Monitors

The Federal Register Notice[1] promulgating the final rule for exceptional events included the following guidance for preparing this demonstration.

> *The final rule permits a case-by-case evaluation, without prescribed threshold criteria, to demonstrate that an event affected air quality. This demonstration would be based on the weight of available evidence, but must consider the historical frequency of such measured concentrations. While a State may determine the specific approach to use for such analysis, it must compare contemporary concentrations with the distribution of all measured data during the past several years. The evidence that an event affected air quality may be presented on a seasonal or other temporal basis to best compare contemporary concentrations with the distribution of historical values. For consistency with data reporting and computation of NAAQS statistics, a calendar quarter basis is suggested.*

To address this requirement, ADEQ has assembled data for the spring (March, April and May) season, as defined by the NWS. To further support a demonstration that concentrations were in excess of normal, historical fluctuations, comparisons have been prepared using both 24-hour FRM measurements and hourly measurements during high wind hours.

A summary of the frequency distribution of the previous five years of certified data (2003-2007) for the West 43rd Ave. monitor is contrasted with the March 14, 2008, value in Table 3-1. Historical distributions are presented for both the entire 5-year dataset and for the spring season. They show that the 24-hour PM_{10} concentration recorded on March 14, 2008, exceeded the 99.5th percentile when compared to the entire 5-year dataset and to the 5-year spring season dataset. Since this a methodology similar to one accepted by EPA, it is clear that the PM_{10} levels on March 14, 2008, were outside of normal historical fluctuations.

[1] Federal Register/ Vol. 72, No. 55, Thursday, March 22, 2007 / Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule

Table 3-1. Historical Distribution

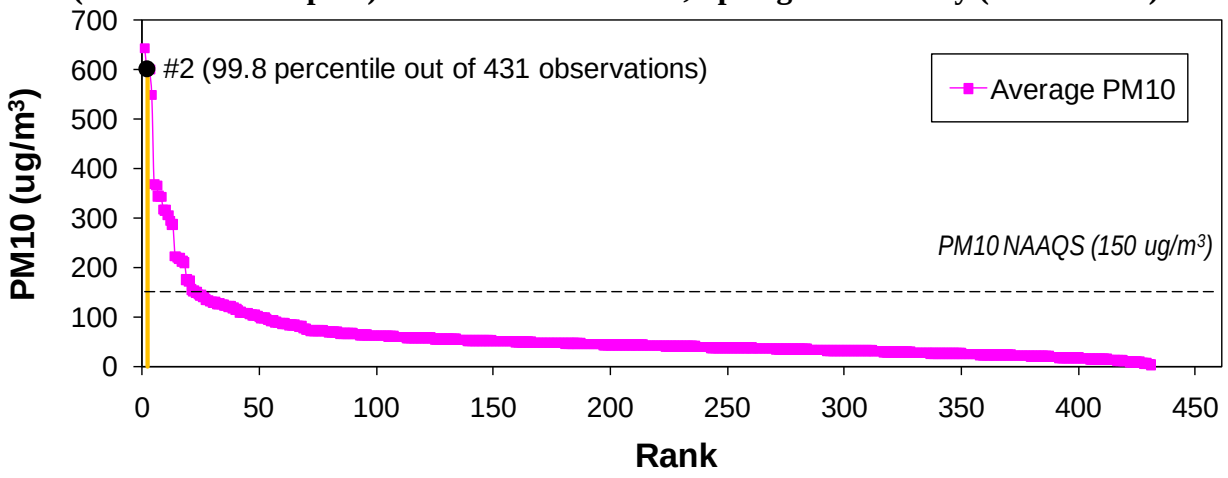
Historical Distribution 5-Yr. Distribution of Values (µg/m^3)						
MONITORS: WEST 43RD AVE.			**Column Index** Yr - All Data (5-Yrs) Sea - Data for Spring season only (5-Yrs)			
Cumulative Frequency	West 43rd					
	Yr	Sea				
Min	5	8				
0.5%	9	9				
1.0%	11	11				
2.5%	15	13				
5%	19	19				
10%	29	28				
25%	44	46				
50%	65	63				
75%	91	82				
90%	121	107				
95%	139	125				
97.5%	157	134				
99.0%	192	194				
99.5%	227	220				
Max	313	313				
Flagged Value	251					

Additional insight into the unusual nature of concentrations recorded on March 14, 2008, can be gained from a historical examination of concentrations recorded during the high wind hours. As discussed further in Section 5.1, high wind hours are defined to be those in which 5-minute vector average measurements exceeded 13 mph, the lowest threshold speed at which winds can initiate entrainment of PM_{10} impacting local monitors in Maricopa County (see Appendix H). Using this criterion, the high wind hours for the West 43rd Ave. monitor were determined to be 9:00 a.m. to 4:00 p.m. (the period of average for the high wind hours for this event).

The additional analysis used the available hourly dataset (2005-2009) for the spring season. The severity of concentrations recorded during those hours on March 14, 2008, is illustrated in Figure 3-1. It displays the average concentration recorded during those hours at the West 43rd Ave. monitoring site relative to the same period of time in the available hourly dataset (2005 – 2009) for the spring season. Figure 3-1 shows that March 14, 2008, ranked 2nd (99.8th percentile) out of the available data for the spring season.

In summary, an examination of the historical record of 24-hour concentrations over annual and the relevant seasonal period demonstrates that concentrations recorded on March 14, 2008, were, well outside of normal, historical fluctuations.

Figure 3-1. Distribution of Average PM_{10} Concentrations During High Wind Hours (9:00 a.m. – 4:00 p.m.) at West 43rd Monitor, Spring Season Only (2005 – 2009)



3.2 Other Non-Flagged Monitors

The complete Phoenix Metropolitan Area 24-hour average PM_{10} data are summarized in Table 3-2 for the period March 13th – March 15th. It shows that two other monitors (Central Phoenix and South Phoenix) exceeded the 95th percentile on March 14th, and the residual dust from the storm described in Section 4 below continued to affect all the monitors on March 15th, although it did not cause exceedances of the NAAQS on that date. It can also be seen that the data from March 13th and March 15th were closer to the median values (50th percentile) further confirming the event was wide-spread over most of the Phoenix area.

Table 3-2. Historical Analysis of Maricopa County PM_{10} Network Data

Site ID – Name	March 13th	March 14th	March 15th	March - May 95th Percentile	March – May 75th Percentile	March - May 50th Percentile
4011 – Buckeye	43	79	43	83	59	45
4003 – South Phx	53	119	57	86	54	45
4009 – West 43rd	60	250	50	125	82	63
9812 – Durango	56	92	42	97	69	52
3002 – Central Phx	42	68	41	67	44	36
3010 – Greenwood	52	70	41	94	56	43
0019 – West Phx	45	57	41	68	48	38
9997 – JLG	32	40	35	51	37	31
4014 – Coyote Lakes	47	47	29	86	57	47
4006 – Higley	44	53	47	96	65	46

Section 4: Description of March 14, 2008, Exceptional Event

On March 14th, 2008, strong winds were expected throughout much of Arizona due to a tightening pressure gradient ahead of a low pressure system and associated cold front approaching Arizona from the west. The 500 mb weather maps show that the main branch of the storm track was over Arizona in the form of very strong zonal west-northwest to east-southeast flow (Figure 4-1). At this 500 mb level, wind speeds on March 14th ranged from about 80 – 85 knots throughout Arizona with strong winds of 60 – 80 knots also seen over portions of California and New Mexico.

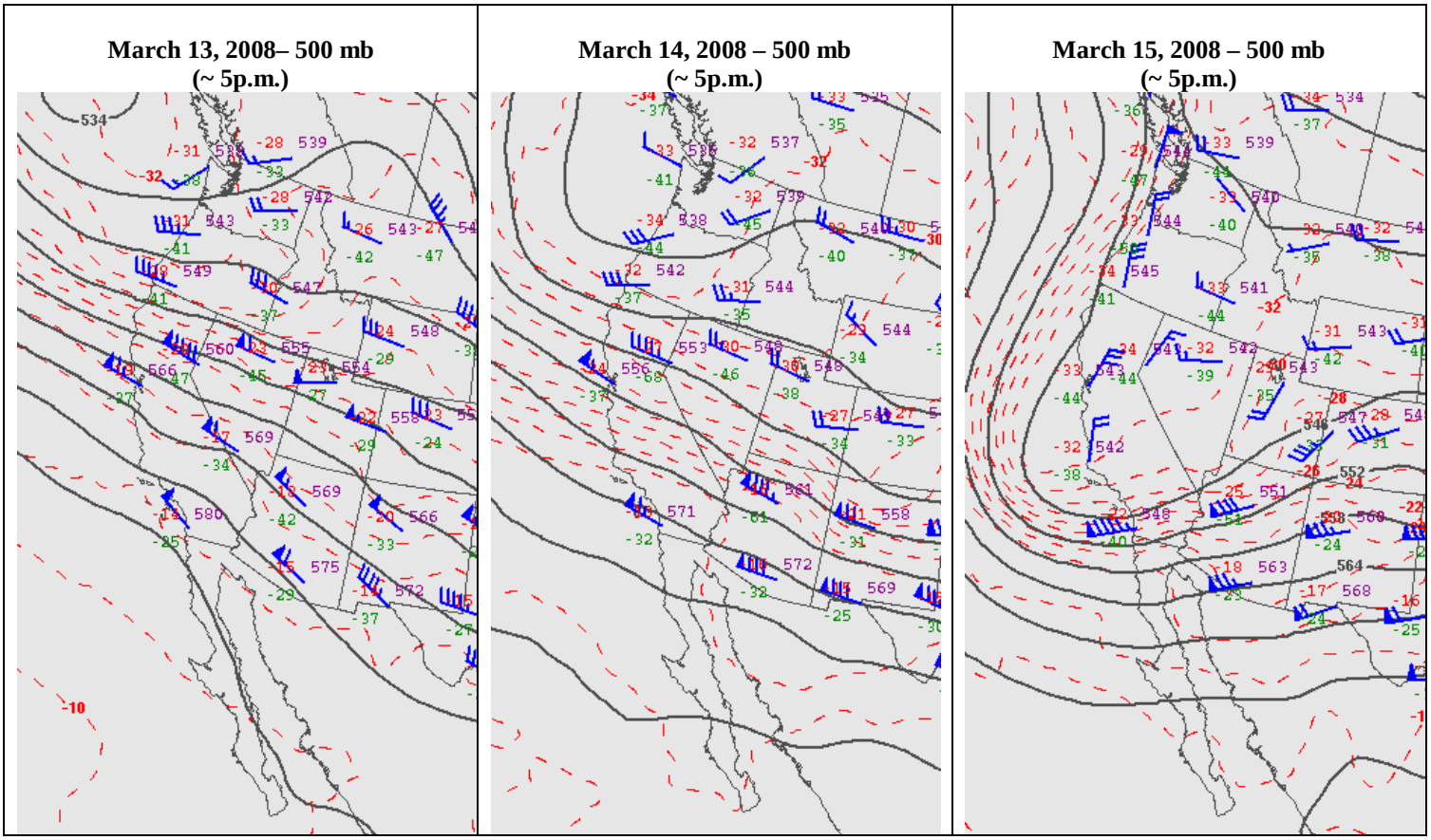


Figure 4-1. Evolution of 500 mb Winds Ahead of an Approaching Low Pressure Trough Over a 3 Day Period

Supporting materials for this analysis are contained in the appendices of this report. Appendix J contains the NWS advisories and event reports, Appendix K contains any related news articles, Appendix L contains graphic and tabular summaries of all PM_{10} measurements and local winds at the air quality monitor locations, and Appendix M contains a comprehensive archive of all relevant hourly meteorological (and air quality) data for all stations in the region archived by ADEQ. Information in these appendices should be review to add context to the weather discussion.

By the morning of March 14th, an upper level jet max had reached Arizona. At the 300 mb level a 100+ knot jet stream can be seen over most of CA, NV, UT, AZ, and NM as of the evening of March 14, 2008 (Figure 4-2). Mostly clear skies, abundant sunshine, and daytime temperatures approaching or exceeding 80°F in the deserts of southeastern California and Arizona allowed for a well mixed atmosphere, which enabled the upper level winds to mix down to the surface, as evidenced by the numerous reports of high winds by the NWS. The NWS issued a wind advisory for the Lower Colorado River Valley and surrounding areas (see Appendix J). Additionally, local topography likely increased surface winds at certain locations.

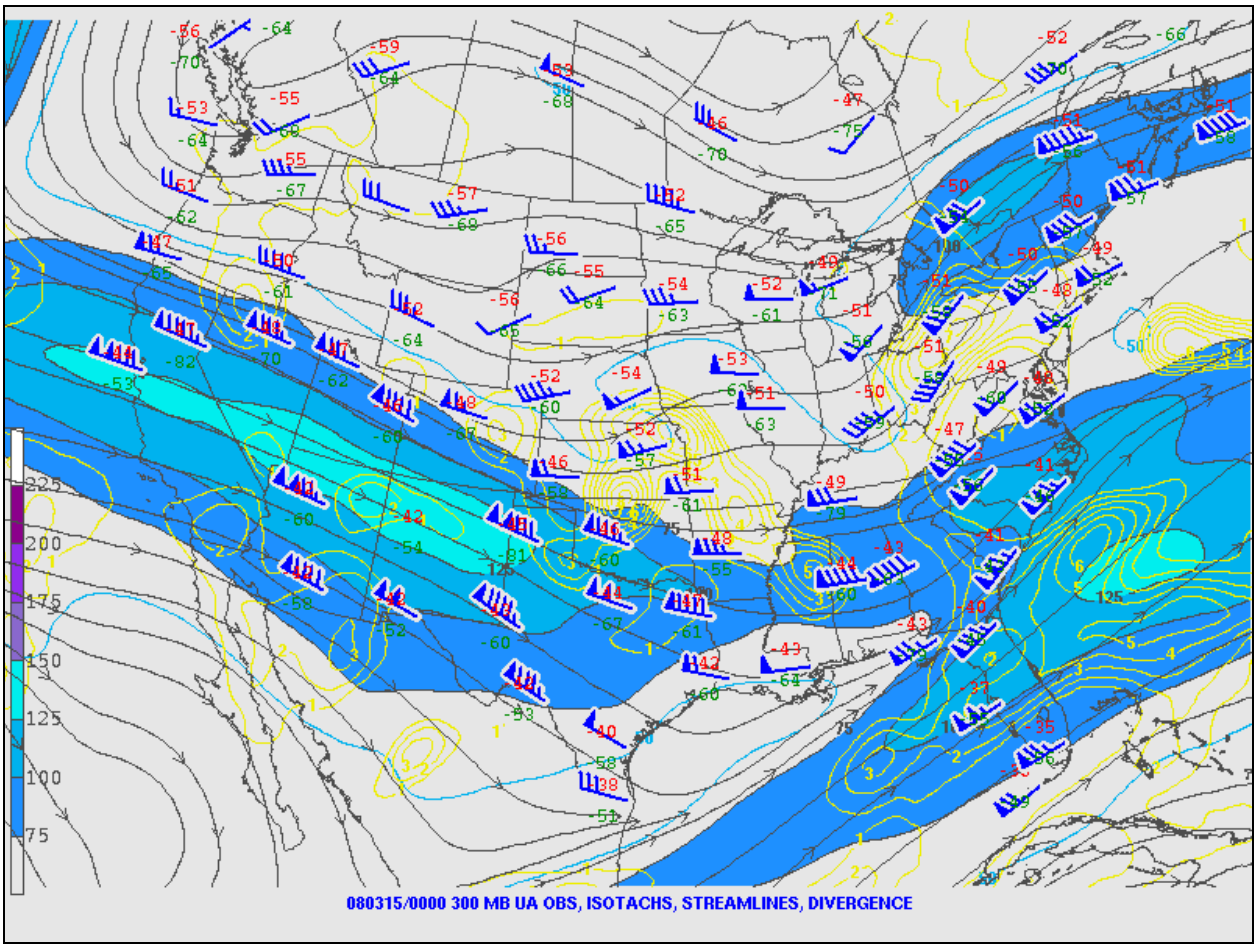


Figure 4-2. Wind Field at 300 mb During the Late Afternoon/Evening of March 14 (a strong jet maximum was over the southwestern United States covering most of California, Nevada, Arizona, Utah, and New Mexico).

The presence of a cold front over western Arizona is shown in the Surface Weather Map (Figure 4-3). Low pressure can be seen over the Four Corners region of the southwestern United States with the accompanying cold front entering the western portions of Arizona as of the morning of March 14th. Strong wind gusts associated with and out ahead of this approaching system began being reported by NWS, ADEQ, Maricopa County, and AZMET stations around 9:00 a.m. on March 14, 2008. During the 9:00 a.m. hour, winds began to increase across much of the Phoenix area with gusts out of the west and southwest at or greater than 20 mph reported at the West 43rd

Ave., Durango, Greenwood and West Phoenix monitor locations. The following hour, additional sites began reporting gusts greater than 20 mph including the South Phoenix and Central Phoenix monitor locations. Other monitors also reported strong wind gusts beginning in the morning and continuing into the afternoon, including the Cave Creek site with a gust of 31 mph, West Indian School with gusts to 31 mph, Pinnacle Peak with gusts as high as 34 mph, and Buckeye with a gust of 31 mph. NWS stations in Glendale and at Sky Harbor in Phoenix first reported wind gusts greater than 20 mph during the 9:00 a.m. and 10:00 a.m. hours, respectively. The NWS station in Goodyear first reported strong gusts during the 11:00 a.m. hour and had a peak gust of 43 mph during the 1:00 p.m. hour. A majority of monitors and NWS stations in and around the Phoenix area consistently reported increased winds (many above 20-25 mph) beginning in the 9:00 a.m. and 10:00 a.m. hours with peak wind gusts (many above 30-35 mph) between 12:00 p.m. and 3:00 p.m. The timing of these monitor site and NWS wind gusts match both the onset of elevated PM_{10} concentrations as well as the maximum hourly PM_{10} concentrations measured at the West 43rd monitor on March 14, 2008.

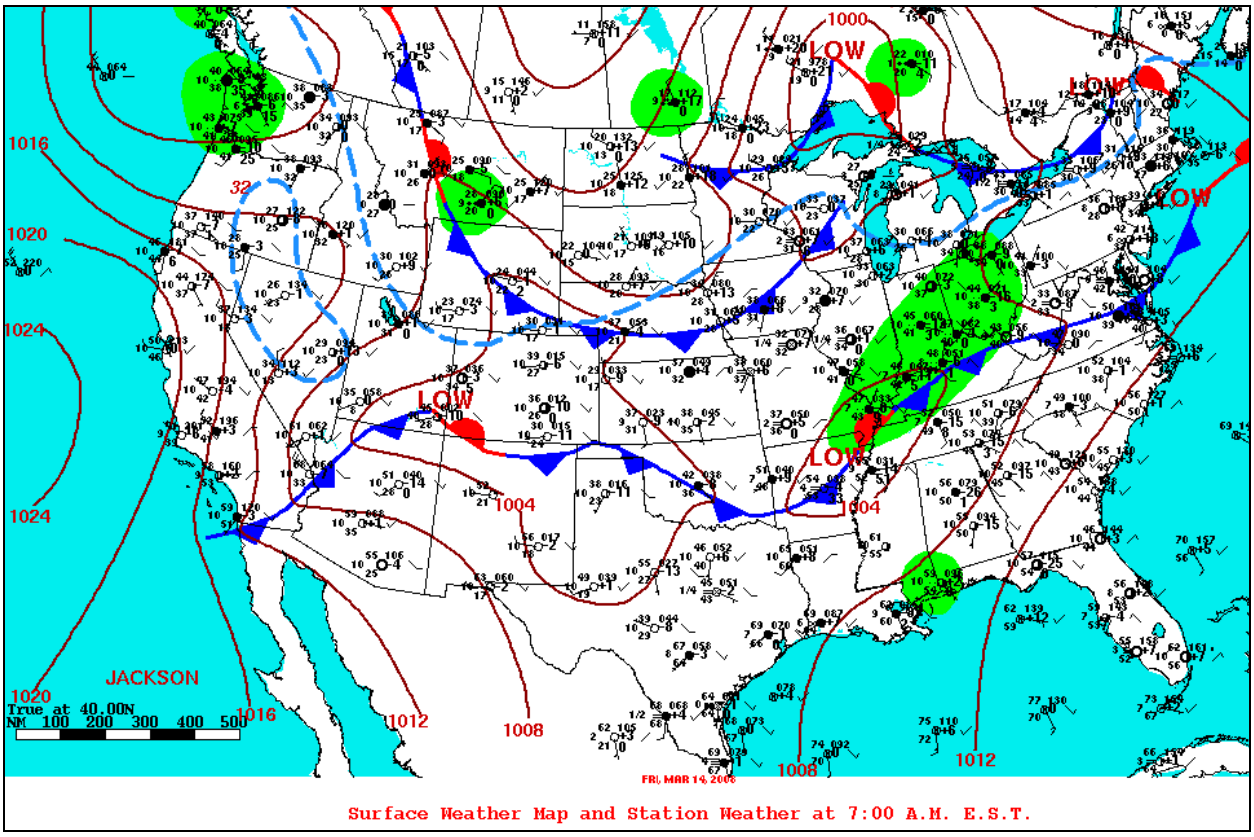


Figure 4-3. Surface Analysis from the Morning (~5a.m.) of March 14, 2008 (a low pressure system is over the four corners area of the southwestern United States with a cold front entering western portions of Arizona).

Although areas of elevated PM_{10} concentration seemed to be concentrated over western and central portions of Phoenix, the strong and gusty winds that generated this dust were not confined to only the Phoenix area on March 14, 2008. Significant wind gusts were also reported over areas of northern, western, and southern Arizona as well as areas of southeastern California. The NWS station in Needles, California reported elevated winds gusting from 26 mph to 38 mph throughout the morning and into the afternoon while NWS station in El Centro and Imperial

County saw mostly westerly wind gusts above 25 mph beginning as early as the 9:00 a.m. hour with westerly gusts above 30 mph reported throughout the afternoon and evening hours at both sites. A number of weather stations in the Yuma area reported elevated winds beginning in the late morning and continuing through the afternoon, including gusts as high as 31 mph at the ADEQ Yuma monitor site, 32 mph at the Yuma Valley AZMET site, and 26 mph at the NWS Yuma MCAS site. Blowing dust was reported in the southwestern portions of Arizona and southeastern portions of California both at the NWS Yuma MCAS and El Centro NAS sites. In northern Arizona, the AZMET station in Flagstaff saw strong westerly and southwesterly winds gust above 25 mph as early as during the 9:00 a.m. hour with peak gusts of 34 mph between 1:00 p.m. and 4:00 p.m. while Prescott reported gusts as high as 39 mph during that same time span. In southern Arizona, the NWS station in Tucson also reported wind gusts between 24 mph and 26 mph during the 2:00-5:00 p.m. hours.

While elevated wind speeds and strong wind gusts were reported throughout much of central and southwestern Arizona and throughout southeastern California, windblown dust generation was localized and concentrated in areas with lower threshold friction velocities, such as the dry river channels found in and around the Phoenix area. As can be seen in Table 3-2 of this report, most Phoenix area PM_{10} monitors recorded March 14th 24-hour average PM_{10} concentrations between 57 $\mu g/m^3$ and 119 $\mu g/m^3$. Many of these concentrations are approximately twice that of each monitor's respective median concentration for the March through May time frame (based on five years of data). Monitors located at Central Phoenix, South Phoenix, and West 43rd Ave. all recorded 24-hr average PM_{10} concentrations greater than their 95th percentile levels for the March through May period (based on five years of data) while Durango was just slightly below its 95th percentile value. Also of note are the monitors at West Phoenix, Greenwood, Buckeye, and JLG Supersite which all recorded 24-hr average PM_{10} concentrations in excess of their respective March-May 75th percentile values. This suggests that the southwestern portion of the Valley was influenced by a greater concentration of dust particles compared to the rest of the Phoenix metropolitan area. The urbanized core of the Phoenix metropolitan area acted to reduce the amount of blowing dust compared to the western periphery due to increased surface roughness. The strong evidence of a gradient of PM_{10} emanating from the Salt River channel suggests that alluvial dust was a major contributor to the event.

The meteorological phenomena associated with this event were regional in nature, as evidenced by the numerous reports of strong surface winds throughout California and Arizona. Additionally, the synoptic scale weather maps show the approaching upper level trough and the extent to which it affected the southwestern United States. While the meteorological aspect of this event covered a large geographical area, the blowing dust that was generated from these high winds occurred at sporadic locations, though these locations also covered a wide geographic area. Essentially, high concentrations of blowing dust only occurred where dust sources were located and where threshold friction velocities were low (see Appendix H, white paper on unusual winds). In the arid southwest, these dust sources are typically located in depositional areas where fine and coarse particles are deposited during times of precipitation, such as the dry river channels in Maricopa County including the Salt River channel which is located upwind, and in close proximity to, the West 43rd Ave. monitor.

Section 5: Event Analysis

In this section, the Exceptional Events Criteria are examined. 40 CFR 50.1(j) of the Exceptional Events Regulation defines an exceptional event as an event that:

- Affects air quality;
- Is not reasonably controllable or preventable;
- Is either an event caused by human activity that is unlikely to recur at a particular location or a natural event; and,
- Is determined by the EPA Administrator in accordance with the Exceptional Events Rule to be an exceptional event.

Sections 5.1 to 5.3 describe how the first three criteria are met for the March 14, 2008, high wind exceptional event in Phoenix. In addition, Section 5.4 is a re-statement that all reasonable measures were taken to protect public health.

5.1 Affects Air Quality

For an event to qualify as an exceptional event, it is necessary to show that the event affected air quality. This criterion can be met by establishing that the event is associated with a measured exceedance in excess of normal historical fluctuations, including background. The demonstration of a clear causal relationship is necessary to establish that the event affected air quality and is also a separate requirement.

The documentation provided herein for the March 14, 2008, natural event that affected the Phoenix area provides the required information to establish a causal connection between the high winds and the high concentrations measured at the West 43rd Ave. PM_{10} monitor. The measured 24-hour PM_{10} concentration shows that air quality was affected. Concentrations were lower on the days before and after the high wind event, as is shown in Table 3-2. The hourly PM_{10} concentrations increased rapidly as the winds peaked, as is shown in Section 5.2. As was shown previously in Section 3, in the last five years of analyzed data, high PM_{10} concentrations exceeding the 24-hour NAAQS do not often occur and fall above the 95th percentile of the data. Section 7 includes meteorological and particulate data showing a clear correlation between strong, gusty winds and increased hourly PM_{10}. The measured exceedance on March 14, 2008, was in excess of normal fluctuations.

5.2 Is Not Reasonably Controllable or Preventable

The Federal Register Notice[2] promulgating the final rule for exceptional events included the following guidance for preparing this demonstration:

> *The EPA's final rule concerning high wind events states that ambient particulate matter concentrations due to dust being raised by unusually high winds will be treated as due to*

[2] Federal Register/ Vol. 72, No. 55, Thursday, March 22, 2007 / Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule

uncontrollable natural events where (1) the dust originated from nonanthropogenic sources, or (2) the dust originated from anthropogenic sources within the State, that are determined to have been reasonably well-controlled at the time that the event occurred, or from anthropogenic sources outside the State.

The analytical steps required to prepare this demonstration include selecting high wind hours, plotting a back trajectory during high wind hours, determining the land use along the trajectory, estimating emissions, determining anthropogenic and nonanthropogenic source contributions, and documenting that identified anthropogenic sources were "reasonably well controlled." Presented below is a summary of the approach used to complete each of these steps.

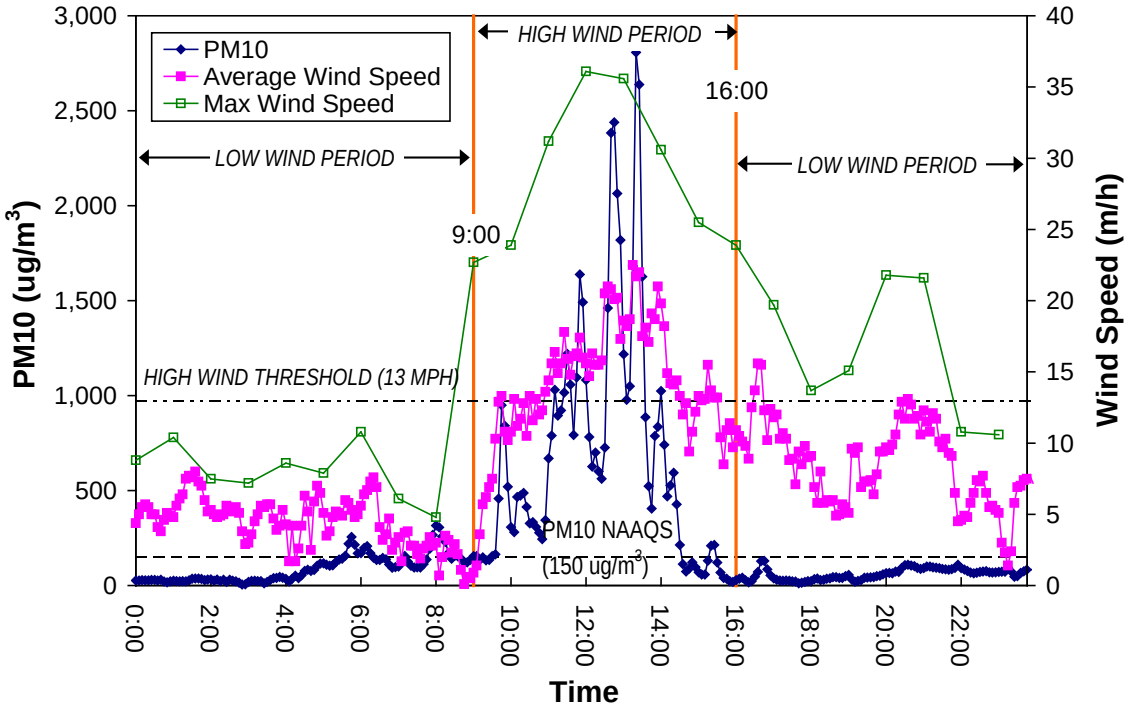
Selection of High Wind Hours

As discussed in the Unusual Winds White paper,[3] hours containing one or more 5-minute periods with an average wind speed of 13 mph or higher were designated as high wind hours. Generally, these hours are found to group together in a continuous period. In some cases, however, wind speeds tailed off after the initial weather front moved through the region, fell below the 13 mph threshold, and then again rose above the 13 mph threshold. In these cases, a second criterion can be used to determine if the hour was to be designated a high wind hour, which is whether PM_{10} concentrations continued to exceed the ambient 24-hour standard. If concentrations remained below the standard, the conclusion was that the reservoir of erodible soil was exhausted by elevated winds in previous hours and that even though the 5-minute threshold had been exceeded, there was no significant impact at the monitor. This second criterion did not apply to March 14, 2008.

A summary of the diurnal profile of 5-minute average wind speeds and PM_{10} concentrations and maximum hourly wind gusts recorded at the West 43rd Ave. monitor for March 14, 2008, is displayed in Figure 5-1. It shows the 13 mph threshold divides the day into two low wind periods from midnight to 9:00 a.m. and from 5:00 p.m. to the end of the day, and a high wind period from 9:00 a.m. to 4:00 p.m. It also shows that PM_{10} concentrations began increasing after 9:00 a.m., and peaked at about 1:00 p.m. during the highest wind hours, before declining and remaining at low levels for the remainder of the day. It also shows that the maximum hourly gusts during the high wind hours uniformly exceeded 20 mph.

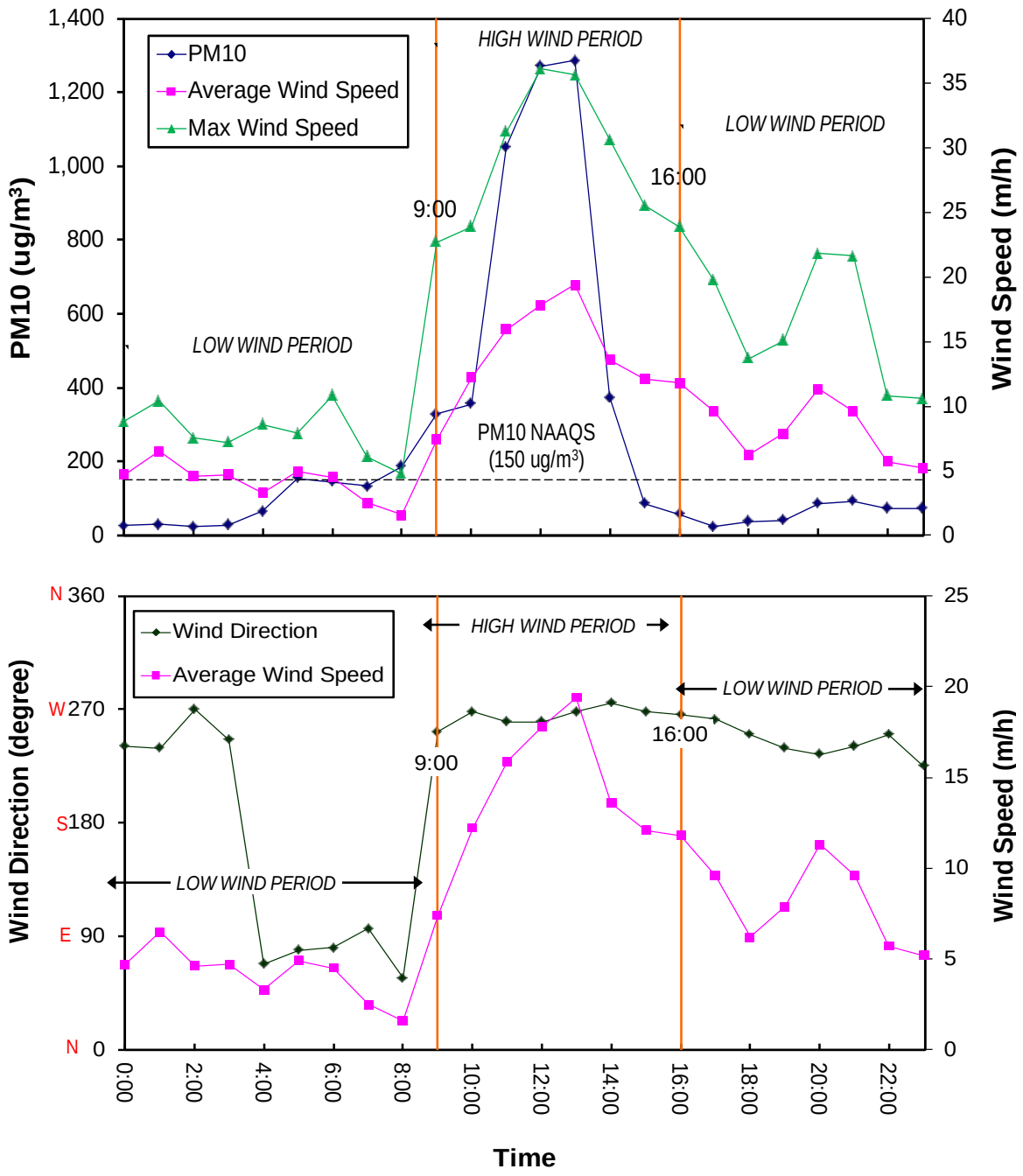
[3] The Impact of Exceptional Events 'Unusual Winds' on PM_{10} Concentrations in Arizona, ADEQ, Appendix H

Figure 5-1. Diurnal Profile of 5-Minute Average PM_{10} Concentrations and Wind Speed and 1-Hour Average Max Wind Speed at West 43rd Ave. Monitor (3/14/2008)



A similar plot of one-hour average values, along with the maximum hourly wind speeds, is presented in the top panel of Figure 5-2; hourly average wind speed and wind direction are presented in the bottom panel. As can be seen, the plots of the average hourly values significantly smooth the spikes and do not offer the insight provided by the 5-minute data. They also show that the maximum wind speed remained well above the 13 mph threshold between 9:00 a.m. and 4:00 p.m. Figure 5-2 also shows that the wind direction shifted during the early low wind hours of the day. Starting about 9:00 a.m., however, the wind shifted to the west with minimal change (i.e., < 30º) for the remainder of the day. Once the wind shifted to that course, the speeds and PM_{10} concentrations began to increase, reaching a peak at about 1:00 p.m. At that point, the wind speed declined for the remainder of the day and PM_{10} concentrations dropped precipitously. The trend continued until 4:00 p.m., after which the wind speed fell below the low wind threshold (i.e., 5-minute average values were below 13 mph threshold) for the rest of the day.

Figure 5-2. Diurnal Profile of One-Hour Average PM_{10} Concentrations and Wind Speed at West 43rd Monitor (3/14/2008)



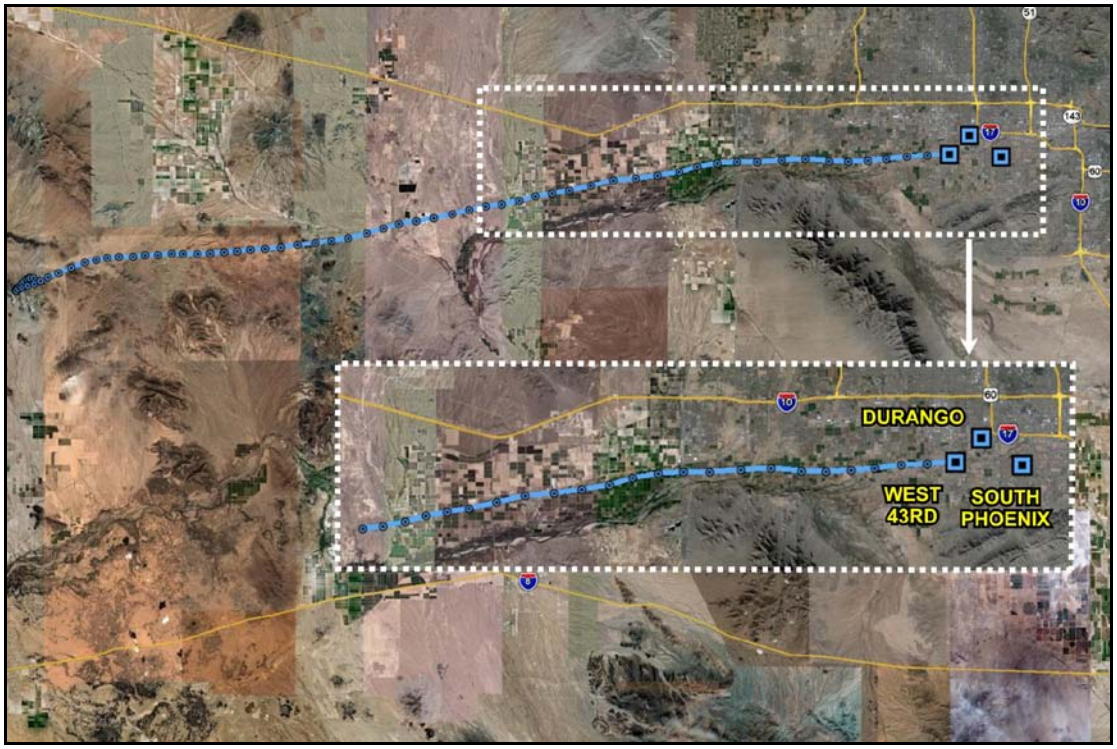
Plotting of Back Trajectory During High Wind Hours

Several factors were considered in the selection of hours used in the back trajectory calculations, including:

- Hours when peak concentrations occurred at the West 43rd Ave. monitoring site – both the hourly and 5-minute data suggest 9:00 a.m. – 2:00 p.m.; and,
- Identifying anthropogenic sources impacting the West 43rd Ave. monitoring site – the distance from the West 43rd Ave. monitor to the edge of the desert depends on wind speed and direction. As shown in Figure 5-2, the wind direction is stable during the high wind hours and the wind speeds remained high.

Since concentrations generally declined after 2:00 p.m. through the end of the day, it was selected as the starting hour for the back trajectory. The duration of the trajectory was set at six hours (2:00 p.m. to 8:00 a.m.) to ensure that all high wind/high concentration activity was captured. Given the wind speeds measured during those hours, the trajectory extended far out into the desert. Because land use within the desert provides no insight into the anthropogenic sources impacting the monitor, the analysis focused on land use during the last two hours of the back trajectory, which is roughly equivalent to the distance from the West 43rd Ave. monitor to the desert along a southwest trajectory. A plot of the selected back trajectory is presented in Figure 5-3. As can be seen, the trajectory traverses an extended desert area in which there is no anthropogenic activity.

Figure 5-3. Back Trajectory of Wind Impacting the West 43rd Ave. Monitor Starting at 2:00 p.m. March 14, 2008



Determination of Land Use Along the Back Trajectory

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

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

These categories correspond to those used in the windblown dust emission inventory published in the MCAQD's 2008 Periodic PM_{10} Emission Inventory[4] with the exception of the riverbed category, which was split out from the passive/restricted open space category and reported separately. The separate reporting and analysis of windblown emissions from riverbed lands was deemed necessary because of the finer soil texture and higher emission rate in comparison to other restricted open space lands, and because of the high prevalence of riverbed lands in the zones along the mapped back-trajectories.

A summary of the total acreages reported within each of the seven land use categories within a ½ mile during the last two hours of the back trajectory for the West 43rd Ave. monitoring site on March 14, 2008, is presented in Table 5-1. It shows that while the distribution of the source-

[4] 2008 PM_{10} Periodic Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area, Appendix 4. Windblown Dust Emission Estimates Methodology, Final Draft, Maricopa County Air Quality Department, June 2010

specific acreage varies by hour, the total acreage is very similar, confirming that there is little difference in the wind speed between the two hours.

Table 5-1. Total Acreage Within ½ Mile of Back Trajectory by Land Use Category West 43rd Ave. Monitor – March 14, 2008		
Land Use Category	**1st Hour (2:00 p.m.)**	**2nd Hour (1:00 p.m.)**
Vacant	763	2,427
Agriculture	6,054	6,796
Construction	343	159
Passive/Restricted	0	84
Riverbed	2,322	19
Sand & Gravel/Landfill	1,552	0
Other	1,402	1,706
Total	12,436	11,191

Estimation of Anthropogenic and Nonanthropogenic Emissions

A detailed discussion of the methodology used to prepare source-specific emission estimates is presented in Appendix O. In addition to the source-specific acreage values listed above, it details the rule effectiveness rates extracted from the 2008 Periodic Emissions Inventory (PEI), information on crop-specific agricultural activity, the Nickling and Gillies emission factors applied to each land use category, determination of the portion of land use which is disturbed and undisturbed, and the method used to allocate related emission estimates into anthropogenic and nonanthropogenic estimates. A summary of the resulting emission estimates for the combined two-hour period is presented in Table 5-2. It shows that anthropogenic emissions are estimated to account for 56% of the mass impacting the West 43rd Ave. monitor on March 14, 2008. One significant finding is that agricultural emissions are estimated to have no impact on the West 43rd Ave. monitor during that period. As shown below, this is because interviews with local farmers, farming organizations, and inspection of 2008 crop distribution aerial images showed that much of the land within the back trajectory zone was being used to cultivate alfalfa and hay (Bermuda grass), which fully protected these lands from wind erosion and greatly reduced emissions from agricultural lands. The principal reason other sources were estimated to have no emissions impacting the West 43rd Ave. monitor on March 14, 2008, is that the winds recorded during the two-hour period did not exceed the threshold friction velocities based on the Nickling & Gillies data.

Table 5-2. Anthropogenic and Nonanthropogenic Windblown PM_{10} Emissions From West 43rd Ave. Monitor Back-Trajectory Lands on March 14, 2008			
Land Use Category	**PM_{10} Emissions (lb)**		**% of Anthropogenic**
	Anthropogenic	**Nonanthropogenic**	
Vacant/Undisturbed	-	0	
Vacant/Disturbed	4,649	-	43.9%
Agriculture/Undisturbed	0	-	0.0%
Agriculture/Disturbed	0	-	0.0%
Construction/Undisturbed	0	-	0.0%
Construction/Disturbed	359	-	3.4%
Passive-Restricted/Undisturbed	-	0	
Passive-Restricted/Disturbed	110	-	1.0%
Riverbed/Undisturbed	-	8,284	
Riverbed/Disturbed	2,424	-	22.9%
Sand & Gravel Landfill/Undisturbed	0	-	0.0%
Sand & Gravel Landfill/Disturbed	3,053	-	28.8%
Other	0	-	
Total	10,595	8,284	
% of Grand Total	56.1%	43.9%	

Table 5-1 indicates significant differences in land use between hour 1 and hour 2 of the back trajectory. Despite these differences, there is little difference in the anthropogenic emission distributions between the hours. This is largely the result of the selected threshold friction velocities.

Documentation that Identified Anthropogenic Sources Were "Reasonably Well Controlled"

Table 5-2 identifies the sources of PM_{10} emissions located upwind of the West 43rd Ave. monitor. This section describes the measures that were in place on March 14, 2008, to control PM_{10} emissions from these sources. The control measures in the EPA-approved Serious Area PM_{10} Plan and the 2007 Five Percent Plan for PM_{10} are legally binding commitments that must be implemented by the sponsoring agency. The control measures that were implemented for the major sources upwind of the West 43rd Ave. monitor on March 14, 2008, are discussed below.

Agriculture

Although Table 5-2 indicates that agricultural emissions did not contribute to the exceedance at the West 43rd Ave. monitor on March 14th, agricultural land uses represent over 50 percent of the acreage along the back trajectory for the West 43rd Ave. monitor. The State of Arizona has implemented Agricultural Best Management Practices in Area A, which includes the back trajectory area for March 14th. The Serious Area PM_{10} Plan requires farmers to implement at least one best management practice (BMP) for tilling and harvesting, cropland, and non-

cropland. The Five Percent Plan required farmers to implement a second BMP for each of these agricultural activities. The four committed control measures in the Serious Area and Five Percent Plans are described below.

Serious Area Plan Measure

Measure 49, Agricultural Best Management Practices – The Arizona Legislature passed S.B. 1427 in 1998 which includes Best Management Practices for Agriculture to reduce particulate emissions. The legislation established a Best Management Practices Committee for Regulated Agricultural Activities appointed by the Governor.

By June 10, 2000, the Best Management Practices Committee adopted by rule an agricultural general permit specifying best management practices for regulated agricultural activities to reduce PM_{10} emissions. The ADEQ Director submitted the rule to the U.S. Environmental Protection Agency as a revision to the State Implementation Plan.

As defined by state law, an agricultural general permit means best management practices that reduce PM_{10} particulate emissions from tillage practices and from harvesting on a commercial farm; from those areas of a commercial farm that are not normally in crop production; and from those areas of a commercial farm that are normally in crop production including prior to plant emergence and when the land is not in crop production. Best management practices are defined as techniques verified by scientific research, that on a case-by-case basis are practical, economically feasible and effective in reducing PM_{10} emissions from a regulated agricultural activity.

The Best Management Practices Committee adopted by rule a list of best management practices, at least one of which was used to demonstrate compliance with the agricultural general permit.

A person engaged in a regulated agricultural activity on the effective date of this act (August 21, 1998) was required to comply with the agricultural general permit by December 31, 2001. A person who begins a regulated agricultural activity after December 31, 2000, is required to comply with the general permit within eighteen months of beginning the activity.

Five Percent Plan Measures and Implementation Status

The following measures are included in Chapter Six of the MAG 2007 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area. The implementation status of each measure in calendar year 2008 is shown in italics after the measure.[5]

Measure 41, Forward to the Governor's Agricultural Best Management Practices Committee that cessation of tilling be required on high wind days and that agricultural best management practices be required in existing Area A – *Agricultural Best Management Practices required in Area A by S.B. 1552; on September 25, 2007, the Governor's Agricultural Best Management Practices (BMP) Committee revised its rule to double the number of BMPs that farmers must*

[5] MAG, 2008 Implementation Status of Committed Measures in the MAG 2007 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area, January 2010.

implement, added 5 BMP choices (including cessation of tilling on High Pollution Advisory Days) and expanded the land area in which BMPs must be applied.

Measure 50, Require two agricultural best management practices, Required by SB 1552 – *The Legislature adopted a requirement that expanded the regulated area for Agricultural BMPs to include the portion of Area A in Maricopa County and increased the number of required Ag BMPs from one to two for each category by December 31, 2007.*

Construction

Table 5-1 indicates that construction activity was negligible (roughly two percent of the acreage) along the March 14th back trajectory and Table 5-2 indicates that construction sources marginally contributed to the exceedance at the West 43rd Ave. monitor on March 14th. Nevertheless, there were 14 measures in place to control construction activities on March 14, 2008: 3 from the Serious Area Plan and 11 from the Five Percent Plan, as described below. For the Five Percent Plan, the implementation status of the measures on March 14, 2008, is also described. Detailed descriptions of these measures are contained in Chapter Seven of the Serious Area Plan and Chapter Six of the Five Percent Plan.

Serious Area Plan Measures

Measure 30, Encourage the Use of Temporary Electrical Power Lines Rather than Portable Generators at Construction Sites – Seventeen cities and towns and Maricopa County committed to implement this measure.

Measure 39, Strengthening and Better Enforcement of Fugitive Dust Control Rules – Maricopa County indicates that this measure involves achieving improved compliance with existing air pollution rules through the provision of additional inspection and enforcement personnel. In addition, it involves evaluating the effectiveness of rules and improving clarity.

January to February 2001	Draft rule revisions, if necessary.
March to May 2001	Workshop draft rule, if rule revisions are necessary.
June to September 2001	Board consideration of rule revision, if necessary.

The Maricopa County schedules for implementation of increases in inspection frequency and Rule 310 revisions are shown below.

Inspection Frequency Part II--Sources Requiring Permits:

June 1997	Scheduled weekend inspections randomly at least once a month.
July 1999	Proactively inspect sites larger than 10 acres 3 to 6 times per year. Proactively inspect sites less than 10 acres once within 30 days of project start date listed on the permit application form.

January 2000	Develop inspection priorities for permitted sources.
March 2000	Revise Standard Operating Procedure and checklists for fugitive dust inspections to be consistent with revised rules.
March 2000	Provide a shortened complaint response time with a goal of 8 hours for high priority complaints. Maintain the current goal of 24 hours for all others.
September 2000	Conduct mid-year review of program to evaluate its progress and future needs.
September to January 2001	Draft Fugitive Dust Operating Plan to track progress and identify future needs.
March 2001	Review program to evaluate its effectiveness and potential future needs.

Evaluate and Revise Rule 310:

December 1999 to February 2000	Revise earth moving application forms and dust control plans to be consistent with the revised rule and to improve program effectiveness.
December 1999 to July 2001	Research and develop a standard(s) and test method(s) for earth moving sources, considering field research sponsored by EPA, designed to be enforceable and meet BACM requirements as to stringency and the number of sources that it applies to. If research reveals problems with the existing opacity standard's enforceability, feasibility or stringency for some or all earthmoving operations, revise rule by June-September 2001 to modify the existing opacity test method to address the problems as warranted and adopt a new standard(s) and test method(s) to deal with any problems that cannot be addressed by modifying the opacity test method.
January 2000 to July 2001	Research, develop and incorporate additional requirement for dust suppression practices/equipment into dust control plans and/or Rule 310 by June - September 2001.
June 2000 to June 2001	Revise the sample daily recordkeeping logs for new and renewed Rule 310 permits to be consistent with rule revisions and to provide sufficient detail documenting the implementation of dust control measures required by Rule 310 and contained in the dust control plan. Distribute sample log sheets with issued permits and conduct outreach to sources by June 2000.

Measure 47, Dust Control Plans for Construction/Land Clearing and Industrial Sites (Including Active Landfills), With Elements Addressing Trackout Prevention, Site and Material Maintenance, Construction Staging, and High Wind Operating Restrictions. Maricopa County indicates that this measure involves requiring dust control plans for construction, demolition, land clearing, and industrial projects. Dust control plans are an element of Maricopa County's fugitive dust program described in the measure, Strengthening and Better Enforcement of Fugitive Dust Control Rules 97-DC-1. Credit for the fugitive dust program including dust control plans will be taken under Measure 22, Strengthening and Better Enforcement of Fugitive Dust Control Rules.

Five Percent Plan Measures and Implementation Status

The following measures are included in Chapter Six of the MAG 2007 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area. The implementation status of each measure in calendar year 2008 is shown in italics after the measure.

Measure 2, Extensive Dust Control Training Program – *In March 2008, Maricopa County hired 2 dust control compliance and 2 administrative personnel to coordinate and conduct the training program. During 2008, 11,100 individuals completed County-certified dust control training classes.*

Measure 3, Dust managers required at construction Sites of 50 acres or more – *Dust Managers were required by SB 1552. In March 2008, Maricopa County adopted Rules 310 and Rule 316 revisions in regard to dust managers.*

Measure 6, Better tarping requirements in Rule 310 to include enclosure of the bed – *In March 2008, Maricopa County adopted Rule 310 and Rule 310.01 revisions in regard to tarping*.

Measure 8, Conduct nighttime and weekend consistent inspections – *Nighttime and weekend inspections conducted in 2008 included complaint inspections and targeted inspections of specific industries that operate at night and on weekends.*

Measure 9, Increase consistent inspection frequency of permitted sources – *In March 2008, Maricopa County adopted Rule 280 revisions in regard to inspection frequency. In 2008, Maricopa County hired 32 inspectors, 13 administrative and permit technicians, 6 inspector supervisors and 4 administrative supervisors for the Dust Control Compliance Program. Maricopa County issued 4,355 permits for dust control sources (Rule 310) and conducted 12,303 inspections of dust control permitted sources (Rule 310).*

Measure 11, Notify violators more rapidly to promote immediate compliance – *Maricopa County continued the standard practice of dust compliance inspectors who observe potential violations making reasonable efforts to inform a person on-site or call the permit holder so that measure can be taken to prevent, reduce or mitigate dust generation before a violation occurs.*

Measure 13, Develop a program for subcontractors – *Required by SB 1552; In March 2008, Maricopa County adopted Rule 200 and Rule 280 revisions in regard to the subcontractor*

registration program. In 2008, Maricopa County hired 4 permit technicians to administer the subcontractor registration program and registered 4,882 subcontractors.

Measure 16, Require dust coordinators at earthmoving sites of 5-50 acres – *Dust coordinator required by SB 1552; In March 2008, Maricopa County adopted Rule 310 and Rule 316 revisions in regard to dust coordinators.*

Measure 36, Require barriers in addition to Rule 310 stabilization requirements for construction activities where all activity has ceased, except for sites in compliance with storm water permits – *In March 2008, Maricopa County adopted Rule 310 revisions in regard to barriers. Maricopa County revised long-term stabilization control measures to reduce the period of inactivity to 30 days and added the requirement for barriers, if water is chosen as the control option.*

Measure 37, Reduce the tolerance of trackout to 25 feet before immediate cleanup is required for construction sites be placed in Maricopa County Rule 310 – *In March 2008, Maricopa County adopted Rule 310 revisions in regard to the trackout requirements by reducing the toleration of trackout to 25 feet before cleanup is required.*

Measure 38, No visible emission across the property line be placed in Maricopa County Rule 310 and 310.01, and in local ordinances for nonpermitted sources as appropriate – *In March 2008, Maricopa County adopted Rule 310 and Rule 310.01 in regard to visible emissions.*

Open Space, Riverbeds and Vacant Areas

Table 5-1 shows little of the land in the back trajectory for March 14 was passive, restricted open space, which has not been disturbed by human activity. An additional 10 percent of the land is located in the dry riverbeds of the Salt River and the Gila River, while another 14 percent is vacant land. Together, these land uses represent nearly 26 percent of the area of the March 14 back trajectory. The measures that were in place on March 14, 2008, to control emissions from these sources are legally binding commitments in the Serious Area and Five Percent Plans. These 12 measures are described below. For the Five Percent Plan, the implementation status of the measures on March 14, 2008, is also provided.

Serious Area Plan Measures

Measure 39, Strengthening and Better Enforcement of Fugitive Dust Control Rules – Maricopa County indicates that this measure involves achieving improved compliance with existing air pollution rules through the provision of additional inspection and enforcement personnel. In addition, it involves evaluating the effectiveness of rules and improving clarity. Maricopa County's schedule for increasing the frequency of inspections for nonpermitted sources is shown below.

Increase Inspection Frequency Part I--Sources Not Requiring a Permit:

June 1999	Board adopted Rule 310.01 that addressed vacant lots, unpaved parking lots and public unpaved roads.
April 2000	Develop inspection priorities for vacant lot and unpaved parking lot inspections considering lot size and number of sources. Larger lots will be inspected first and smaller lots in succeeding years. Department resources will be directed initially to areas that lack municipal programs.
January 2000	Department obtains copies of local government plans developed pursuant to A.R.S. Section 9-500.04 or 49-474.01 to stabilize targeted unpaved roads, alleys and stabilize unpaved shoulders on targeted arterials.
Annually Thereafter	Review reports filed on those plans

Measure 46, Reduce Particulate Emissions from Vacant Disturbed Lots – Eighteen cities and towns, Maricopa County and the Arizona Department of Transportation made commitments to implement this measure.

Measure 48, Dust Abatement and Management Plan for State Lands – The Arizona Legislature passed S.B. 1427 in 1998 which appropriated $200,000 from the State General Fund to the State Land Department for implementing a Dust Abatement and Management Plan to include measures to control particulate pollution on State Trust Lands in Area A. The plan may include measures to close areas to illegal use by off-highway vehicles, closing roads that are unused or illegal, and increasing the enforcement of no trespassing areas (Section 36 of S.B. 1427).

Measure 77, Additional Dust Control Measures – The City of Tempe, in 1997, indicates that earlier this year, construction began on the Rio Salado Development, which will ultimately improve approximately 4.5 miles of the dry Salt River bed and adjacent properties. Included in this project is the construction of a two-mile long lake, which is due to be completed in 1999. The Salt River and the properties adjoining its banks constitute the largest unimproved portion of land remaining within Tempe.

Five Percent Plan Measures and Implementation Status

The following measures are included in Chapter Six of the MAG 2007 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area. The implementation status of each measure in calendar year 2008 is shown in italics after the measure.

Measure 4, Dedicated enforcement coordinator for unpaved roads, unpaved parking, and vacant lots – *In 2008, Maricopa County assigned a supervisor to oversee the vacant lot program.*

Measure 8, Conduct nighttime and weekend consistent inspections – *Nighttime and weekend inspections conducted in 2008 included complaint inspections and targeted inspections of specific industries that operate at night and on weekends.*

Measure 11, Notify violators more rapidly to promote immediate compliance – *Maricopa County continued the standard practice of dust compliance inspectors who observe potential violations making reasonable efforts to inform a person on-site or call the permit holder so that measure can be taken to prevent, reduce or mitigate dust generation before a violation occurs.*

Measure 14, Reduce dragout and trackout emissions from nonpermitted sources – *In March 2008, Maricopa County adopted Rule 310.01 revisions in regard to dragout and trackout. Maricopa County added the requirement to install a trackout control device to sections covering unpaved parking lots and off-site hauling of bulk materials by livestock operations. Also, in Rule 310.01, Maricopa County added the definitions of "trackout/carryout" and "trackout control device."*

Measure 30, Strengthen and increase enforcement of Rule 310.01 for vacant lots – *Maricopa County hired a supervisor to oversee the vacant lot program. In 2008, Maricopa County conducted 5,005 vacant lot inspections.*

Measure 31, Restrict vehicular use and parking on vacant lots – *Ordinance required by SB 1552; In February 2008, Maricopa County adopted the P-27 Vehicle Parking and Use on Unstabilized Vacant Lots Ordinance. In addition, 23 local governments have new or existing ordinances to prohibit vehicle trespass on vacant land.*

Measure 32, Enhanced enforcement of trespass ordinances and codes – *In February 2008, Maricopa County adopted the P-28 Off-Road Vehicle Use in Unincorporated Areas of Maricopa County and P-27 Vehicle Parking and Use on Unstabilized Vacant Lots Ordinance. In addition, 18 local governments report increased enforcement of vehicle trespass ordinances and codes for vacant lots.*

Measure 33, Ability to assess liens on parcels to cover the costs of stabilizing them – *SB 1552 requires rule revisions for stabilization of disturbed surfaces of vacant lots. Maricopa County adopted Rule 310.01 revisions in March 2008 to allow the County to recover stabilization costs through the penalty process.*

Sand and Gravel Operations

Table 5-1 indicates that seven percent of the land area in the back trajectory was devoted to sand and gravel operations. Table 5-2 shows that these operations were responsible for almost 30 percent of the anthropogenic emissions contributing to the exceedance of the PM_{10} standard at the West 43rd Ave. monitor. The measures that controlled these sources on March 14, 2008, were implemented as part of the Serious Area and Five Percent Plans. These nine measures are described below; for the Five Percent Plan measures, the implementation status is also addressed.

Serious Area Plan Measures

Measure 38, PM_{10} Best Available Control Technology (BACT) Determinations for Stationary Sources – Maricopa County indicates that this measure involves an industry-by-industry study of the major point sources that could be made to determine the best types of control technologies that are available to yield emission reductions.

Most stationary sources already have BACT controls. In analyzing the sources, incremental benefits may be obtained from revising Rule 316--Nonmetallic Mineral Mining and Processing. Several provisions need to be clarified to improve its effectiveness. Maricopa County's implementation schedule for this measure is shown below.

May to August 1997	Research and draft revision
September to October 1997	Workshop draft revision
November to December 1997	Consideration by Board of Supervisors

Five Percent Plan Measures and Implementation Status

The following measures are included in Chapter Six of the MAG 2007 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area. The implementation status of each measure in calendar year 2008 is shown in italics after the measure.

Measure 8, Conduct nighttime and weekend consistent inspections – *Nighttime and weekend inspections conducted in 2008 included complaint inspections and targeted inspections of specific industries that operate at night and on weekends.*

Measure 9, Increase consistent inspection frequency of permitted sources – *In March 2008, Maricopa County adopted Rule 280 revisions in regard to inspection frequency. In 2008, Maricopa County hired 5 inspectors and issued 117 permits for nonmetallic mineral processing facilities. Maricopa County also conducted 443 inspections of nonmetallic mineral processing facilities (Rule 316).*

Measure 11, Notify violators more rapidly to promote immediate compliance – *Maricopa County continued the standard practice of dust compliance inspectors who observe potential violations making reasonable efforts to inform a person on-site or call the permit holder so that measure can be taken to prevent, reduce or mitigate dust generation before a violation occurs.*

Measure 17, Fully implement Rule 316 – *The Rule 316 litigation was settled on June 20, 2007. In 2008, Maricopa County is enforcing the provision of Rule 316 for nonmetallic mineral processing sources of PM_{10}.*

Other Sources

Other sources of PM_{10} emissions along the March 14 back trajectory include industrial sources (other than sand and gravel) and fugitive dust from paved and unpaved roads. There are numerous control measures from the Serious Area and Five Percent Plans that have been implemented to control PM_{10} emissions from these sources. Since Table 5-1 indicates these sources represent roughly 13 percent of the land in the back trajectory and Table 5-2 indicates that these sources did not contribute to the exceedance at the West 43rd Ave. monitor on March 14, 2008, the measures that control these sources are not described here. However, a complete list of measures is provided in Appendix E, Table 1 and detailed descriptions of the committed control measures are included in Chapter Seven of the Serious Area Plan and Chapter Six of the Five Percent Plan.

Inspection Records – Agriculture

Agricultural Dust Inquiries / Complaints in 2008

ADEQ Air Quality Compliance staff reviewed their records of agricultural dust inquires / complaints received in 2008. According to their records, no dust inquires / complaints were received for the high wind PM_{10} exceedance day of March 14, 2008, in Maricopa County.

Agricultural Best Management Practices in 2008

In June 2010, ADEQ Air Quality Compliance staff conducted a telephone survey of farmers in the agricultural area bounded by the West 43rd Ave. PM_{10} monitor on the east and the Buckeye PM_{10} monitor on the west. This agricultural area is the largest agricultural area upwind of the West 43rd Ave. PM_{10} monitor.

Fourteen farmers responded to ADEQ's telephone survey of the Agricultural Best Management Practices (BMPs) that had been implemented on their farms in 2008. According to ADEQ Air Quality Compliance staff, these farmers have the bulk of the field operations in the agricultural area bounded by the West 43rd Ave. PM_{10} monitor on the east and the Buckeye PM_{10} monitor on the west.

Table 5-3 summarizes the results of the telephone survey of the Agricultural BMPs that were in place in 2008 for the agricultural area bounded on the east by the West 43rd Ave. PM_{10} monitor and the Buckeye PM_{10} monitor on the west. This table lists the percentage of farmers that implemented the Agricultural BMPs contained in the "Guide to Agricultural Best Management Practices, Governor's Agricultural Best Management Practices Committee," Second Edition, 2008.[6] The BMPs are ranked from largest percentage implemented to smallest percentage implemented for the three categories of Agricultural BMPs – Tilling and Harvest BMPs, Non-Cropland BMPs, and Cropland BMPs. The percentage of farmers that selected more than two Agricultural BMPs for the three categories ranged from 64 percent to 43 percent.

[6] *http://www.azdeq.gov/environ/air/plan/download/webguide.pdf*

Table 5-3. Survey of Agricultural BMPs Implemented in 2008	
Tilling & Harvest BMPs	
• Limited Activity During a High Wind Event	86%
• Multi-Year Crop	64%
• Combining Tractor Operations	57%
• Reduced Tillage System	36%
• Equipment Modification	29%
• Planting Based on Soil Moisture	21%
• Chemical Irrigation	14%
• Precision Farming	14%
• Timing of a Tillage Operation	14%
• Green Chop	7%
• Integrated Pest Management	7%
• Reduced Harvest Activity	7%
• Tillage Based on Soil Moisture	7%
• Cessation of Night Tillage	0%
• Transgenic Crops	0%
• Farmers Selecting More than 2 Tillage & Harvest BMPs	64%
Non-Cropland BMPs	
• Reduce Vehicle Speed	86%
• Watering	57%
• Access Restriction	43%
• Manure Application	21%
• Aggregate Cover	14%
• Track-Out Control System	14%
• Synthetic Particulate Suppressant	7%
• Artificial Wind Barrier	0%
• Critical Area Planting	0%
• Tree, Shrub, or Windbreak Planting	0%
• Farmers Selecting More than 2 Non-Cropland BMPs	43%
Cropland BMPs	
• Multi-Year Crop	64%
• Cross-Wind Ridges	29%
• Manure Application	29%
• Cover Crop	21%
• Mulching	21%
• Residue Management	21%

Table 5-3. Survey of Agricultural BMPs Implemented in 2008	
Cropland BMPs - Continued	
• Sequential Cropping	21%
• Surface Roughening	21%
• Integrated Pest Management	14%
• Planting Based on Soil Moisture	14%
• Artificial Wind Barrier	0%
• Cross-Wind Strip-Cropping	0%
• Cross Wind Vegetative Strips	0%
• Permanent Cover	0%
• Transgenic Crops	0%
• Tree, Shrub, or Windbreak Planting	0%
• Farmers Selecting More than 2 Cropland BMPs	43%

Agricultural Field Operations on March 14, 2008

A crop calendar of usual field activities by month and crop for Maricopa County was developed from the "Usual Planting and Harvesting Dates for U.S. Crops," Agricultural Handbook Number 628, USDA, ARS, NASS, December 1997 and from consultation with Maricopa County Farm Bureau staff and University of Arizona Cooperative Extension staff for farming practices specific to Maricopa County. [7] This crop calendar is contained in Table 5-4. According to Table 5-4, tilling of cotton fields and planting of corn-silage are the only typical field operations that may have occurred on the high wind PM_{10} exceedance day of March 14, 2008. However, planting of corn-silage likely produces few PM_{10} emissions since these fields are irrigated prior to planting.

The crop calendar in Table 5-4 does not list any months for the planting of alfalfa, hay (Bermuda Grass) or orchards because these crops are multi-year crops which maintain an established plant cover for a number of years. According to Maricopa County Farm Bureau staff, the ideal months for planting and establishing a new stand of alfalfa is September through November, and hay (Bermuda Grass) is typically planted in June. Citrus is usually planted either March through April or October through November. [8] ADEQ Air Quality Compliance staff also reviewed their notes for new alfalfa, hay (Bermuda Grass) fields or orchards that may have been established in 2008. According to their notes, one field near the intersection of 27th Ave. and Southern Ave. in Phoenix, Arizona (Latitude: 33.392198, Longitude: -112.116382) was being prepared for alfalfa during March and part of April 2008. This field activity occurred approximately 2 miles southeast of the West 43rd Ave. PM_{10} monitor. Since this agricultural field was not upwind of the West 43rd Ave. PM_{10} monitor, the field's emissions from establishment of alfalfa likely had little impact on the West 43rd Ave. PM_{10} monitor.

[7] *http://usda.mannlib.cornell.edu/usda/nass/planting/uph97.pdf*
[8] *http://ag.arizona.edu/hypermail/arid_gardener/4062.html*

Crop distribution data in GIS format for 2008 were provided by the Arizona Cotton Research and Protection Council with assistance from the Arizona Cotton Growers Association. The 2008 crop distribution data were overlain on the March 14, 2008, back trajectory developed by Sierra Research (see Figures 5-4 through 5-8). The solid red line on these maps is the March 14, 2008, back trajectory and the dashed red lines are the boundaries of the 1-mile wide buffer area (1-mile on each side of the back trajectory) around the back trajectory.

Table 5-4. Crop Calendar for Maricopa County, Usual Field Activity by Month and Crop

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa[1]												
Corn - Silage[1]												
Cotton[1]												
Grain[2]												
Hay (Bermuda Grass)[3]												
Orchard												
Sorghum - Grain[3]												
Sorghum - Silage[3]												
Days of Interest			3/14/08	4/30/08	5/21/08	6/4/08						

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

Notes

1. "Revised PM10 State Implementation Plan for the Salt River Area, Technical Support Document", ADEQ, June 2005. http://www.azdeq.gov/environ/air/plan/download/tsdrevised.pdf. (See crop calendar in Appendix F which is based on 2003 meetings with Maricopa County Farm Bureau and University of Arizona Cooperative Extension.)
2. "Usual Planting and Harvesting Dates for U.S. Crops", Agricultural Handbook Number 628, USDA, ARS, NASS, December 1997. http://usda.mannlib.cornell.edu/usda/nass/planting/uph97.pdf.
3. Communication with Maricopa County Farm Bureau, May 11, 2010 and July 16, 2010. In 2008, a majority of the sorghum was sorghum was grown for grain instead of silage. Common practice is to plant sorghum in July in the same field that field that corn had been harvested from in July, with minimum tillage in the transition between corn and sorghum. Hay (Bermuda Grass) is a multi-year crop.
4. Cotton fields must be plowed down by February 15th and cannot be irrigated until March 15th as required by the Pink Bollworm Program. Most cotton farmers now plant into fields with moisture (May 17, 2010 communication with Maricopa County Farm Bureau and University of Arizona Cooperative Extension).
5. Planting - fields are either irrigated prior to planting or shortly after planting. Wind erosion during planting months is reduced due to irrigation keeping topsoil moist.
6. Harvesting crop as silage (haylage) produces minimal emissions since crop is harvested green.
7. Typically, there are no agricultural fields being disced or ripped in April in Maricopa County (May 17, 2010 communication with Maricopa County Farm Bureau).

Inspection of the March 14, 2008, back trajectory and crop distribution maps (with a comparison of the crops present on these maps with the crop calendar in Table 5-4) indicate that: (1) The majority of the agricultural land along the March 14, 2008, back trajectory had actively growing/established crops that would produce minimal PM_{10} emissions, (2) Grain fields had little potential for producing PM_{10} emissions in March as no harvesting occurs in that month (approximately 14 percent of the agricultural fields along the back trajectory were grain fields), (3) Fallow fields have the potential for windblown PM_{10} emissions (approximately 2 percent of the agricultural fields along the back trajectory were fallow fields) and (4) Cotton fields, which according to Table 5-4 are tilled in March (accounted for 11 percent of the agricultural fields were along the back trajectory).

ADEQ Air Quality Compliance staff contacted farmers whose cotton fields were along the March 14, 2008 back trajectory buffer area for information on possible tilling operations on that date. ADEQ was unable to establish any pattern of activity for tilling operations for March 14, 2008.

Inspection Records − Other Anthropogenic Sources

The Maricopa County inspection records for March 11-17, 2008, indicate that there were 253 inspections of construction sites (i.e., Rule 310) on March 11-17, 2008, 46 of which resulted in notices of violation. Twenty-three of the Rule 310 inspections were conducted in the area upwind of the West 43rd Ave. monitor. Six of these inspections resulted in the issuance of a notice of violation: one on March 11, four on March 12, and one on March 17.

In addition, Maricopa County conducted fourteen inspections of nonmetallic mineral processing facilities (i.e., Rule 316) on March 11-17, 2008. None of these inspections resulted in the issuance of a notice of violation in the area upwind of the West 43rd Ave. monitor.

Maricopa County records also indicate that there were sixteen vacant lot inspections (i.e., Rule 310.01) on March 11-17, 2008, eleven of which resulted in notices of violation. None of these Rule 310.01 violations occurred in the area upwind of the West 43rd Ave. monitor.

There were a total of 283 inspections of vacant lots, construction sites, and nonmetallic mineral processing facilities conducted by Maricopa County on March 11-17, 2008; 58 of these (20 percent) resulted in notices of violation. Only 6 of these 58 (10 percent) occurred in the area upwind of the West 43rd Ave. monitor.

In summary, the Maricopa County inspection records indicate that there was no unusual anthropogenic dust-generating activity in the area upwind of the West 43rd Ave. monitor during the seven-day period that included March 14, 2008. This provides conclusive evidence that the anthropogenic sources upwind of the West 43rd Ave. monitor were reasonably controlled during the high wind conditions on March 14, 2008.

Summary

According to Table 5-2, the anthropogenic sources contributing to the exceedance of the PM_{10} standard at the West 43rd Ave. monitor on March 14, 2008, were vacant areas (43.9% of all anthropogenic sources), riverbeds (22.9%), sand and gravel operations (28.8%), construction (3.4%) and passive restricted space (1.0%). The previous discussion demonstrates that there were fourteen unique and legally binding measures in place to control these sources on March 14, 2008. The large number of measures implemented and the strengthened enforcement of Rules 316 and 310.01 by Maricopa County in March 2008 confirm that the sources upwind of the West 43rd Ave. monitor were reasonably controlled during the high winds on March 14, 2008.

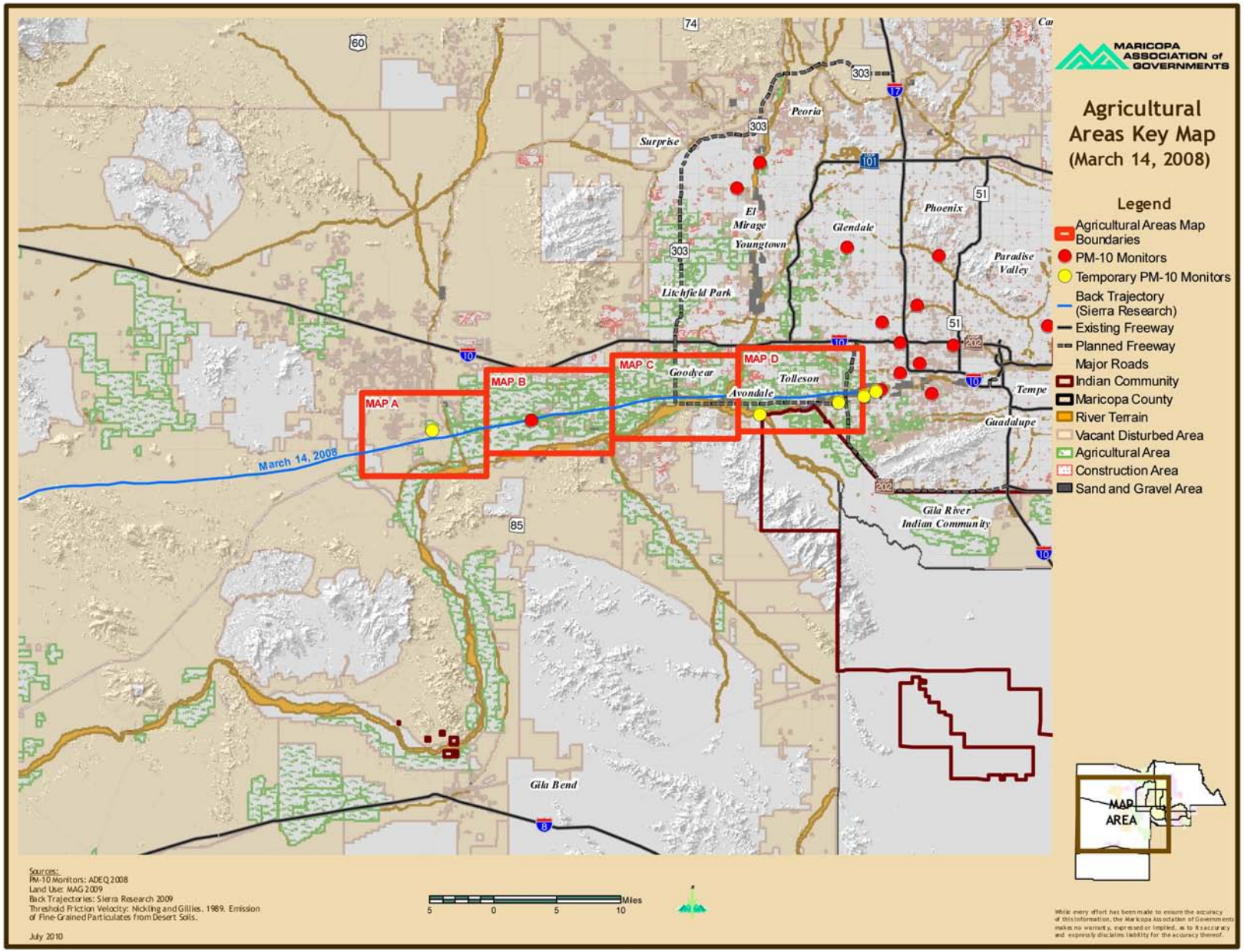


Figure 5-4. Agricultural Areas Key Map for March 14, 2008 Back Trajectory

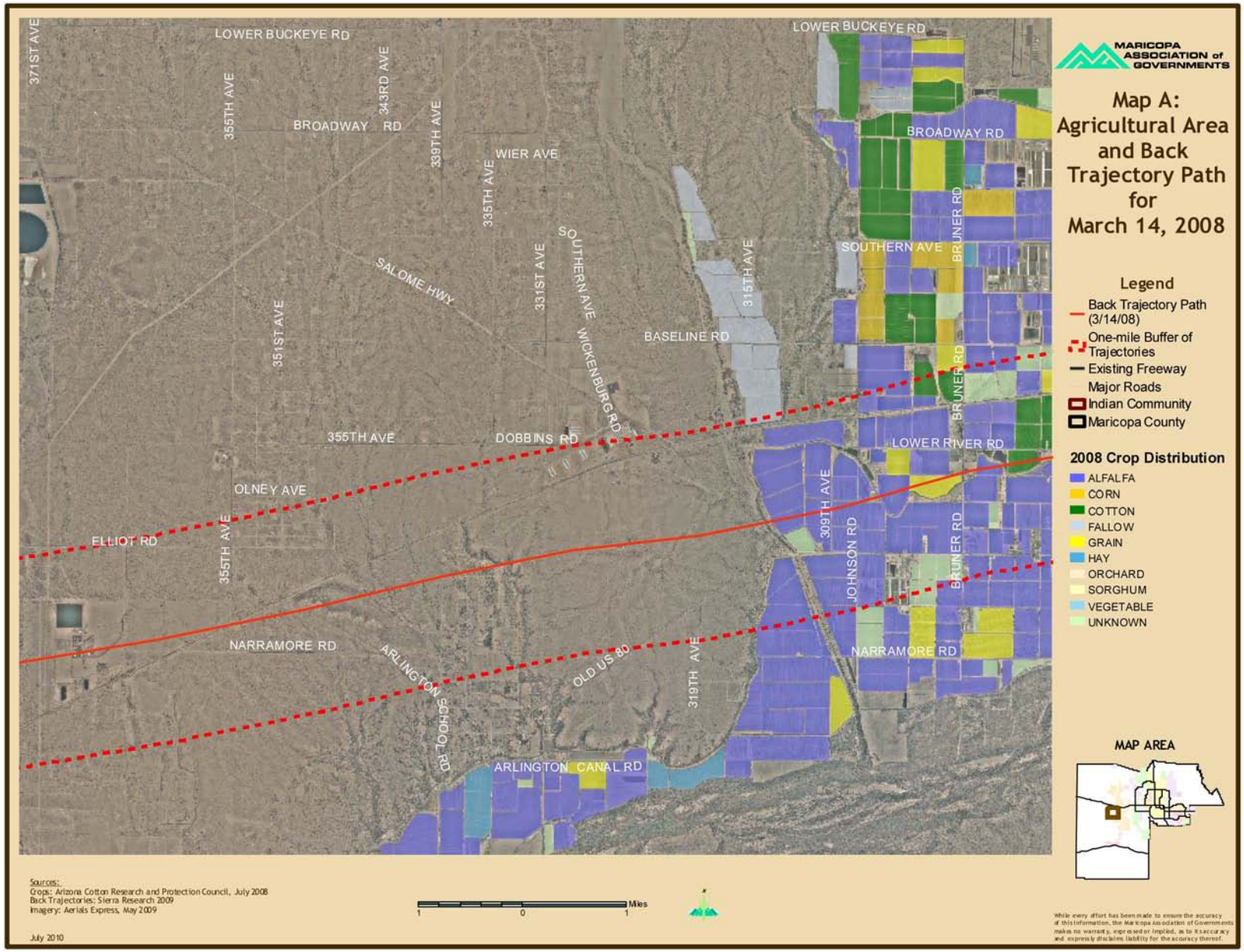


Figure 5-5. Agricultural Area A Map for March 14, 2008 Back Trajectory

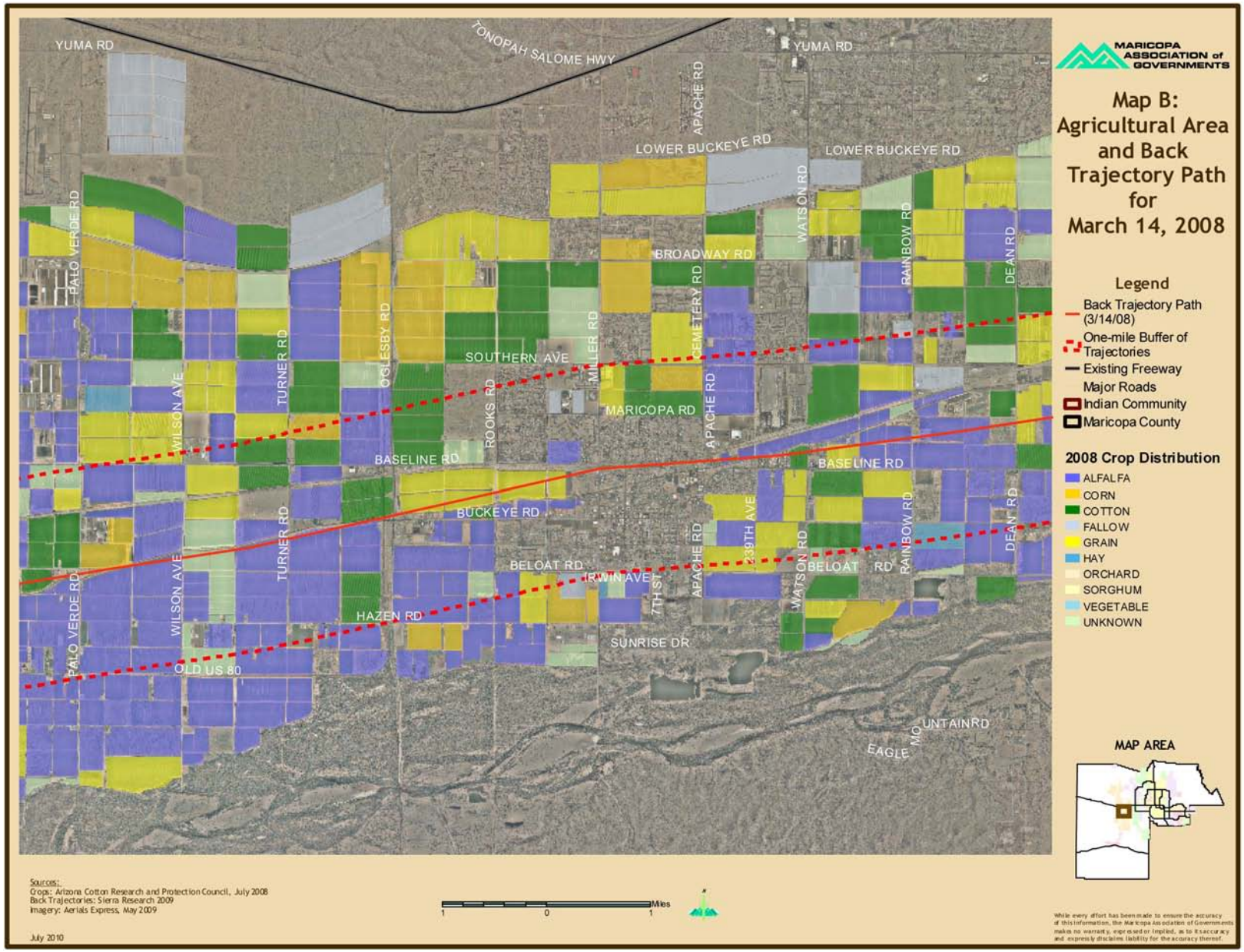


Figure 5-6. Agricultural Area B Map for March 14, 2008 Back Trajectory

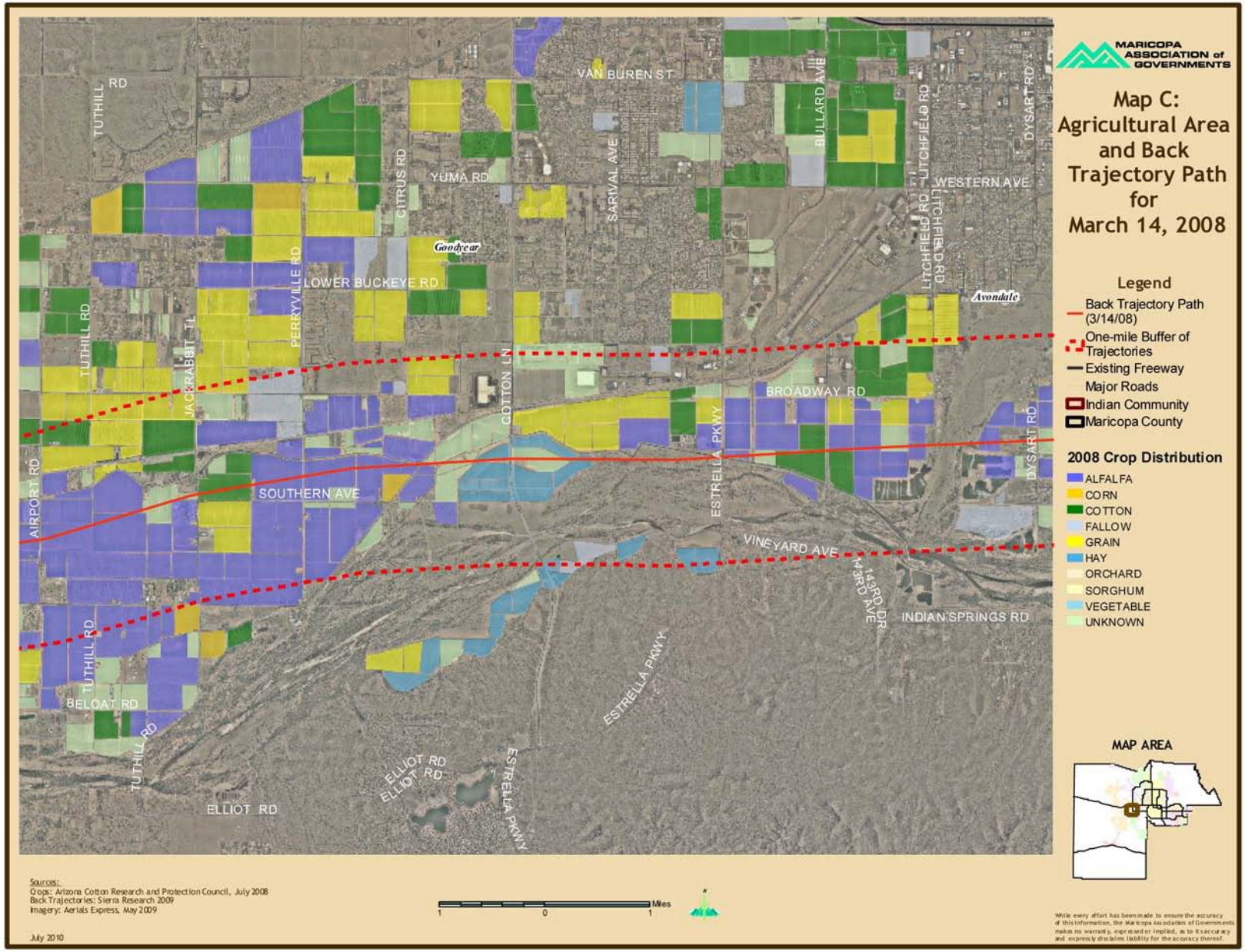


Figure 5-7. Agricultural Area C Map for March 14, 2008 Back Trajectory

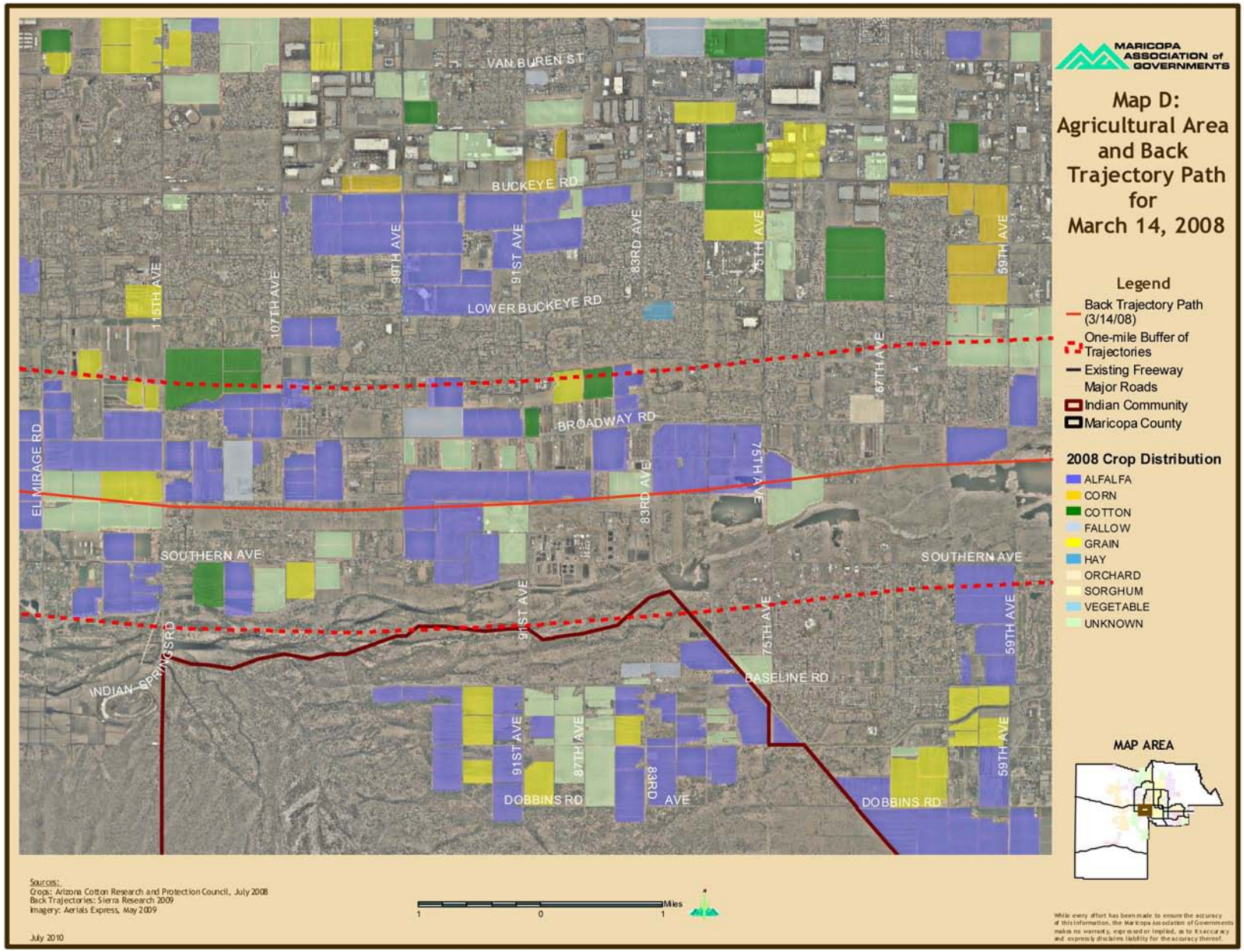


Figure 5-8. Agricultural Area D Map for March 14, 2008 Back Trajectory

5.3 Was a Natural Event

The Federal Register Notice[9] promulgating the final rule for exceptional events included the following guidance for preparing this demonstration:

> *The EPA is retaining the term ''high wind'' event because it accurately connotes the type of natural event that should be excluded under this rule, as well as the action which caused the exceedance or violation of the standard. The term also serves as an indicator concerning the level of wind which caused the exceedance or violation of the standard and indicates that it was unusually high for the affected area during the time period that the event occurred. Therefore, States must provide appropriate documentation to substantiate why the level of wind speed associated with the event in question should be considered unusual for the affected area during the time of year that the event occurred. The EPA will evaluate such instances on a case-by-case basis, including factors such as historically typical wind speed levels for the season of the year that the event is claimed.*

The steps required to prepare a demonstration that March 14, 2008, was a "high wind" event included assembly of the historical wind measurements at the West 43rd Ave. monitoring site and analysis of historic distribution of winds during individual hours. Since multiple measurements of winds are available, an analysis of the historic distributions was prepared for both average hourly wind speeds and hourly wind gusts.

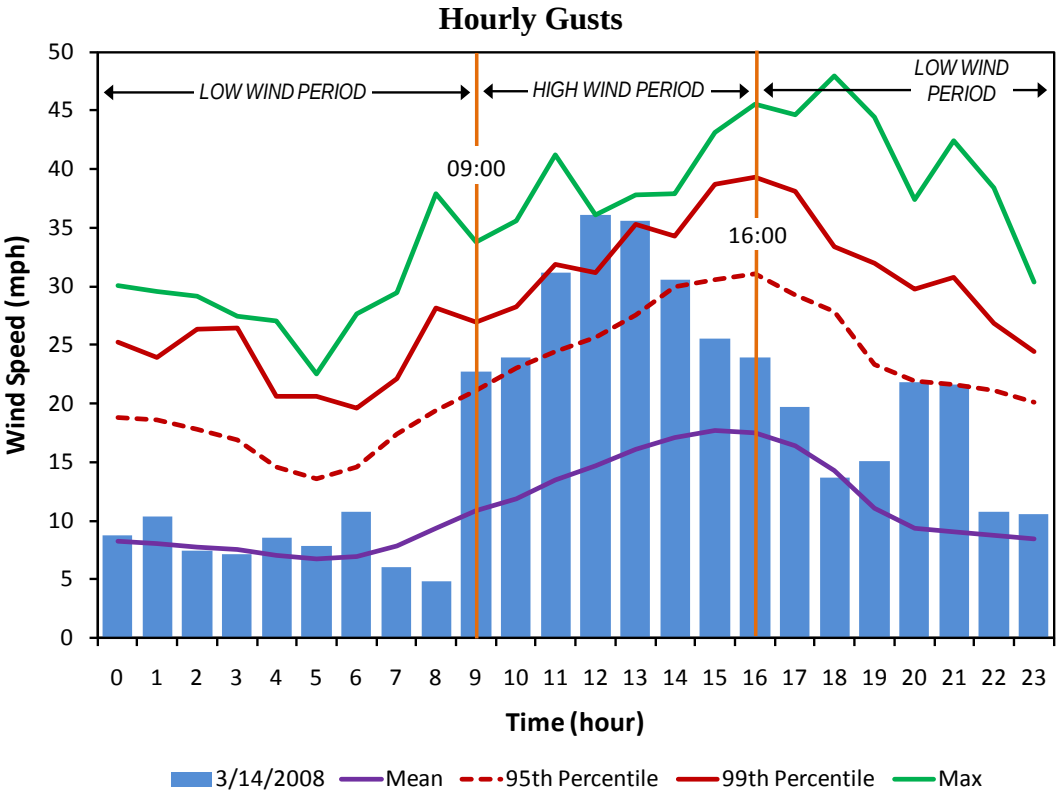
<u>West 43rd Ave. Monitor</u>

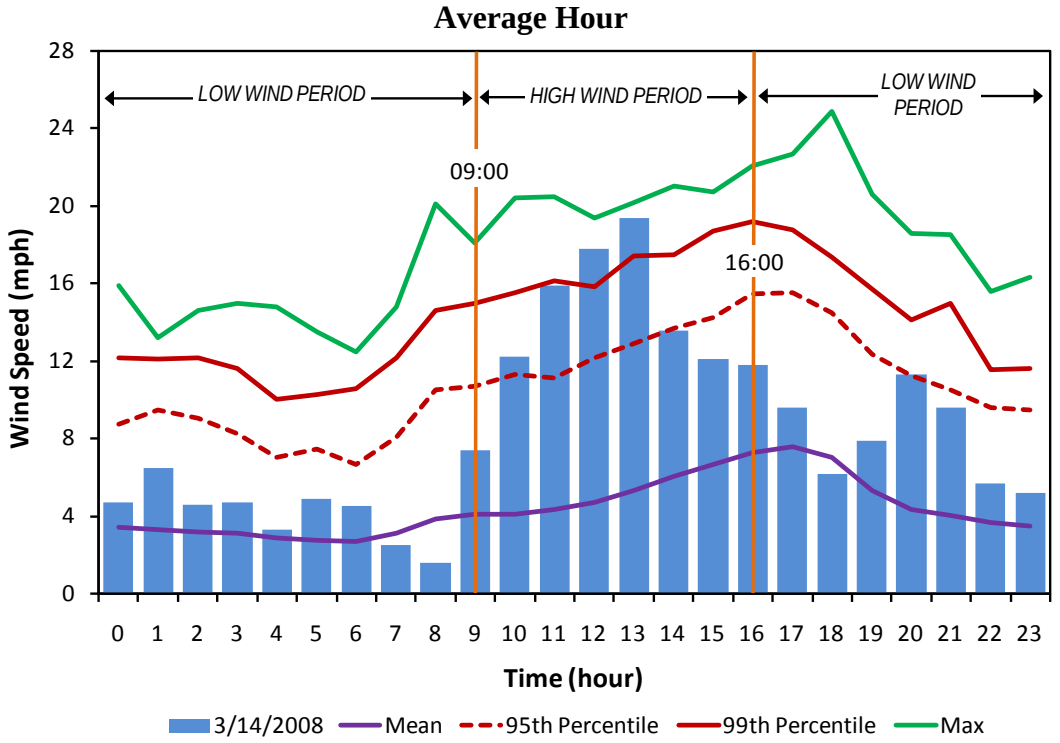
The analysis of hourly wind distributions contrasted event specific values with average values, 95th and 99th percentile values recorded during the spring season for the period 2005 – 2008. A summary of the results is presented in Figure 5-9. It is clear using either metric (gusts or averages) that many of the high wind hours had wind speeds in excess of the 95th and even 99th percentile, thus demonstrating that unusual wind speeds occurred on March 14, 2008.

Further evidence of the unusual wind speeds came from a historical examination of average wind speeds during high wind hours. A description of the process used to select high wind hours is presented in Section 5.2. A threshold of 13 mph was selected as the threshold speed at which winds could initiate the entrainment of PM_{10} impacting monitors in the Salt River area (see Appendix H). Each hour containing one or more 5-minute periods with an average wind speed of 13 mph or higher was designated as a high wind hour. The 13 mph threshold divided the day into two low wind periods from midnight to 9:00 a.m. and from 4:00 p.m. to the end of the day, and a high wind period from 9:00 a.m. to 4:00 p.m. A summary of the diurnal profile of 5-minute average wind speeds and the different periods of the day is presented in Figure 5-1 of Section 5.2.

[9] Federal Register/ Vol. 72, No. 55, Thursday, March 22, 2007 / Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule

Figure 5-9. Relationship of Wind Speeds on March 14, 2008, to Historical Values Recorded During the Spring Months at West 43rd Ave. Monitor





A summary of the relative severity of wind speeds during the high wind hours on March 14, 2008, in comparison to the history of hourly average and hourly gusts for the spring season is presented in Figures 5-10 and 5-11. They show that for the period between 2005 – 2009, the wind speeds recorded during the high wind hours exceeded the 98th percentile using both measurements. This information clearly demonstrates that wind speed levels on March 14, 2008, recorded at the West 43rd Ave. monitor were unusual from a historical perspective.

Figure 5-10. Distribution of Average Wind Gusts During High Wind Hours (9:00 a.m. – 4:00 p.m.) at West 43rd Monitor, Spring Season Only (2005 – 2009)

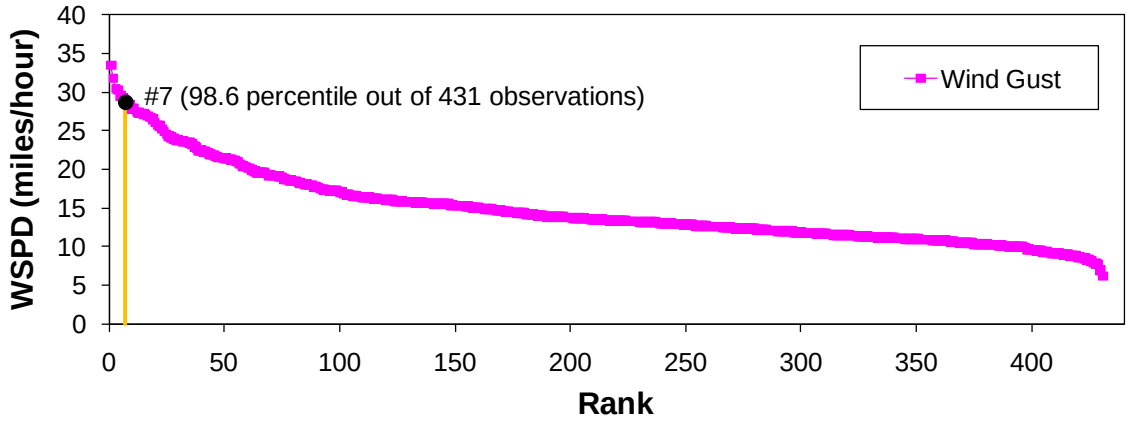
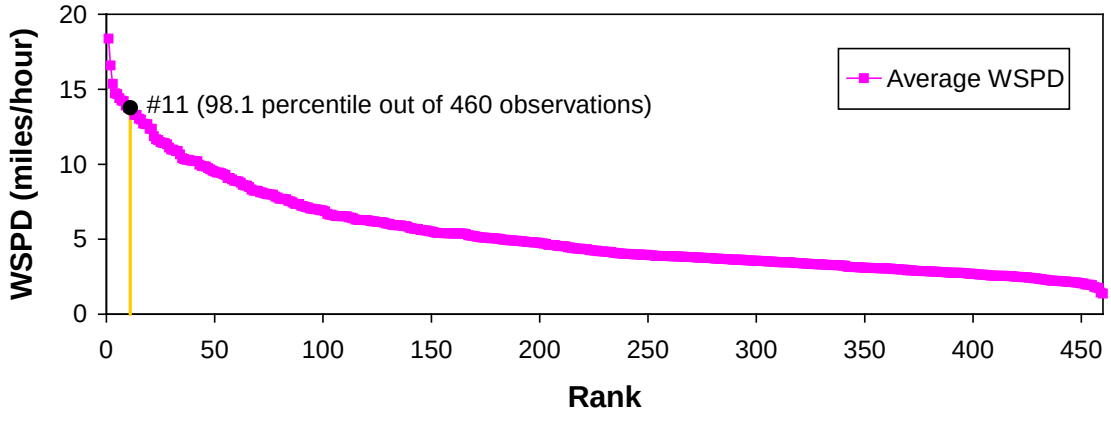


Figure 5-11. Distribution of Average Wind Speed During High Wind Hours (9:00 a.m. – 4:00 p.m.) at West 43rd Monitor, Spring Season Only (2005 – 2009)



5.4 Reasonable Measures

Section 2.2 described the air pollution control programs in place in the Phoenix area to control anthropogenic sources of PM_{10}. Section 5.2 described the increased enforcement and inspection programs that were implemented in the days surrounding the event. These showed that BACM were in place during the event.

ADEQ issued Dust Control Action Forecasts for the Phoenix area and an Air Quality Forecast in Maricopa County as discussed in Section 1.1. All available measures were taken to advise the public that a potential existed for elevated PM_{10} levels from windblown dust. The forecasts/advisories satisfy the requirement in 40 CFR 51.930(a)(1). Copies of these advisories have been included in Appendix I.

Section 6: Event Contribution Analysis

The Federal Register Notice[10] promulgating the final rule for exceptional events included the following guidance for preparing this demonstration:

> *The EPA will maintain the proposed ''but-for'' requirement that air quality data may not be excluded except where States, Tribes, or local agencies show that exceedances or violations of applicable standards would not have occurred ''but for'' the influence of exceptional events. Through analyses, it is possible to demonstrate that an exceedance or violation would not have occurred but for the event… This analysis does not require a precise estimate of the estimated air quality impact from the event. The weight of evidence demonstration can present a range of possible concentrations which is not as technically demanding as justifying a specific adjustment to a measured value.*

The steps required to prepare a demonstration that "but-for" the influence of the exceptional events exceedances or violations of the applicable standards would not have occurred, include assembly of historical wind and concentration measurements, selection of high wind hours, substitution of historical values for high wind hours, recalculation of daily average concentrations using actual low wind values and substituted high wind values and assessment relative to the ambient standard and historical performance.

6.1 West 43rd Ave. Monitor

The methodology used to select high wind hours on the event day is presented in Section 5.2 and discussed in Appendix H. Using the 13 mph threshold speed at which winds could initiate entrainment of PM_{10} impacting monitors in the Salt River area, March 14, 2008, was divided into two periods: low wind (midnight – 9:00 a.m. and 5:00 p.m. to the end of the day) and high wind (9:00 a.m. through 4:55 p.m.). To address the "but-for" requirement, the concentrations recorded during the low wind hours were kept constant; substitutions of average and 95th percentile concentrations recorded during the period from 2005 – 2008 were prepared. The daily average concentrations were computed with the substituted values to assess the influence of the high wind hours on the event. The results of the analysis are presented in Table 6-1 for the spring season. Table 6-1 shows the use of the spring average hourly concentrations during the high wind hours significantly depressed the 24-hour average concentration relative to the event value. It also shows that use of the 95th percentile average hourly concentration during the high wind hours did not cause the 24-hour concentration to exceed the ambient standard.

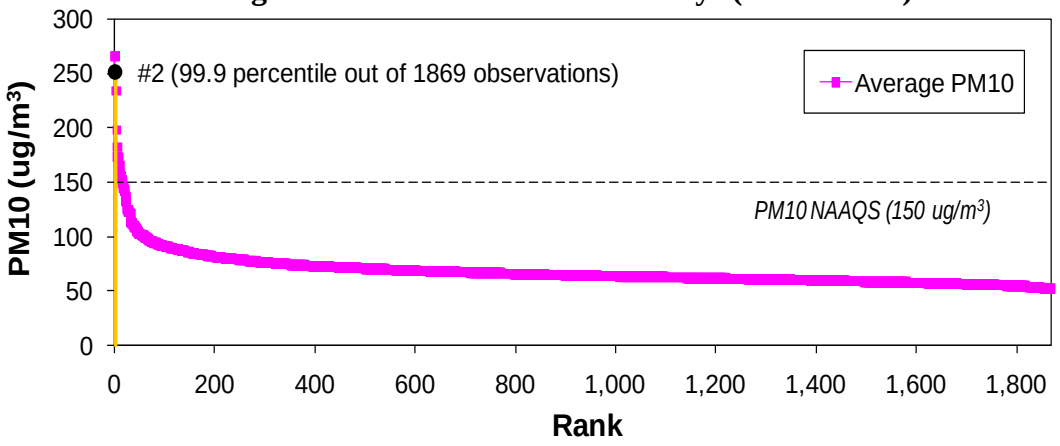
The information presented in Table 6-1 clearly demonstrates that concentrations recorded on March 14, 2008, would not have exceeded the standard "but for" the concentrations recorded during the high wind hours.

[10] Federal Register/ Vol. 72, No. 55, Thursday, March 22, 2007 / Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule

Table 6-1. "But-For" Analysis of West 43rd Ave. Monitor March 14, 2008, PM_{10} Concentrations – Using Spring Values					
Hour	**Average Wind Speed (mph)**	**Max Wind Speed (mph)**	**Event PM_{10} ($\mu g/m^3$)**	**Mean PM_{10} ($\mu g/m^3$)**	**95th Percentile PM_{10} ($\mu g/m^3$)**
Low Wind Hours *(no substitutions performed for mean & 95th percentile)*					
0	5	9	26	26	26
1	7	10	29	29	29
2	5	8	22	22	22
3	5	7	28	28	28
4	3	9	65	65	65
5	5	8	155	155	155
6	5	11	146	146	146
7	3	6	134	134	134
8	2	5	188	188	188
High Wind Hours *(with mean & 95th percentile substitutions)*					
9	7	23	329	75	157
10	12	24	355	60	131
11	16	31	1052	60	117
12	18	36	1270	54	145
13	19	36	1286	60	183
14	14	31	374	65	227
15	12	26	87	64	231
16	12	24	57	65	213
Low Wind Hours *(no substitutions performed for mean & 95th percentile)*					
17	10	20	24	24	24
18	6	14	37	37	37
19	8	15	41	41	41
20	11	22	86	86	86
21	10	22	93	93	93
22	6	11	73	73	73
23	5	11	73	73	73
Average Daily Concentration:	N/A	N/A	251	72	109

A further demonstration of the unusual concentrations recorded during the high wind hours was prepared by again holding the concentrations recorded during the low wind hours on the event constant and substituting concentrations recorded during high wind hours from all days with data available in 2003 – 2009. The results are displayed in Figure 6-1 and show that March 14, 2008, ranked 2nd out of the 1,869 calculated days for a 99.9 percentile value. This ranking from measurements collected over a seven year period clearly demonstrates that unusually high concentrations were recorded during the high wind hours on March 14, 2008.

Figure 6-1. Distribution of Composite 24-Hour Average PM_{10} Concentrations at West 43rd Ave. Monitor Using Actual Low Wind Values from 3/14/2008 with High Wind Hour Values for All Days (2003 – 2009)



6.2 Summary

Using local measurements of the threshold velocity at which winds could initiate entrainment of PM_{10} impacting monitors in the Salt River area, the event day was divided into periods with low and high wind hours. Alternative estimates of the daily concentrations were made by substituting spring average and 95th percentile concentrations recorded during the high wind hours in 2005 – 2008. The resulting daily average concentrations were well below the ambient 24-hour PM_{10} standard, thus demonstrating that "but-for" the concentrations recorded during the high wind hours the exceedance would not have occurred at the West 43rd Ave. monitoring site. A similar calculation using data available for days in 2003 – 2008 showed the resulting daily average concentrations on March 14, 2008, exceeded the 99th percentile for West 43rd Ave. monitoring site, providing further evidence of the severity of the concentrations recorded during the high wind hours on that date.

Section 7: Clear Causal Connection

The Federal Register Notice[11] promulgating the final rule for exceptional events included the following guidance for preparing this demonstration

> *Section 319 requires that, in order to have a flagged value excluded from regulatory determinations, a State must make an affirmative demonstration that an event occurred (as shown by reliable and accurate data that are promptly produced) and that there is a clear causal relationship between measured exceedances or violations of a standard and the exceptional event in question to ''demonstrate that the exceptional event caused a specific air pollution concentration''*

The steps required to prepare a demonstration that there is a clear causal relationship between the observed elevated winds and the exceedance at the West 43rd Ave. monitor on March 14, 2008, include assembly of historical wind and concentration measurements and photographic records of the area and analysis of historic distributions of winds and concentrations and photographic records during the course of the event day. Analyses of the historical data were prepared for the spring season using both maximum hourly gusts and hourly average wind speed.

7.1 Historical Analysis

An analysis of hourly concentrations and hourly maximum wind speeds was prepared for spring months in the period 2005 – 2008. Figures 7-1 through 7-4 display the relationships for mean, 5th, 95th, and 99th percentile values. The low and high wind periods from March 14, 2008, are highlighted so the relationship between concentrations and wind speeds for the different periods can be examined. Figure 7-1 displays the relationship for mean values. It shows the hours of highest concentrations typically occurred in early morning hours when winds speeds were lowest. It also shows that elevated late morning and afternoon concentrations were not common. Figure 7-2 displays the hourly PM_{10} concentrations when gusts were at their lowest 5th percentile. The highest PM_{10} concentrations occurred during morning hours when wind gusts were lowest. A different picture emerges with the display of concentrations associated with the 95th percentile wind gusts presented in Figure 7-3. It shows that when wind gusts were near their highest levels, the early morning concentrations were the lowest and the later morning and afternoon concentrations were highest. When contrasted with the mean values presented in Figure 7-1, it becomes clear that elevated later morning and afternoon concentrations were not a common occurrence unless high winds were present. A more dramatic illustration of this relationship is presented in Figure 7-4. It displays PM_{10} concentrations when winds gusts were at the 99th percentile and shows the highest concentrations continued to occur in the later morning and afternoon hours when wind gusts were at their highest levels. Since several high wind hours on March 14, 2008, exceeded the 95th percentile and 99th percentile wind gust values, as shown in Figure 5-8, the relationships displayed in Figures 7-3 and 7-4 are particularly relevant.

Figures 7-5 through 7-8 present a series of hourly concentration and average wind comparisons; a relationship similar to that observed between wind gusts and PM_{10} concentrations appears. Overall the information presented in these figures demonstrated a clear causal relationship between elevated PM_{10} concentrations and elevated winds.

[11] Federal Register/ Vol. 72, No. 55, Thursday, March 22, 2007 / Rules and Regulations, Environmental Protection Agency, 40 CFR Parts 50 and 51, Treatment of Data Influenced by Exceptional Events, Final Rule

Figure 7-1. Comparison of Hourly Mean PM_{10} Concentrations & Mean Wind Gusts Spring Months at West 43rd Ave. Monitor

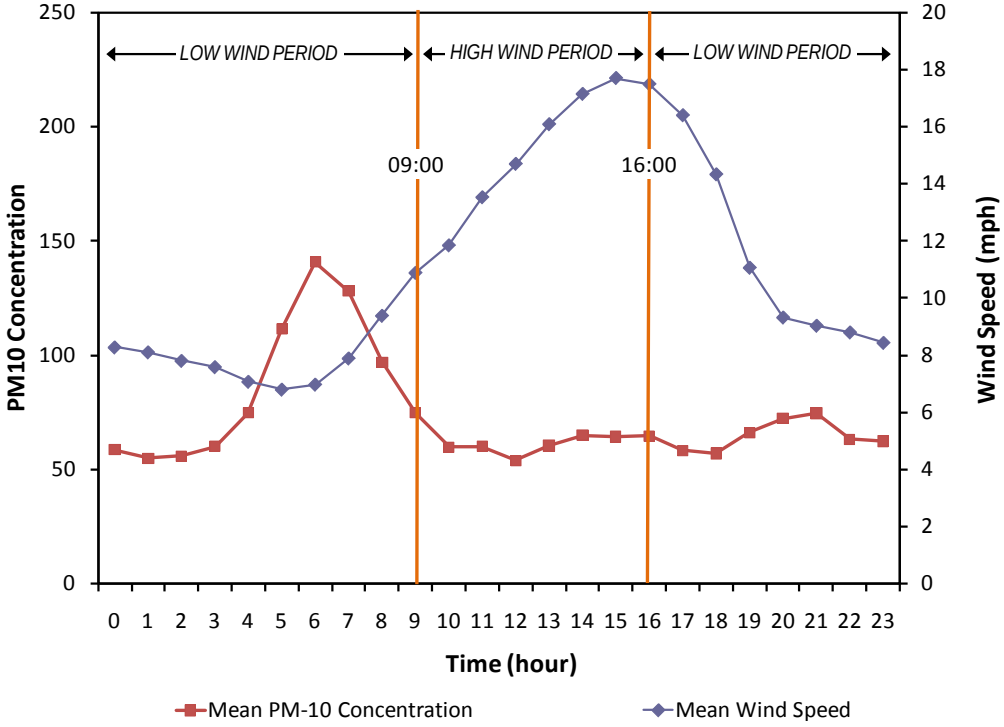


Figure 7-2. Hourly PM_{10} Concentrations at 5th Percentile Wind Gusts Spring Months at West 43rd Ave. Monitor

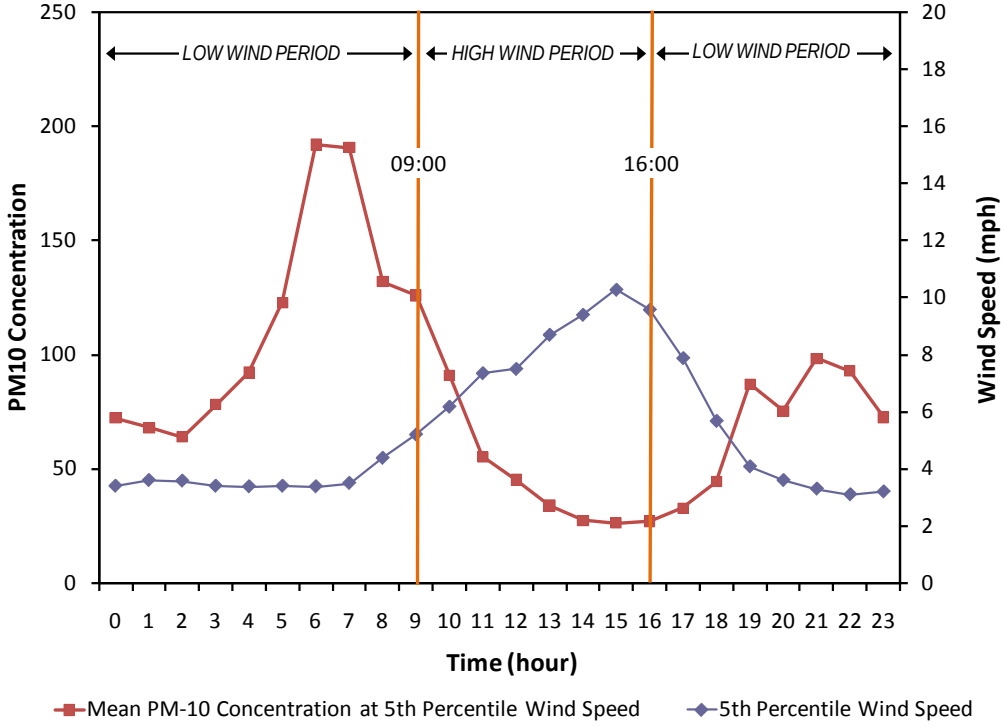


Figure 7-3. Hourly PM_{10} Concentrations at 95th Percentile Wind Gusts Spring Months at West 43rd Ave. Monitor

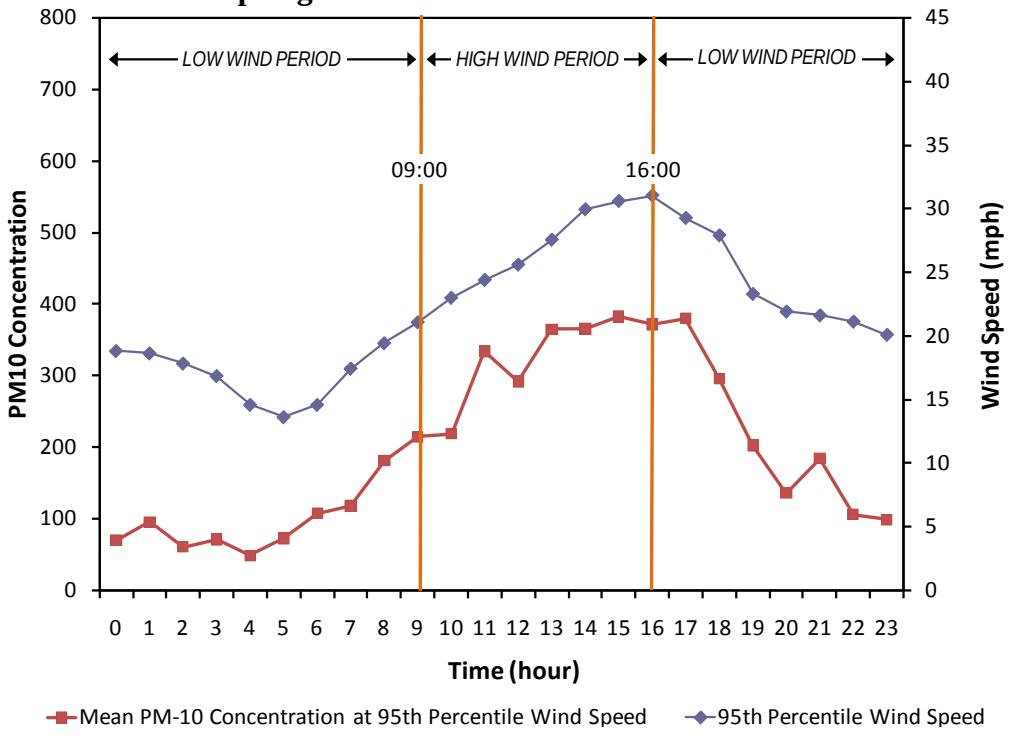


Figure 7-4. Hourly PM_{10} Concentrations at 99th Percentile Wind Gusts Spring Months at West 43rd Ave. Monitor

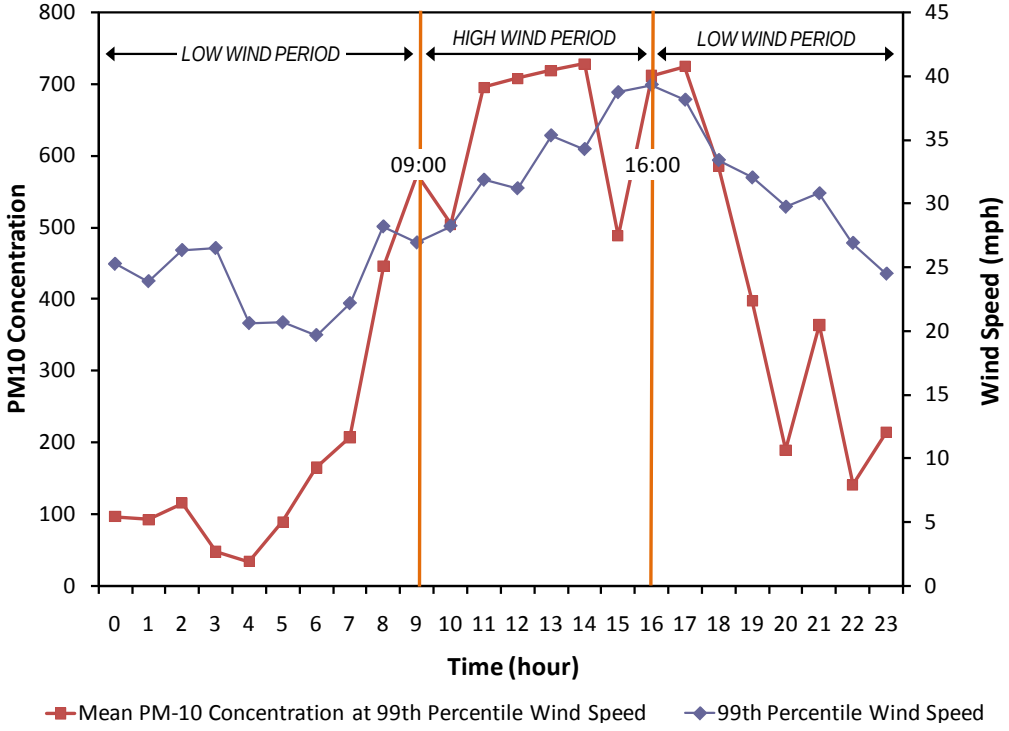


Figure 7-5. Comparison of Hourly Mean PM_{10} Concentrations & Mean Wind Speeds Spring Months at West 43rd Ave. Monitor

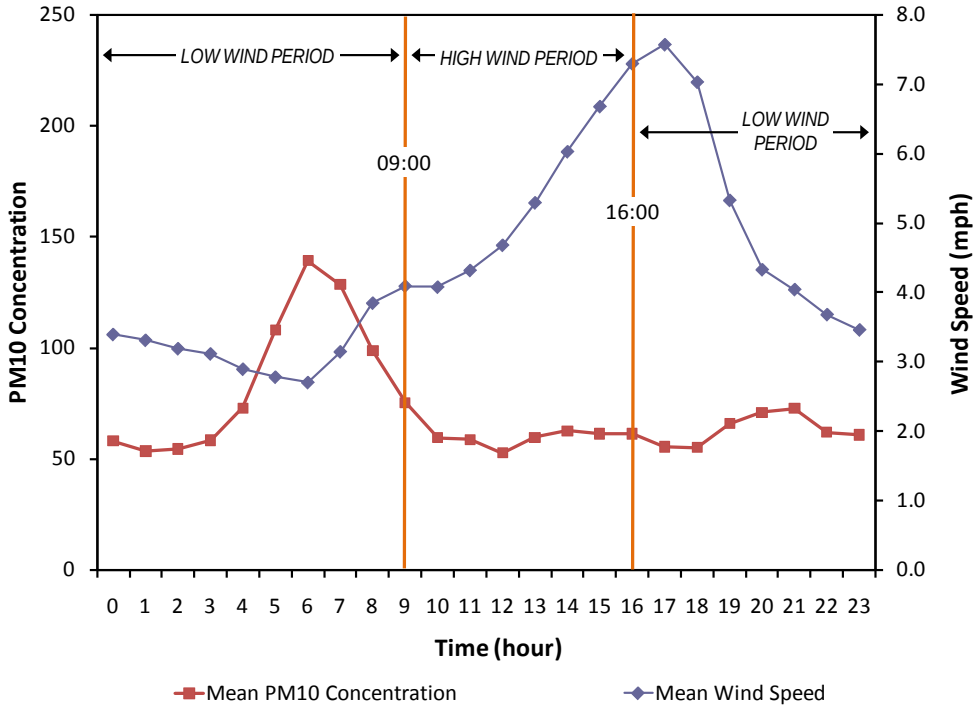


Figure 7-6. Hourly PM_{10} Concentrations at 5th Percentile Mean Wind Speeds Spring Months at West 43rd Ave. Monitor

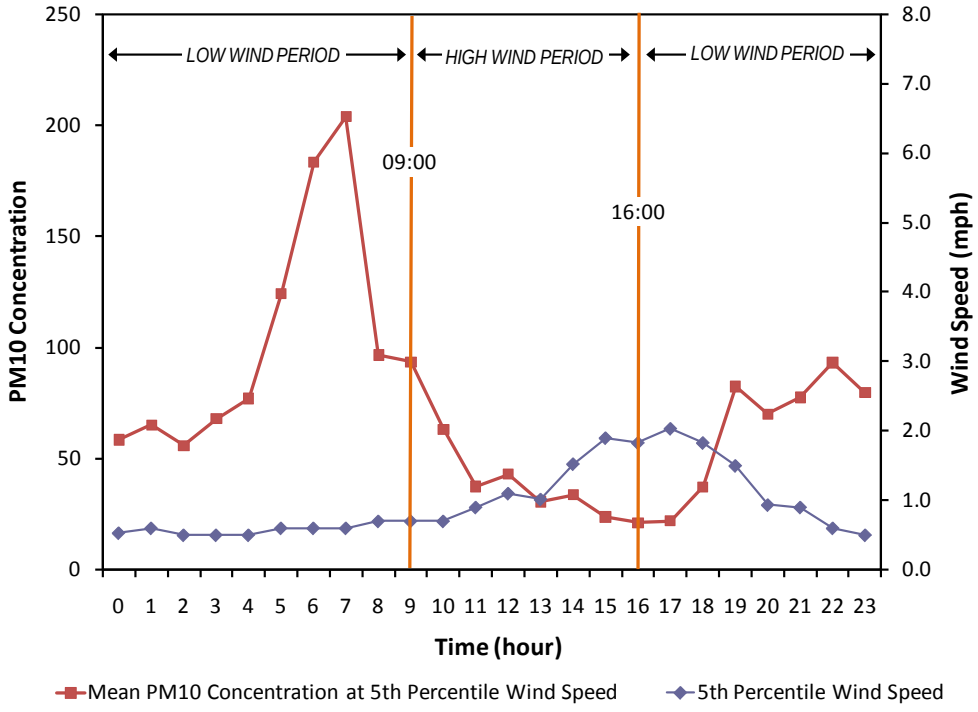


Figure 7-7. Hourly PM_{10} Concentrations at 95th Percentile Mean Wind Speeds Spring Months at West 43rd Ave. Monitor

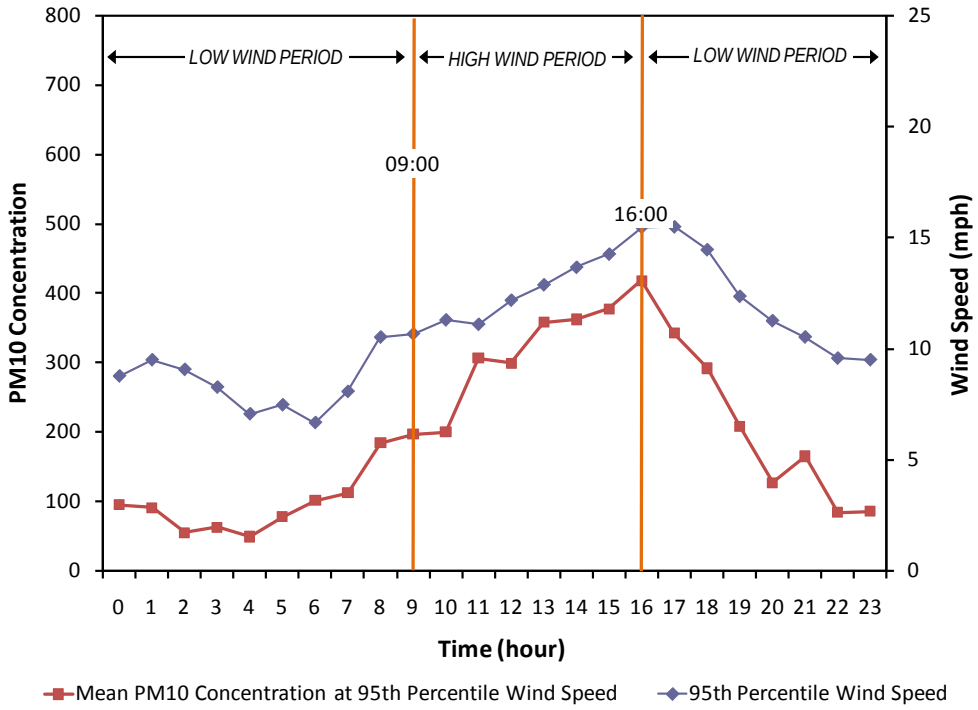
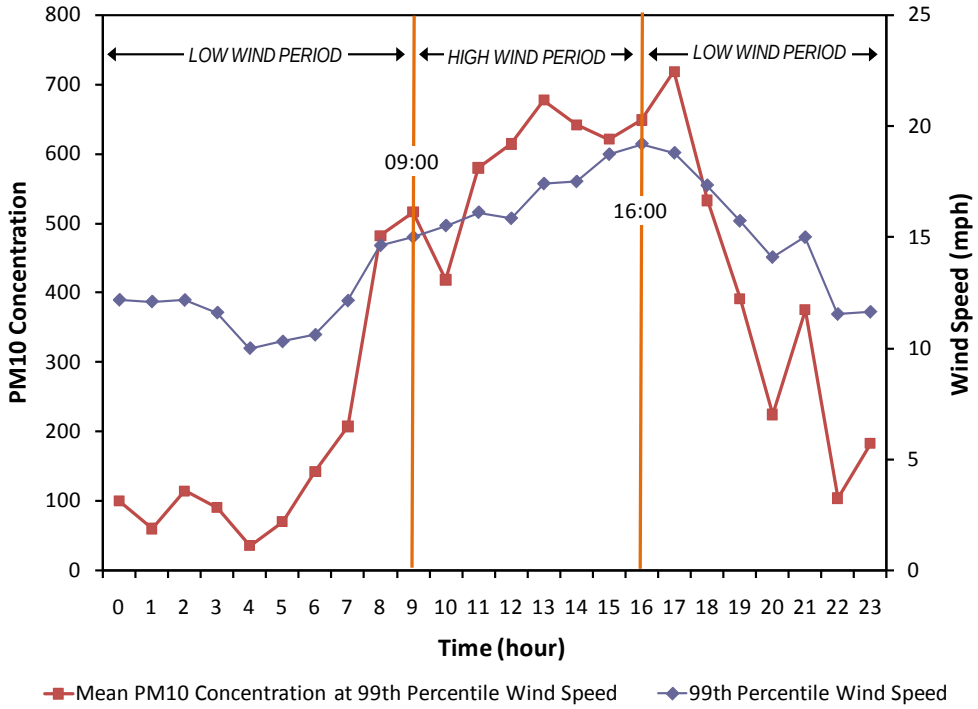


Figure 7-8. Hourly PM_{10} Concentrations at 99th Percentile Mean Wind Speeds Spring Months at West 43rd Ave. Monitor



An examination of the hourly distribution of PM_{10} concentrations recorded on March 14, 2008, relative to the historical values recorded at the West 43rd Ave. monitor is presented in Figure 7-9 for spring months. The hourly values were contrasted with average, 95th, 99th and maximum values recorded for the period 2005 – 2008. The pattern of exceptionally high concentrations, consistent with those of unusually high winds, is evident. Six high wind hours exceeded the 95th percentile spring concentration; three of those hours exceeded the 99th percentile concentration because they had the maximum values recorded during those months. This information is entirely consistent with the clear causal relationship between elevated concentrations and elevated winds presented in Figures 7-1 – 7-8.

7.2 Visibility

Further evidence of the relationship between elevated winds and elevated concentrations is presented in Figure 7-10. It displays time-lapse photographs from the South Mountain Camera (zoomed view) located on North Mountain looking south. A map of the field of view is included in the figure and shows that it covers the area just east of the West 43rd Ave. monitoring site. Also included in the figure is a view of pristine conditions in the frame of South Mountain and Estrella Mountain. The peak in the far ground, visible in the photograph, is in the Estrella range. The south end of the Estrella range is 26.1 miles from the camera and is not visible on the map. South Mountain is at a range of 17 to 20 miles. The time sequence of photographs starting at 8:00 a.m. before the event shows progressively less visibility as the day progressed, which is entirely consistent with the concentrations displayed in Figure 7-9 and the pattern of elevated afternoon winds displayed in Section 5.3. A more complete presentation of the time-lapse photography is presented in Appendix N.

7.3 Summary

The information presented in this section demonstrated that high afternoon concentrations do not typically occur unless unusually high winds are present. Data presented in Section 5.2 demonstrated that unusually high winds were recorded on the afternoon of March 14, 2008, at the West 43rd Ave. monitoring site relative to the historical record for spring months. Information presented in Figure 7-9 shows that PM_{10} concentrations recorded on the afternoon of March 14, 2008, were unusually high relative to the historical record for spring months. Collectively, this information demonstrated a clear causal relationship between elevated winds and elevated concentrations recorded on the day of the event. Further evidence of this relationship is available from time-lapse photographs of the area adjacent to the monitor documenting diminished visibility as the afternoon progressed and winds and concentrations increased.

Figure 7-9. Relationship of PM_{10} Concentrations on March 14, 2008 to Historical Values Recorded During the Spring Months at West 43rd Ave. Monitor

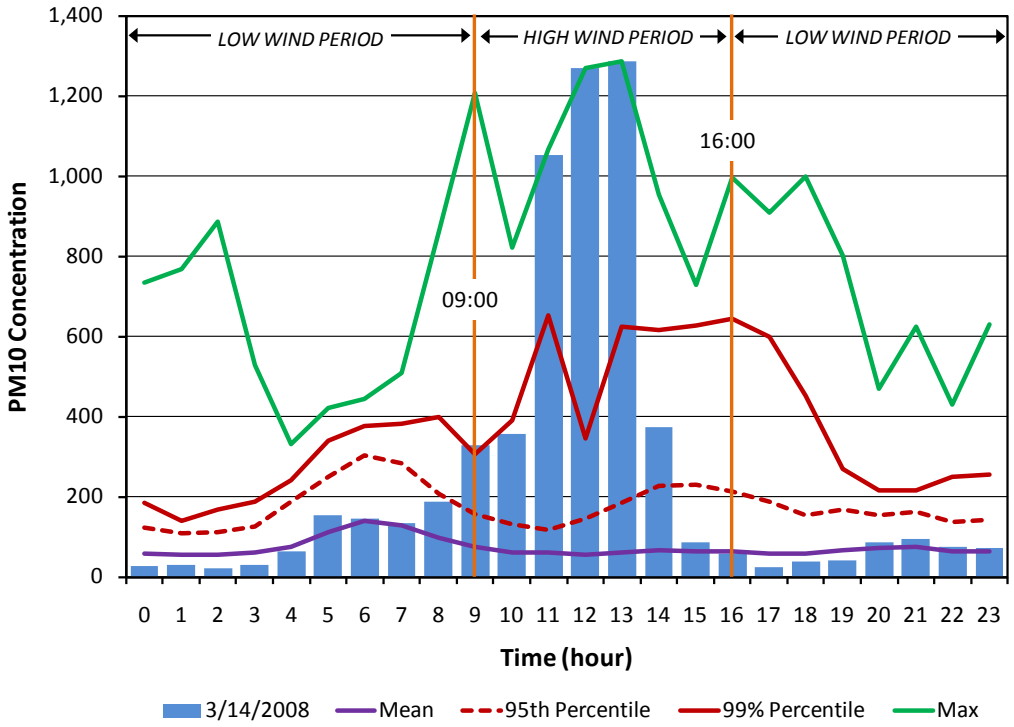
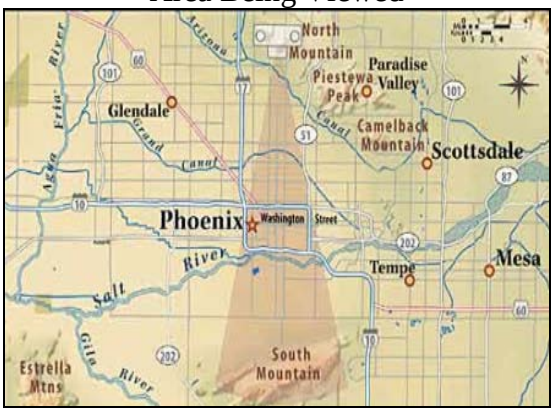


Figure 7-10. Photographs of March 14, 2008 Event Obscuring Visibility of South Mountain as Captured by North Mountain Camera

Pristine Conditions

8:00 a.m.

Area Being Viewed



9:30 a.m.

1:15 p.m.

3:45 p.m.

Section 8: Conclusions

High winds on March 14, 2008, caused significant blowing dust at several locations in California and Arizona and significantly impacted air quality in the Phoenix area.

The following specific conclusions can be drawn from the analysis in this report:

- The 24-hour concentrations at the West 43rd Ave. monitor exceeded "historical fluctuations" during spring months.

- The average concentration during high wind hours at the West 43rd Ave. monitor exceeded "historical fluctuations" during spring months.

- All reasonable controls were in place for anthropogenic sources impacting the West 43rd Ave. monitor during high wind hours.

- The winds were "unusual" at the West 43rd Ave. monitor.

- No exceedance of the ambient PM_{10} standard would have occurred "but-for" the influence of concentrations recorded during the high wind hours.

- There is a "clear causal relationship" between high winds and increased concentrations at the West 43rd Ave. monitor.

The regional high wind event that caused the elevated PM_{10} event on March 14, 2008, in Maricopa County caused the transport of dust and soils from winds that suspended natural soils and soils from areas where all reasonable control measures were in place and should be flagged for air quality planning purposes. The "high wind" (RJ) flag should be applied to the monitor readings.

ADEQ has demonstrated that the air quality readings addressed in this report were influenced by an exceptional event, and requests EPA's concurrence with ADEQ's findings in accordance with the Exceptional Events Rule. This report clearly delineated the requirements of the Rule in Section 1, and the report and Appendices, which supplement the assessment submitted on November 17, 2009, have satisfied those requirements.