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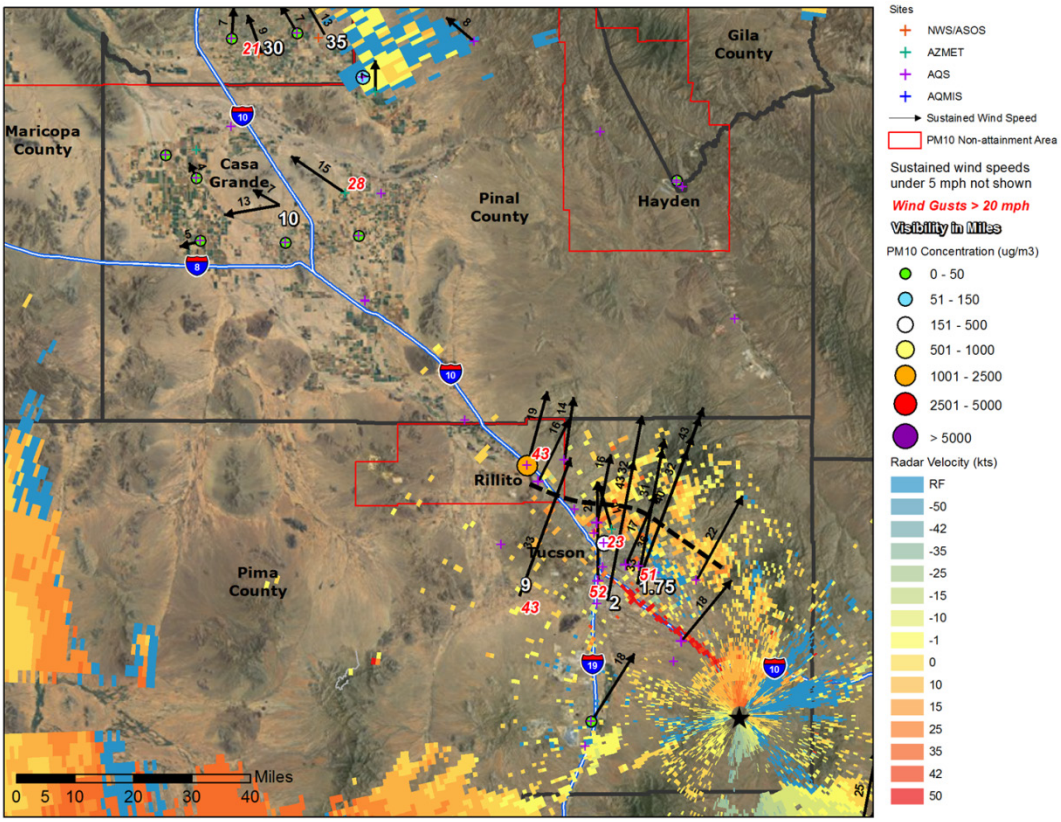
Air Quality Research and Innovative Solutions

State of Arizona Exceptional Event Documentation for the Event of May 9, 2012, for the Rillito PM_{10} Nonattainment Area



Final Report Prepared for

Arizona Department of Environmental Quality
Phoenix, AZ

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State of Arizona Exceptional Event Documentation for the Event of May 9, 2012, for the Rillito PM_{10} Nonattainment Area

Final Report
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Cover graphic illustrates hourly wind speeds, visibilities, PM_{10} concentrations, and radar data in the Rillito, Arizona, area during the May 9, 2012, event. See Section 3 for more information.

Acknowledgments

The authors would like to acknowledge the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency, Region 9, for helpful discussion and feedback during the preparation of this document.

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1. Introduction

On May 9, 2012, the Rillito monitor recorded a 24-hr average PM_{10} concentration of 239 µg/m^3 (particulate matter less than 10 microns in diameter). This value exceeds the National Ambient Air Quality Standard (NAAQS) of 150 µg/m^3 for 24-hr PM_{10}. This report demonstrates that this exceedance was caused by naturally occurring windblown dust, was not reasonably controllable or preventable, was historically unusual, and would not have occurred "but for" the windblown dust and, therefore, the event is an exceptional event as defined by the U.S. Environmental Protection Agency's (EPA) Exceptional Events Rule (EER).

1.1 Report Contents

Section 2 of this assessment contains a conceptual model of the windblown dust event that occurred on May 9, 2012, providing a background narrative of the exceptional event and an overall explanation of how the event affected air quality. Section 2 also provides evidence that the event was a natural event.

Section 3 of this assessment establishes a clear causal connection between the natural event on May 9, 2012, and the exceedance of the 24-hr PM_{10} standard at the monitoring station. The evidence in this section also confirms that the event in question both affected air quality and was the result of natural events.

Section 4 of this assessment contains data summaries and time-series graphs which help illustrate that the event of May 9, 2012, produced PM_{10} concentrations in excess of normal historical fluctuations.

Section 5 of this assessment details the existing dust control measures and demonstrates that despite the presence and enforcement of these controls, the event of May 9, 2012, was not reasonably controllable or preventable.

Section 6 of this assessment builds upon the demonstration, showing a clear causal connection between the natural event and the exceedance, and concludes that the exceedance of the 24-hr PM_{10} standard on May 9, 2012, would not have occurred but for the event.

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

1.2 Exceptional Event Rule Requirements

In addition to the technical requirements contained in the EER, procedural requirements must also be met for the EPA to concur that the flagged air quality monitoring data is due to an exceptional event. This section of the report contains the requirements of the EER and associated guidance, and discusses how ADEQ has addressed those requirements.

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

ADEQ issued Air Quality Forecasts indicating that gusty winds associated with thunderstorm outflows could generate areas of dense blowing dust on May 9, 2012. More information on ADEQ's forecasting program can be found in Section 5.2 of this report. The forecasts and advisories that were issued for May 9, 2012, are included in Appendix B.

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

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

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

If ADEQ and/or other operating air quality agencies determine that the potential exists for a monitor's reading(s) to be influenced by an exceptional event, a preliminary flag is submitted for the measurement in AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1 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.

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

ADEQ submitted a letter to EPA on September 11, 2013, listing all days for calendar years 2011 to 2013 that ADEQ intends to analyze under the EER. The PM_{10} exceedance that occurred at the Rillito monitor on May 9, 2012, in the Rillito PM_{10} Nonattainment Area (RNA) was included on this list. This assessment report demonstrates support for the flagging of these data.

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

ADEQ posted this assessment report on the ADEQ webpage and placed a hard copy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on February 7, 2014. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv). See Appendix C for a copy of the affidavit of public notice.

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

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

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

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

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

1.3 Guide to New Material in This Report

Naturally occurring dust events occur several times per year in Arizona, with each event requiring the preparation of exceptional events documentation. Some text in this documentation is required by the EER and is common to all the demonstrations. The text, figures, and tables unique to this event are outlined in **Table 1-1**.

Table 1-1. Summary of information unique to the Rillito May 9, 2012, event.

Section	Unique Material
Throughout the report	Event date(s) updated
Section 2.4	Event day summary
Chapter 3	Clear causal relationship
Chapter 4	Historical norm
Section 5.1.6 through Section 5.4	Source-permitted inspections and public complaints, forecasts and warnings, and wind observations
Chapters 6 and 7	But-for analysis and conclusion
Appendices A and B	Additional data and forecasts

2. Conceptual Model

This section provides a narrative background for and summarizes the meteorological and air quality conditions in Rillito on May 9, 2012. This section includes

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

2.1 Geographic Setting and Monitor Locations

Rillito is an unincorporated community in Pima County in southern Arizona, approximately 88 miles southeast of Phoenix and 20 miles northwest of Tucson (**Figure 2-1**). Rillito is bordered on all sides by the incorporated town of Marana. The region, along with much of southern Arizona, is in the Sonoran Desert. Rillito and Marana are flanked by the foothills of the Tortolita Mountains to the east, the Tucson Mountains to the south, and the Silver Bell Mountains to the west. Rillito and Marana lie at an elevation of approximately 1,900 feet above sea level, while peaks in each of the surrounding mountain ranges exceed 4,500 feet above sea level.

The RNA encompasses 324 square miles and nine townships. Much of the RNA comprises undeveloped land, and approximately 30% of the RNA consists of land cleared for agricultural purposes. Interstate 10 traverses the northeastern corner of the RNA, and the Silver Bell copper mine is in the southwestern corner of the RNA. Saguaro National Park is south of the RNA.

Over the past 20 years, the RNA has undergone a transformation from a predominantly rural, agricultural area to an area of substantial population growth. The town of Marana has annexed large sections of the RNA and has grown from an estimated population of just over 2,000 in 1990 to over 30,000 in 2010. The population of Rillito has also grown during this period, but because of its very small geographic area, Rillito's population was only 97 as of 2010.

The air quality and meteorological monitors used in this analysis are shown in Figure 2-1. AQS monitors measure air quality and meteorological data; Arizona Meteorological Network (AZMET) and NWS monitors measure meteorological data only. The PM_{10} exceedance on May 9, 2012, was recorded at the Rillito monitor, which has been operational since 1985 (**Figure 2-2**). In 2005, the monitor was moved to a new location less than 1,000 feet from its original location. The site is close to residential and industrial areas (chiefly, the CalPortland Cement plant). Collocated wind data are available from the Rillito monitor. There are no AZMET or NWS monitors in the immediate vicinity of Rillito. However, data from two NWS monitors in Tucson (about 15 to 20 miles away) and Casa Grande (about 50 miles away) are used in this report to illustrate regional weather conditions.

Recent analyses have determined that the I-10 corridor between Marana/Rillito and Casa Grande is particularly susceptible to dust storms and fatal traffic accidents due to the associated low visibilities.[1] These analyses identify this region as particularly susceptible to dust storms because much of the land was originally used for agricultural purposes. That land has since been largely abandoned and allowed to revert to open desert. Desert soil that has been farmed and then abandoned in this manner takes a long time to recover. As a result, there is a dearth of vegetation to hold down or catch blowing dust. Most of this land is located from Rillito northward into Pinal County.

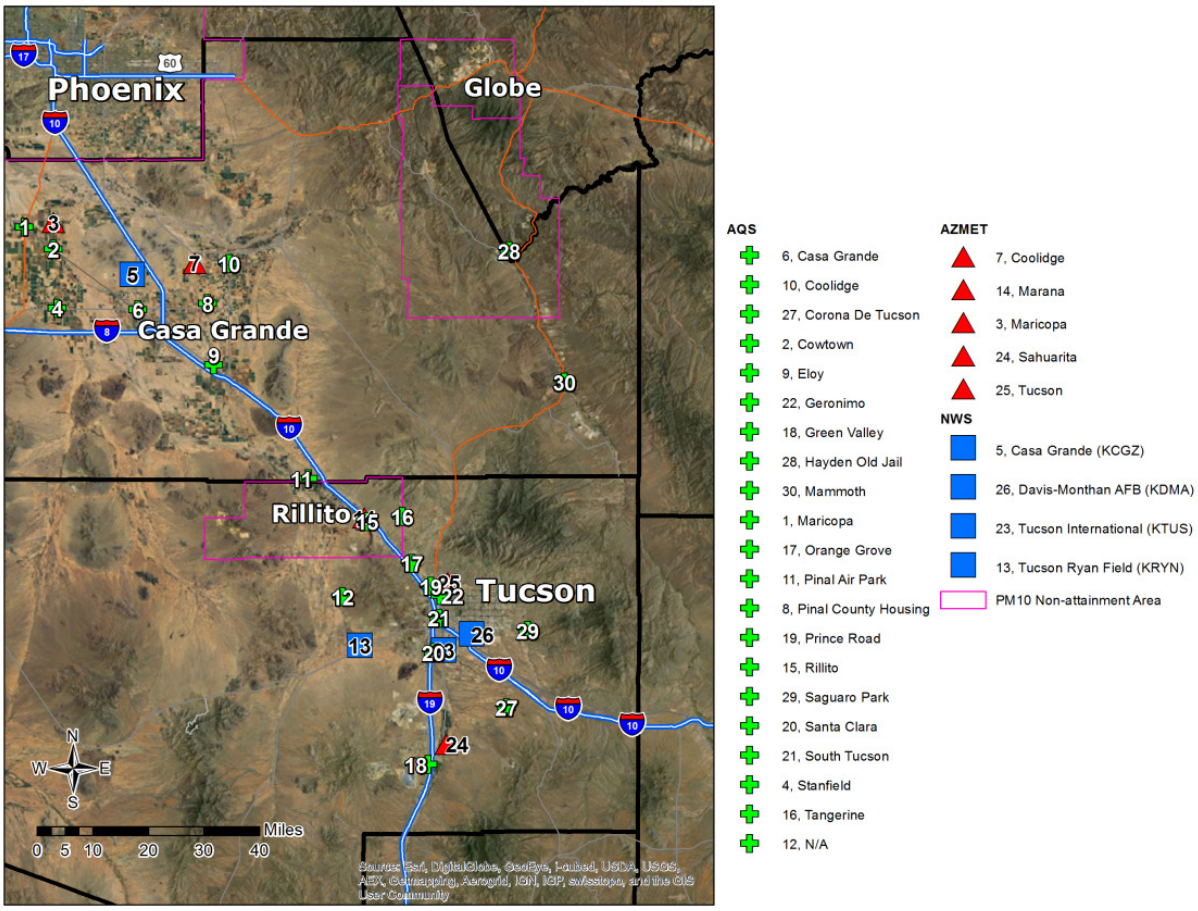


Figure 2-1. Air quality and meteorological monitors in Pima and Pinal counties.

[1] Several media outlets reported on the I-10 corridor dust storm analyses, including http://bit.ly/1gClpJq.

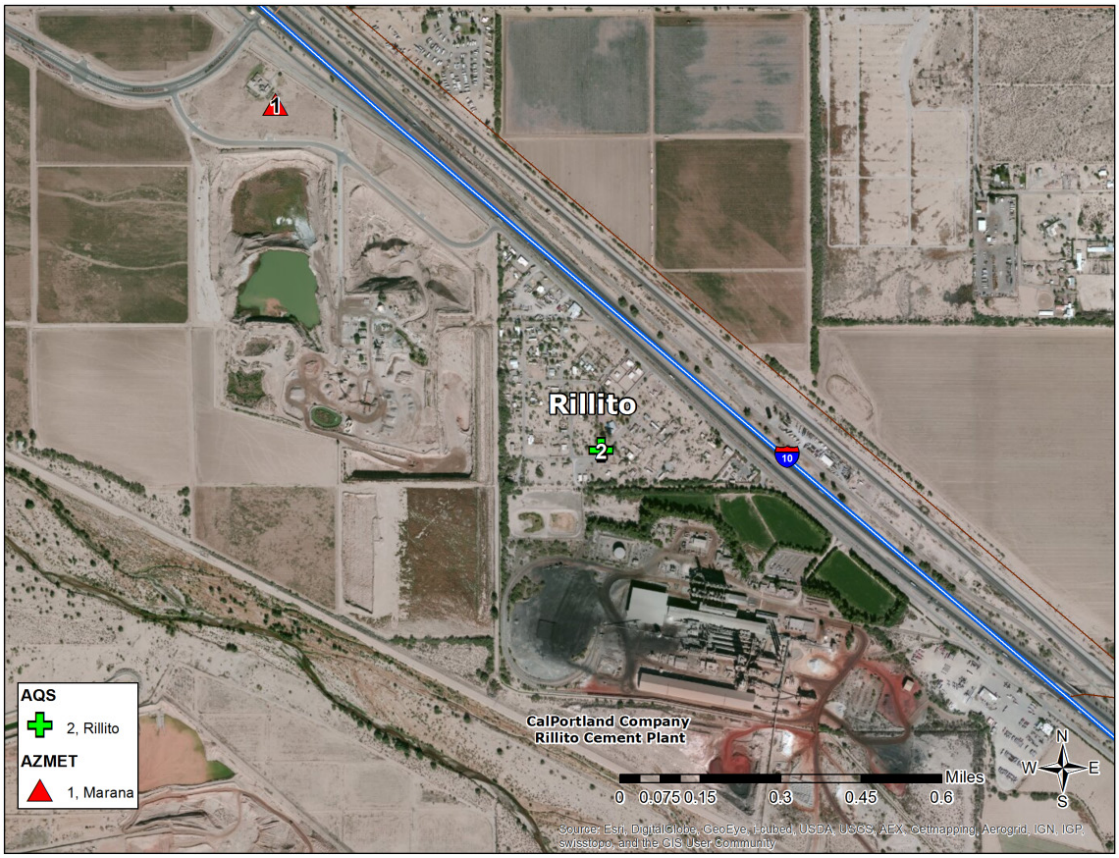


Figure 2-2. Air quality and meteorological monitors in the immediate Rillito region.

2.2 History of PM_{10} Attainment Status for Rillito

ADEQ began monitoring PM in what is now the RNA in 1971. The original measurement standard for PM, known as total suspended particulate matter (TSP), included a size range of particles collected by high-volume samplers (generally particles up to 40 microns in diameter). PM_{10} monitoring began in the RNA in 1985 on a sampling schedule of once every six days. Daily PM_{10} monitoring in the RNA began on April 1, 2010. On July 1, 1987, EPA revised PM standards to include only PM_{10} (52 FR 24634). As part of the implementation policy for the new standards, where insufficient observational PM_{10} data were available, EPA categorized areas of the country according to their probability of violating the standards: (1) Group I areas have a high probability of violating the standards, (2) Group II areas have a moderate probability of violating the standards, and (3) Group III areas are unlikely to violate the standards.

EPA listed Rillito as a Group I area. As a result, the state of Arizona was required to submit a State Implementation Plan (SIP) within nine months of the promulgation of the NAAQS (52 FR 24672, July 1, 1987, and 52 FR 29383, August 7, 1987).

Prior to the state of Arizona's submission of a SIP, EPA updated its initial geographic descriptions for the Group I and Group II areas. Consistent with EPA's PM_{10} grouping scheme, the Rillito Group I Area was designated and classified as a moderate PM_{10} nonattainment area

upon enactment of the 1990 Clean Air Act (CAA) amendments, effective November 15, 1990. This action included requirements for submittal of an attainment demonstration and reasonably available control measures (RACM) implementation provisions by November 15, 1991.

ADEQ submitted a PM_{10} moderate nonattainment area attainment demonstration for the RNA on November 14, 1991. In a letter dated May 14, 1992, EPA found this plan to be incomplete because it lacked an emissions inventory. On April 22, 1994, ADEQ submitted a revised PM_{10} attainment plan for Rillito. In a letter dated August 18, 1994, EPA found the revised plan to be incomplete because of a lack of RACM. EPA has not taken further action on the 1994 PM_{10} plan.

No exceedances of the 24-hr PM_{10} NAAQS occurred in the RNA from 1990 through 2006. As a result, EPA determined that the RNA had met the PM_{10} NAAQS and issued a “clean data” finding for the area in 2006. Subsequently, ADEQ submitted to EPA a PM_{10} Limited Maintenance Plan (LMP) and a request for redesignation of the area to attainment. The LMP is a streamlined alternative to the reporting required under a regular Maintenance Plan.

2.3 Climate

Rillito’s climate is typical of the desert region of the southwestern United States. The warmest months of the year are June through August, when average daily maximum temperatures are near 100°F (**Figure 2-3**). Average annual rainfall in Rillito is nearly 12 inches. The bulk of this rain usually falls during July through September, with a secondary maximum during December through February. During December through February, winter storms originating from the Pacific Ocean can produce significant rains in southern Arizona. During July through September, monsoonal moisture originating from the Gulf of California and Gulf of Mexico, as well as large thunderstorm complexes over the Sierra Madre Occidental Mountains in Mexico, move northward into Arizona. Prevailing winds in the Tucson/Rillito area are from the southeast.

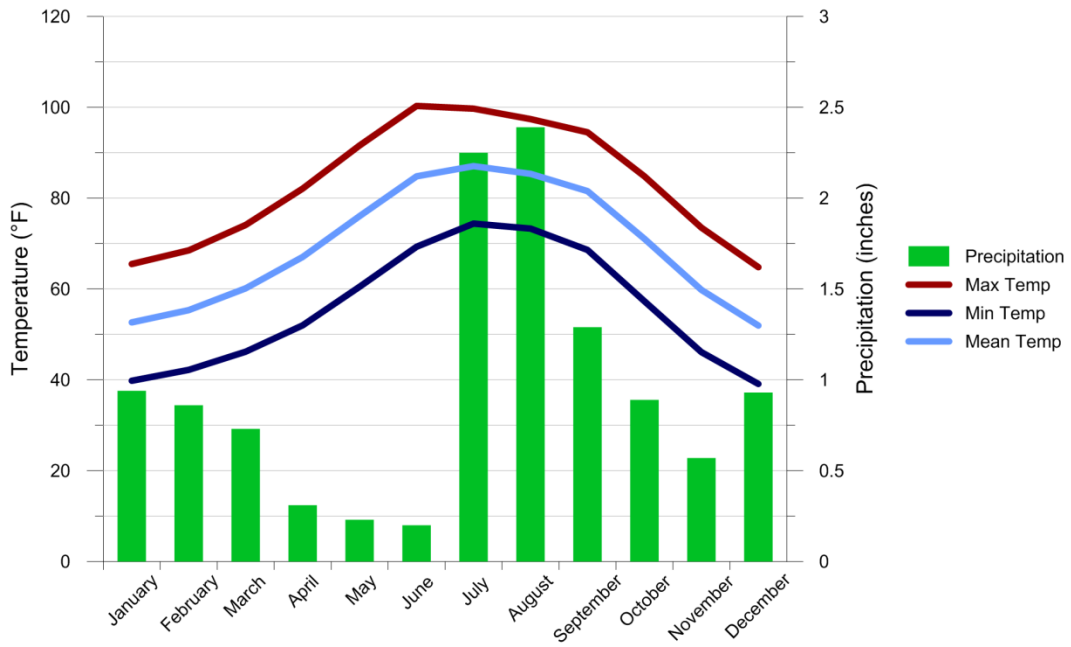
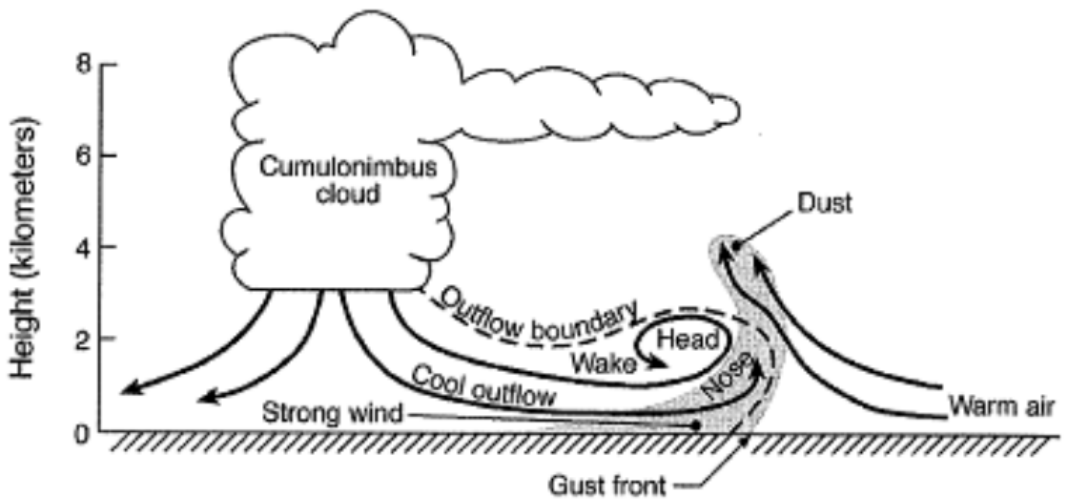


Figure 2-3. Average monthly temperatures and precipitation for Tucson, 1981–2010. Rillito does not have an official NWS climate site. The nearest NWS climate site is in Tucson, approximately 20 miles southeast of Rillito.

The influx of moisture associated with a monsoon, combined with strong solar heating, can result in unstable atmospheric conditions favorable for the development of thunderstorms. Heavy precipitation associated with thunderstorms, and the eventual collapse or dissipation of thunderstorms, can generate downbursts. Downbursts are rapid descents of rain-cooled air in a thunderstorm. Upon reaching the surface, this air rapidly disperses horizontally away from the storm as outflow boundaries (also called gust fronts; see **Figure 2-4**). The high winds associated with outflow boundaries can efficiently loft dust into the air and transport the dust over long distances, resulting in dust storms (also called haboobs) with high PM_{10} concentrations and low visibilities.



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

Figure 2-4. Cross-section of a thunderstorm creating an outflow boundary and haboob.[2]

Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before rains moisten the soil and limit potential lofting of soil into the air. However, depending on the amount and frequency of precipitation received during the monsoon season, extremely hot temperatures can dry the surface soils very quickly; thus, dust storms can occur at any time during the year. The thunderstorms that generated the strong winds and blowing dust in the Rillito area on May 9, 2012, were associated with an upper-level low pressure system over northern Mexico, and occurred well before the onset of the traditional summer monsoon season. Specific PM_{10} source regions are difficult to determine during thunderstorm-driven dust storms because the thunderstorm outflow can carry dust over long distances that encompass many possible sources of dust. Instead, we consider general PM_{10} source regions, which are typically identified based on the locations of the thunderstorms that are believed to have generated the dust-laden outflow winds.

2.4 Event Day Summary

On May 9, 2012, strong winds generated by nearby thunderstorms transported dust northward into Rillito (**Figure 2-5**). The windblown dust resulted in a 24-hr average PM_{10} concentration of 239 µg/m^3 at the Rillito monitor (**Table 2-1**); this value is in exceedance of the

[2] Warner T.T. (2004) *Desert meteorology*, Cambridge University Press, Cambridge, UK. Available at http://books.google.com/books?id=kUBxA5P7YbQC.

NAAQS. The hourly and 24-hr average PM_{10} concentrations measured at the Rillito monitor were in excess of normal historical fluctuations. The dust was naturally occurring and likely originated over undeveloped lands outside the RNA. Sustained winds of over 40 mph with wind gusts in excess of 50 mph overwhelmed reasonable dust control measures. Other PM_{10} monitors in adjacent Pinal County also recorded high PM_{10} concentrations in coincidence with the strong winds, illustrating the regional nature of this event. The Tucson International Airport surface meteorological site reported dust storm (DS) conditions for several hours on May 9, 2012, coincident with strong winds and peak PM_{10} concentrations (see Appendix A).

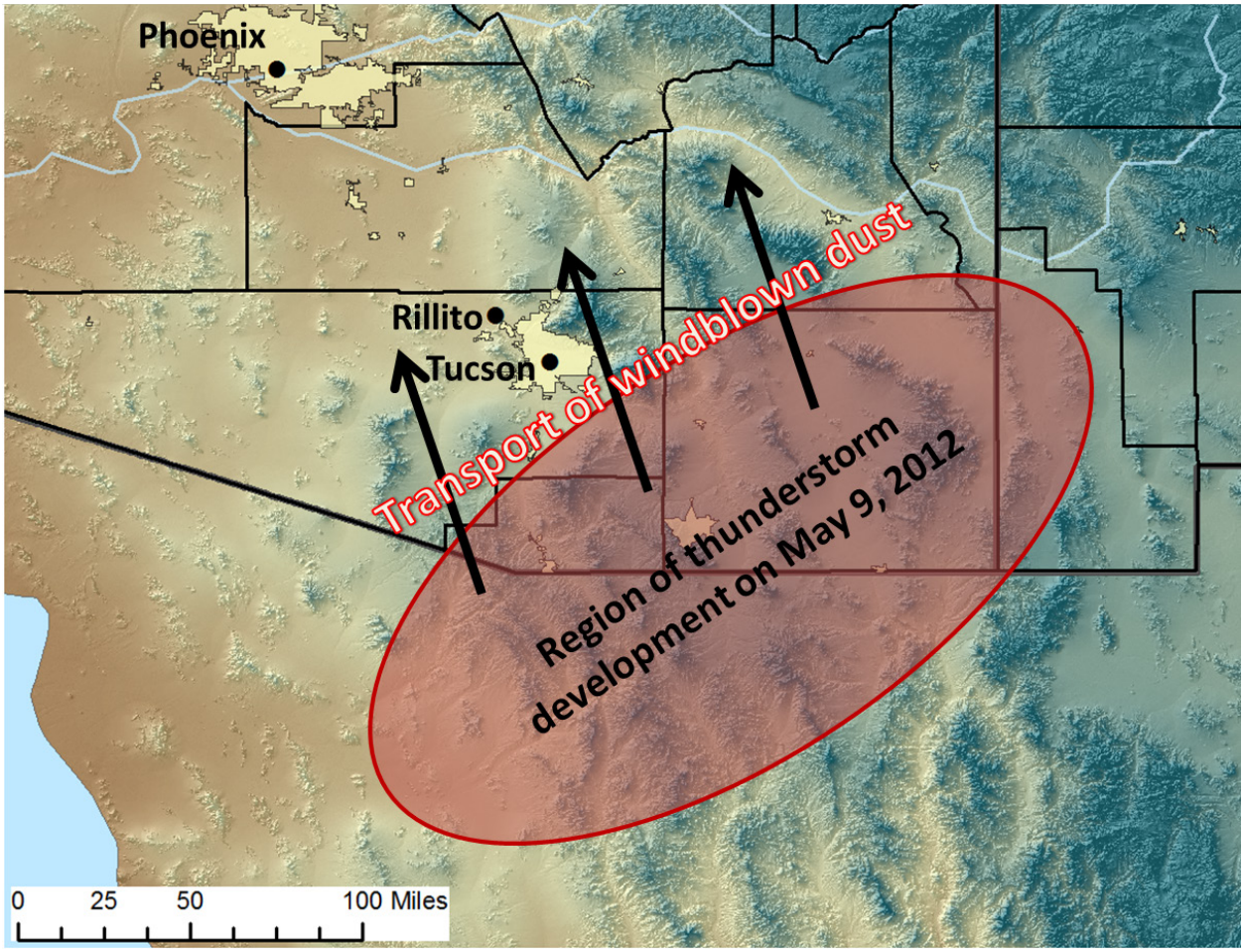


Figure 2-5. Gusty southerly winds generated by thunderstorms south of Tucson transported dust into the Rillito area on May 9, 2012.

Table 2-1. PM_{10} measurements collected in Arizona on May 9, 2012. Data from the Rillito monitor are shown in **bold green**.

Page 1 of 3

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM_{10} ($\mu g/m^3$)	1-hr Max PM_{10} ($\mu g/m^3$)	Time of Max 1-hr PM_{10} (MST)	AQS Qualifier Flag
Cochise County							
Paul Spur Chemical Lime Plant	FRM	ADEQ	04-003-0011-81102-1	18	N/A	N/A	
Paul Spur Chemical Lime Plant	TEOM	ADEQ	04-003-0011-81102-3	22	215	1300	IJ
Paul Spur Chemical Lime Plant	FRM	ADEQ	04-003-0011-85101-1	16	N/A	N/A	
Douglas Red Cross	FRM	ADEQ	04-003-1005-81102-1	19	N/A	N/A	
Douglas Red Cross	FRM	ADEQ	04-003-1005-85101-1	17	N/A	N/A	
Coconino County							
Flagstaff Middle School	FRM	ADEQ	04-005-1008-81102-1	23	N/A	N/A	
Flagstaff Middle School	FRM	ADEQ	04-005-1008-85101-1	19	N/A	N/A	
N/A	TEOM	NNIR	04-005-1237-81102-1	35	53	1200	
Gila County							
Payson Well Site	FRM	ADEQ	04-007-0008-81102-1	19	N/A	N/A	
Payson Well Site	FRM	ADEQ	04-007-0008-81102-2	19	N/A	N/A	
Payson Well Site	FRM	ADEQ	04-007-0008-85101-1	16	N/A	N/A	
Payson Well Site	FRM	ADEQ	04-007-0008-85101-2	16	N/A	N/A	
Miami Ridgeline	GRAV	ADEQ	04-007-0009-81102-1	23	N/A	N/A	
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	30	85	1700	
Miami Golf Course	GRAV	ADEQ	04-007-8000-81102-1	21	N/A	N/A	
Miami Golf Course	GRAV	ADEQ	04-007-8000-81102-2	20	N/A	N/A	
Maricopa County							
West Phoenix	BAM	MCAQD	04-013-0019-81102-1	50	103	1900	
North Phoenix	BAM	MCAQD	04-013-1004-81102-1	48	245	1600	
Glendale	TEOM	MCAQD	04-013-2001-81102-1	50	135	1700	
Central Phoenix	TEOM	MCAQD	04-013-3002-81102-4	65	426	1600	
South Scottsdale	GRAV	MCAQD	04-013-3003-81102-1	45	N/A	N/A	
Greenwood	TEOM	MCAQD	04-013-3010-81102-1	84	588	1600	
South Phoenix	TEOM	MCAQD	04-013-4003-81102-1	134	1,512	1600	
West Chandler	TEOM	MCAQD	04-013-4004-81102-1	72	405	1700	
Tempe	TEOM	MCAQD	04-013-4005-81102-1	68	223	1600	
Higley	TEOM	MCAQD	04-013-4006-81102-1	87	493	1700	

Table 2-1. PM_{10} measurements collected in Arizona on May 9, 2012. Data from the Rillito monitor are shown in **bold green**.

Page 2 of 3

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM_{10} ($\mu g/m^3$)	1-hr Max PM_{10} ($\mu g/m^3$)	Time of Max 1-hr PM_{10} (MST)	AQS Qualifier Flag
Maricopa County (continued)							
West 43rd Ave	TEOM	MCAQD	04-013-4009-81102-1	124	968	1600	
Dysart	TEOM	MCAQD	04-013-4010-81102-1	68	395	1800	
Zuni Hills	TEOM	MCAQD	04-013-4016-81102-1	56	303	1700	
Fort McDowell/Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	48	N/A	N/A	
Senior Center	GRAV	SRPMIC	04-013-7020-81102-2	59	N/A	N/A	
Lehi	GRAV	SRPMIC	04-013-7022-81102-1	96	N/A	N/A	
High School Air Monitoring Station	GRAV	SRPMIC	04-013-7024-81102-1	79	N/A	N/A	
Durango Complex	TEOM	MCAQD	04-013-9812-81102-1	89	506	1600	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	46	255	1600	IJ
JLG Supersite	TEOM	ADEQ	04-013-9997-81102-4	47	225	1600	IJ
Mohave County							
Peach Springs	GRAV	HIR	04-015-1000-81102-1	51	N/A	N/A	
Peach Springs	GRAV	HIR	04-015-1000-81102-2	68	N/A	N/A	
Bullhead City	FRM	ADEQ	04-015-1003-81102-1	36	N/A	N/A	
Bullhead City	FRM	ADEQ	04-015-1003-85101-1	34	N/A	N/A	
Grand Canyon	GRAV	HIR	04-015-1011-81102-1	112	N/A	N/A	
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	17	44	1200	
Pima County							
Corona de Tucson	FRM	PCDEQ	04-019-0008-81102-1	36	N/A	N/A	
Orange Grove	GRAV	PCDEQ	04-019-0011-81102-2	58	N/A	N/A	
Rillito	**TEOM**	**ADEQ**	**04-019-0020-81102-3**	**239**	**1,671**	**1500**	**RJ**
South Tucson	GRAV	PCDEQ	04-019-1001-81102-1	104	N/A	N/A	
Prince Road	FRM	PCDEQ	04-019-1009-81102-1	81	N/A	N/A	
Tangerine	FRM	PCDEQ	04-019-1018-81102-1	35	N/A	N/A	
Santa Clara	FRM	PCDEQ	04-019-1026-81102-1	106	N/A	N/A	
Green Valley	TEOM	PCDEQ	04-019-1030-81102-1	40	147	1400	
Geronimo	TEOM	PCDEQ	04-019-1113-81102-1	88	819	1400	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	146	1721	1700	
Apache Junction Fire Station	GRAV	PCAQCD	04-021-3002-81102-1	27	N/A	N/A	W
Apache Junction Fire Station	TEOM	PCAQCD	04-021-3002-81102-3	45	111	0800	

Table 2-1. PM_{10} measurements collected in Arizona on May 9, 2012. Data from the Rillito monitor are shown in **bold green**.

Page 3 of 3

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM_{10} ($\mu g/m^3$)	1-hr Max PM_{10} ($\mu g/m^3$)	Time of Max 1-hr PM_{10} (MST)	AQS Qualifier Flag
Pinal County (continued)							
Coolidge	GRAV	PCAQCD	04-021-3004-81102-1	134	N/A	N/A	
Pinal Air Park	GRAV	PCAQCD	04-021-3007-81102-1	159	N/A	N/A	RJ
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	334	5,181	1700	RJ
Combs	TEOM	PCAQCD	04-021-3009-81102-3	158	2,284	1700	RJ
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	171	1,383	1800	RJ
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-1	131	N/A	N/A	
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-2	193	N/A	N/A	RJ
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	261	2,925	1700	RJ
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	115	1,256	1700	
Eloy	GRAV	PCAQCD	04-021-3014-81102-1	91	N/A	N/A	
Casa Blanca Air Monitoring Site	GRAV	GRIC	04-021-7004-81102-1	184	N/A	N/A	RJ
Casa Blanca Air Monitoring Site	GRAV	GRIC	04-021-7004-81102-2	169	N/A	N/A	RJ
Santa Cruz County							
Nogales Post Office	FRM	ADEQ	04-023-0004-81102-1	29	N/A	N/A	
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	39	99	1100	
Nogales Post Office	FRM	ADEQ	04-023-0004-85101-1	26	N/A	N/A	
Yavapai County							
Prescott Valley	FRM	ADEQ	04-025-2002-81102-1	17	N/A	N/A	
Prescott Valley	FRM	ADEQ	04-025-2002-85101-1	14	N/A	N/A	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	84	405	1700	IJ

BAM: Beta Attenuation Monitor
FMIR: Fort McDowell Indian Reservation
FRM: Federal Reference Method
GRAV: Gravimetric Analysis
GRIC: Gila River Indian Community
HIR: Hualapai Indian Reservation
IJ: qualifier flag for high winds
MCAQD: Maricopa County Air Quality Department
MST: Mountain Standard Time
NNIR: Navajo Nation
NPS: National Park Service
PCAQCD: Pinal County Air Quality Control District
PCDEQ: Pima County Department of Environmental Quality
RJ: qualifier flag for high winds
SRPMIC: Salt River Pima-Maricopa Indian Community
TEOM: Tapered Element Oscillating Microbalance
W: qualifier flag for flow rate average out of spec.
WMAT: White Mountain Apache Tribe

3. Causal Relationship

3.1 Discussion

Meteorological and air quality observations indicate that dust lofted and transported by strong outflow winds from nearby thunderstorms was directly responsible for the high PM_{10} concentrations observed in Rillito on May 9, 2012. The thunderstorms responsible for the strong winds and subsequent windblown dust were clearly evident over Arizona on satellite (**Figure 3-1**) and radar (**Figure 3-2**) imagery. The thunderstorms were generated by an upper-level low pressure system over Mexico (**Figure 3-3**). The likely source region for PM_{10} during the May 9, 2012, event was undeveloped desert land south of Tucson. This region consists largely of natural, undisturbed desert soils. The last time the Rillito area recorded any measurable rainfall leading up to the May 9, 2012, event was on April 14, 2012, when showers associated with a cold front produced 0.12 inches of rain at Tucson International Airport. This combination of geography and lack of rainfall preceding the event resulted in a large fetch of soils that were particularly vulnerable to particulate suspension.

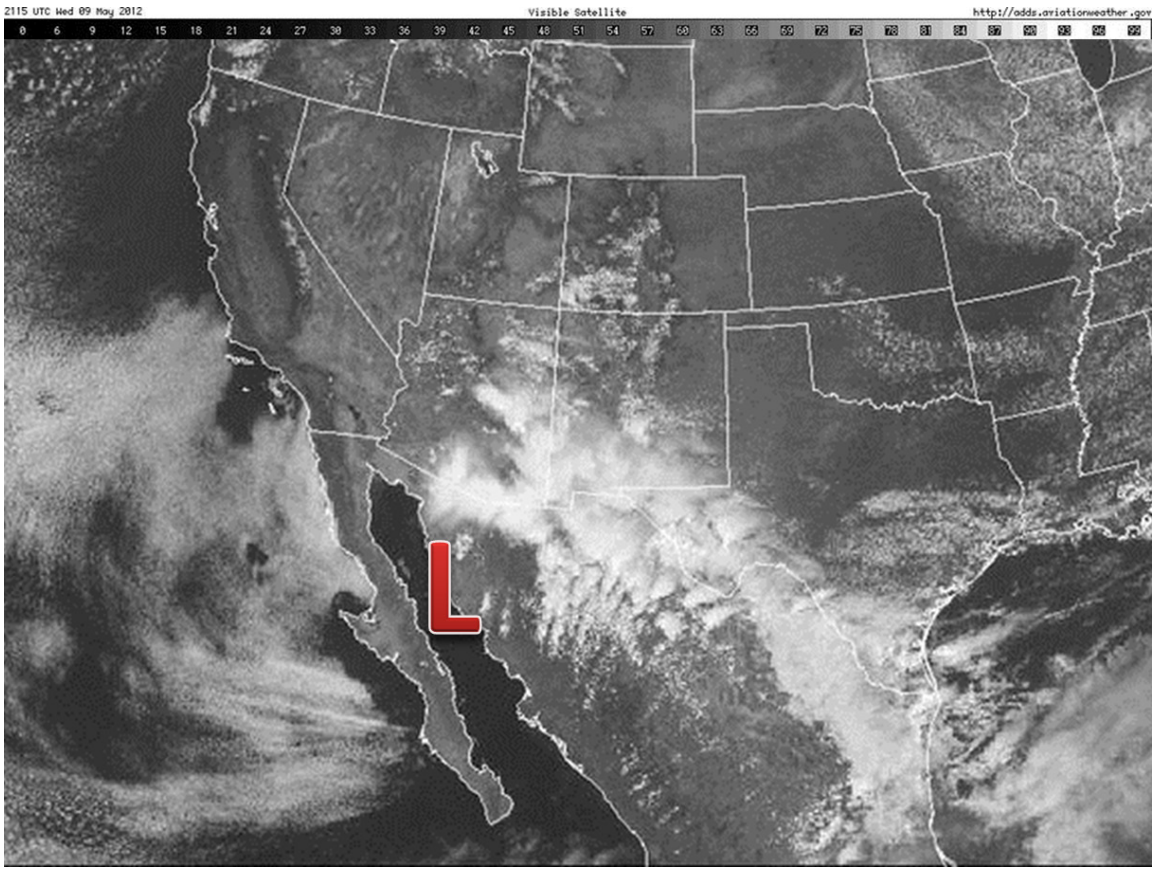


Figure 3-1. Visible satellite image from 14:15 MST on May 9, 2012. An upper-level low pressure system (red "L") over northwestern Mexico generated thunderstorms over southeastern Arizona, southern New Mexico, and north central Mexico.

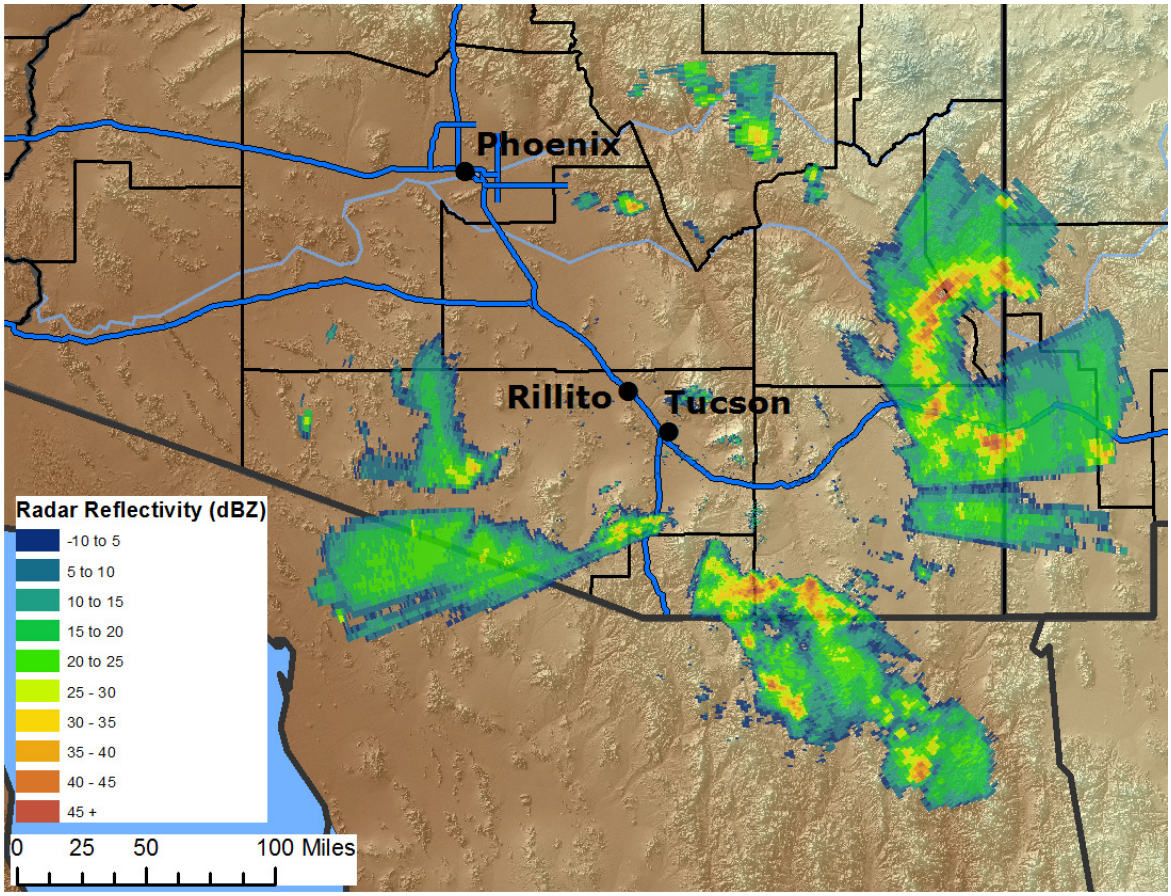


Figure 3-2. Radar reflectivity data from 14:16 MST on May 9, 2012. Thunderstorms (green, yellow, and red areas) were developing over southern and southeastern Arizona, moving slowly northwestward. The thunderstorms south of Tucson generated strong winds that lofted and transported dust into Tucson and Rillito.

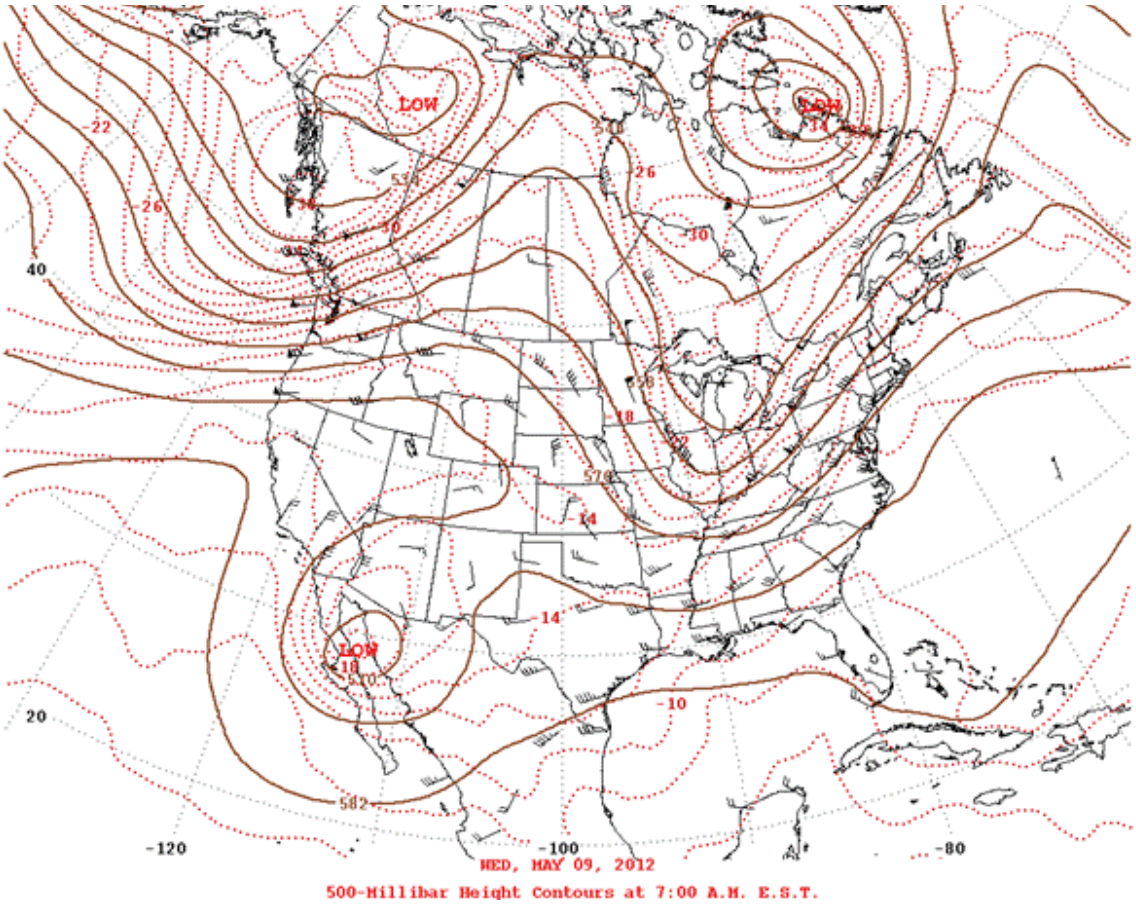


Figure 3-3. 500 mb geopotential height map from 05:00 MST on May 9, 2012. An upper-level low pressure system was located over northwestern Mexico, south of Arizona. This system generated thunderstorms over southeastern Arizona.

Time-series plots of PM_{10} and wind data show a sharp increase in PM_{10} concentrations and wind speeds at 14:00 MST, illustrating the causal relationship between the strong winds and dust (**Figure 3-4**, **Figure 3-5**, and Appendix A). Visibility at Tucson International Airport (KTUS) dropped to under 1 mile as the windblown dust moved through the region (**Figure 3-6**). Dust (DU) and dust storm conditions were also reported at KTUS. At 14:44 MST, the NWS office in Tucson issued a Dust Storm Warning, stating that a dust storm was moving northward through the Tucson and Marana areas and that wind gusts of up to 50 mph and visibilities below 0.25 miles were possible (Appendix B). Blowing dust was also observed at the NWS office itself. PM_{10} concentrations and wind speeds rapidly fell after 18:00 MST as the dust storm moved out of the area. A peak wind gust of 43 mph was reported at the Rillito monitor coincident with the peak 1-hour PM_{10} concentration of 1,671 µg/m^3. Wind gusts of up to 52 mph were reported at Tucson International Airport and Davis-Monthan Air Force Base (AFB). While southerly winds are favorable for transport of emissions from the CalPortland plant to the Rillito monitor, the fact that strong winds, high PM_{10} concentrations, and low visibilities were reported regionwide indicates that the exceedance of the NAAQS at the Rillito monitor was not directly attributable to local sources. **Table 3-1** summarizes the maximum sustained winds and wind gusts in the region on May 9.

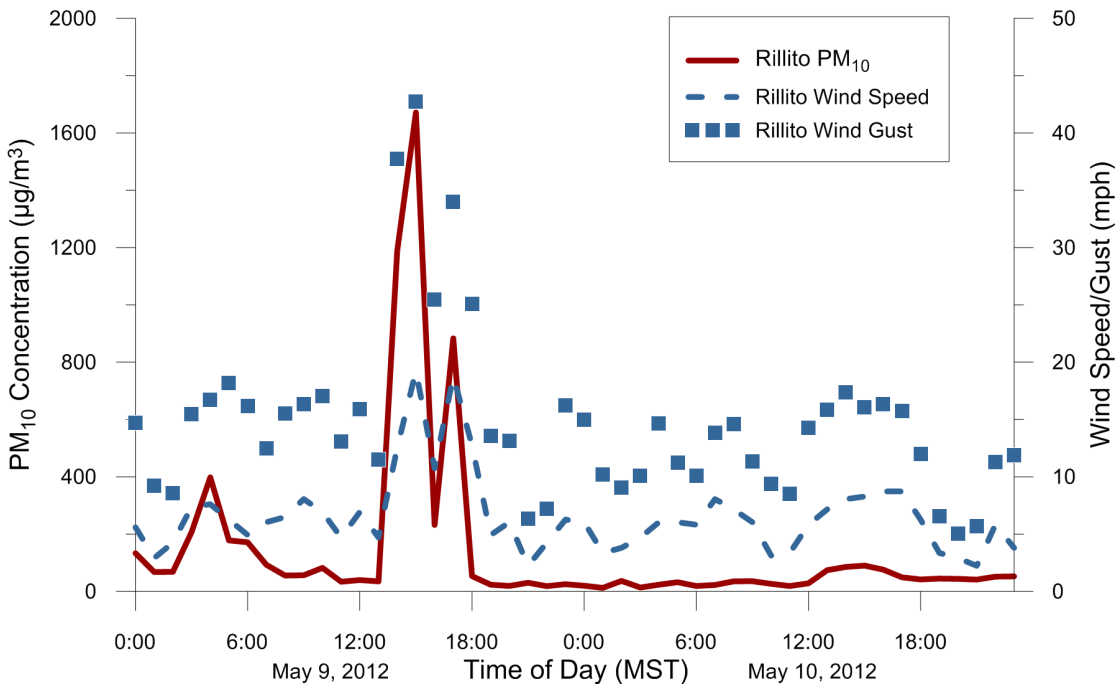


Figure 3-4. Hourly PM_{10} concentrations and wind speeds at the Rillito monitor on May 9 and 10, 2012. PM_{10} concentrations and wind speeds sharply increased at 14:00 MST on May 9, indicating the presence of windblown dust.

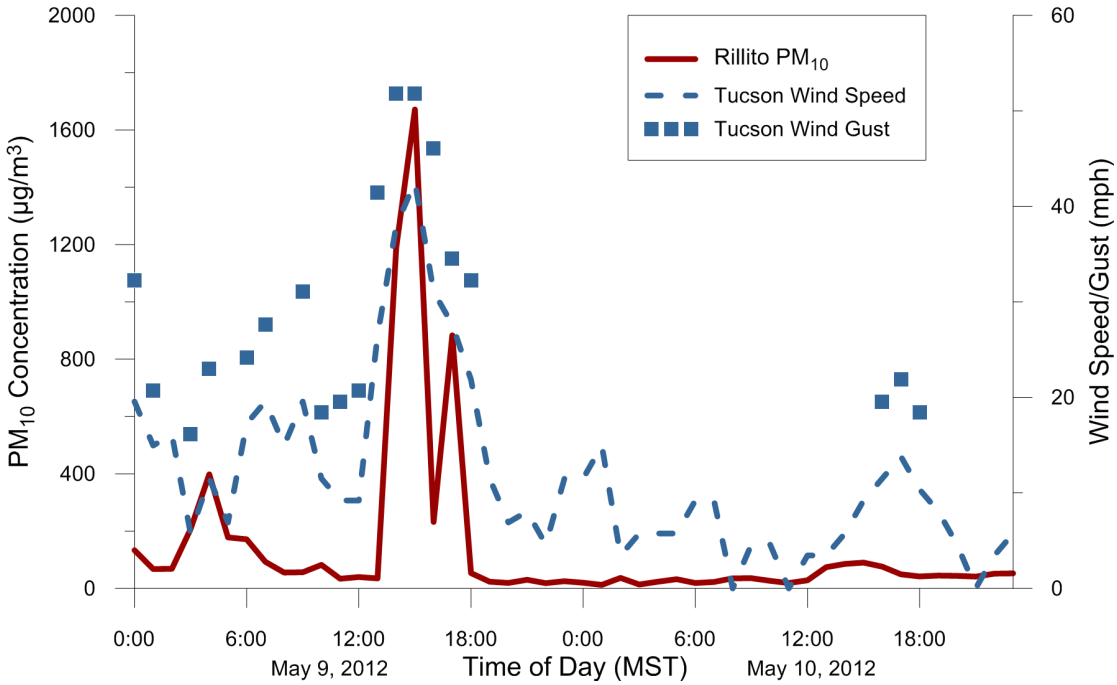


Figure 3-5. Hourly PM_{10} concentrations at the Rillito monitor and wind speeds at Tucson International Airport on May 9 and 10, 2012. PM_{10} concentrations and wind speeds sharply increased at 14:00 MST on May 9, indicating the presence of windblown dust.

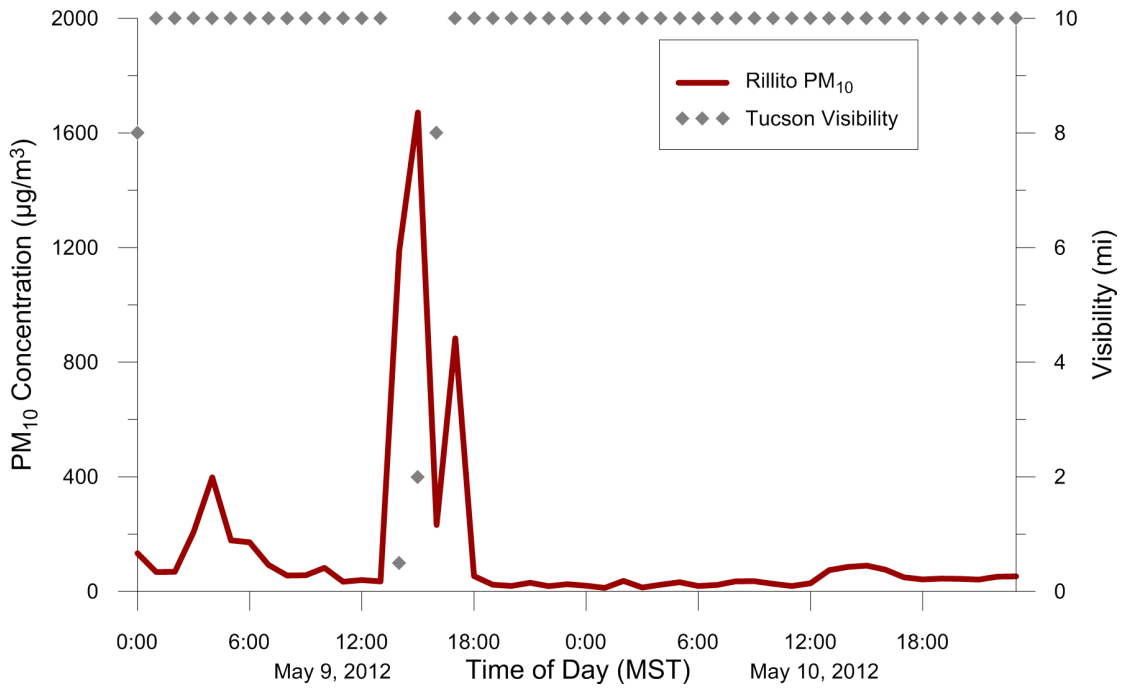


Figure 3-6. Hourly PM_{10} concentrations at the Rillito monitor and visibilities at Tucson International Airport on May 9 and 10, 2012. PM_{10} concentrations sharply increased and visibilities decreased at 14:00 MST on May 9, indicating the presence of windblown dust.

Table 3-1. Peak observed wind speeds and wind gusts at Pima and Pinal county monitors on May 9, 2012. The Rillito monitor reported a 1-hr PM_{10} concentration of 1,671 µg/m^3 at 15:00 MST.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
Tucson Davis-Monthan Air Force Base	43	200	14:37	52	14:37
Tucson International Airport	43	190	14:42	52	14:42
Tucson Ryan Field	33	200	14:45	43	14:45
Rillito	19	205	15:00	43	15:00
Casa Grande	30	170	16:35	41	16:35

Figures 3-7 through 3-10 show PM_{10} concentrations, wind speeds and gusts, visibilities, and radar velocity data in Pima and Pinal counties before, during, and after the thunderstorm-driven dust storm event.

Before the thunderstorm outflow and associated windblown dust affected the Tucson and Rillito areas, PM_{10} concentrations were low, visibilities were high, and winds were moderate easterly across Pima and Pinal counties (Figure 3-7).

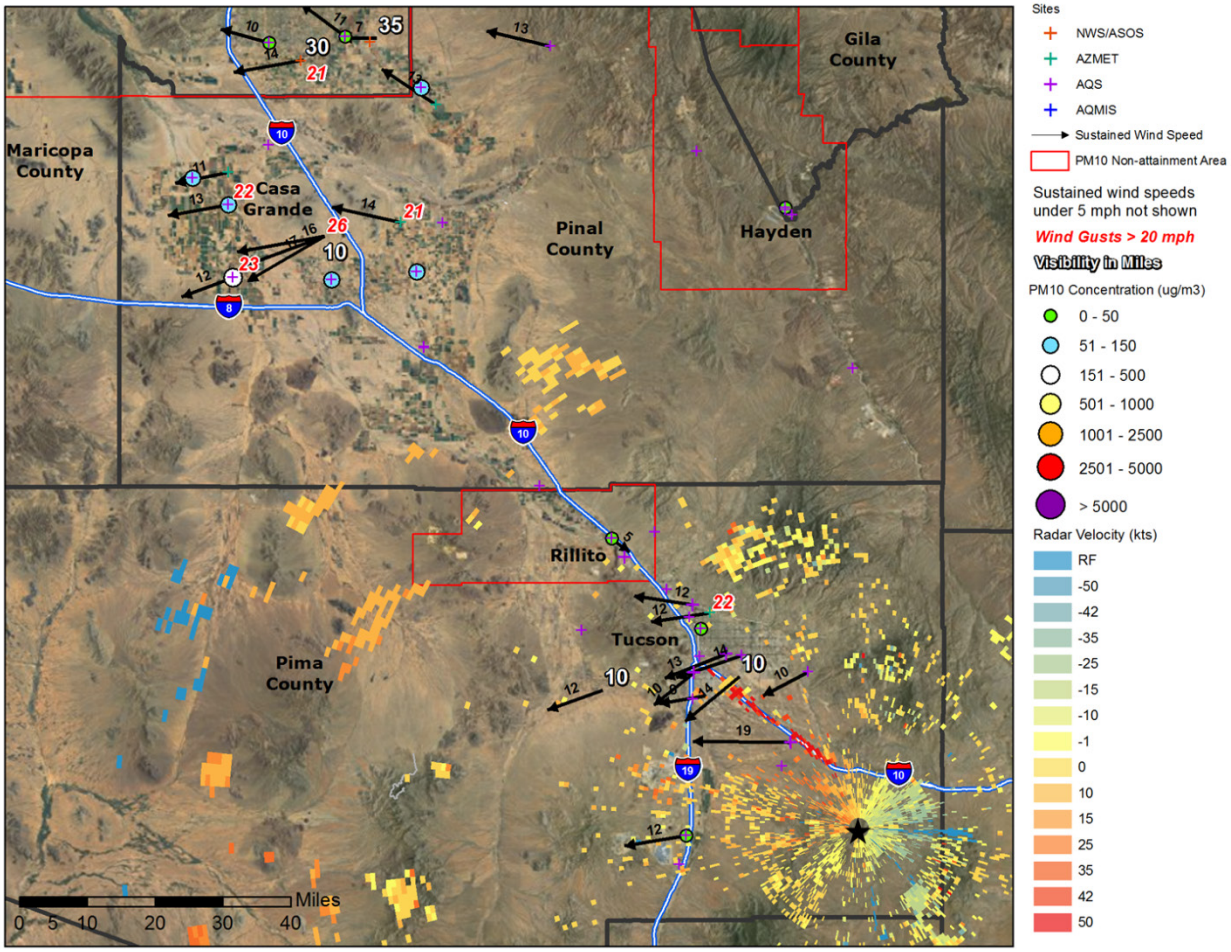


Figure 3-7. Observations at Pima and Pinal county monitors between 10:30 and 11:30 MST on May 9, 2012, of hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts, and minimum visibility (white numbers). Also shown are radar velocity data from the NWS Doppler radar southeast of Tucson, where cool colors indicate motion toward the radar, and warm colors indicate motion away from the radar. The black star denotes the location of the radar. Moderate easterly winds, low PM_{10} concentrations, and high visibilities were reported across the region at this time.

After 12:00 MST, numerous thunderstorms developed across southern Arizona, mainly south of Tucson, and outflow from these thunderstorms arrived in the Tucson metropolitan area just after 14:30 MST (Figure 3-8). As the outflow boundary moved through Tucson and Rillito, high PM_{10} concentrations, gusty southerly winds, and low visibilities were reported. At that time, monitors further north in Pinal County were not yet affected by the thunderstorm outflow, and were reporting low PM_{10} concentrations and moderate easterly winds. Winds shifted to southeasterly by 16:30 MST but remained gusty throughout the Tucson metropolitan area per monitor measurements and radar velocity data (Figure 3-9). Outflow and the associated windblown dust also started to impact monitors in Pinal County.

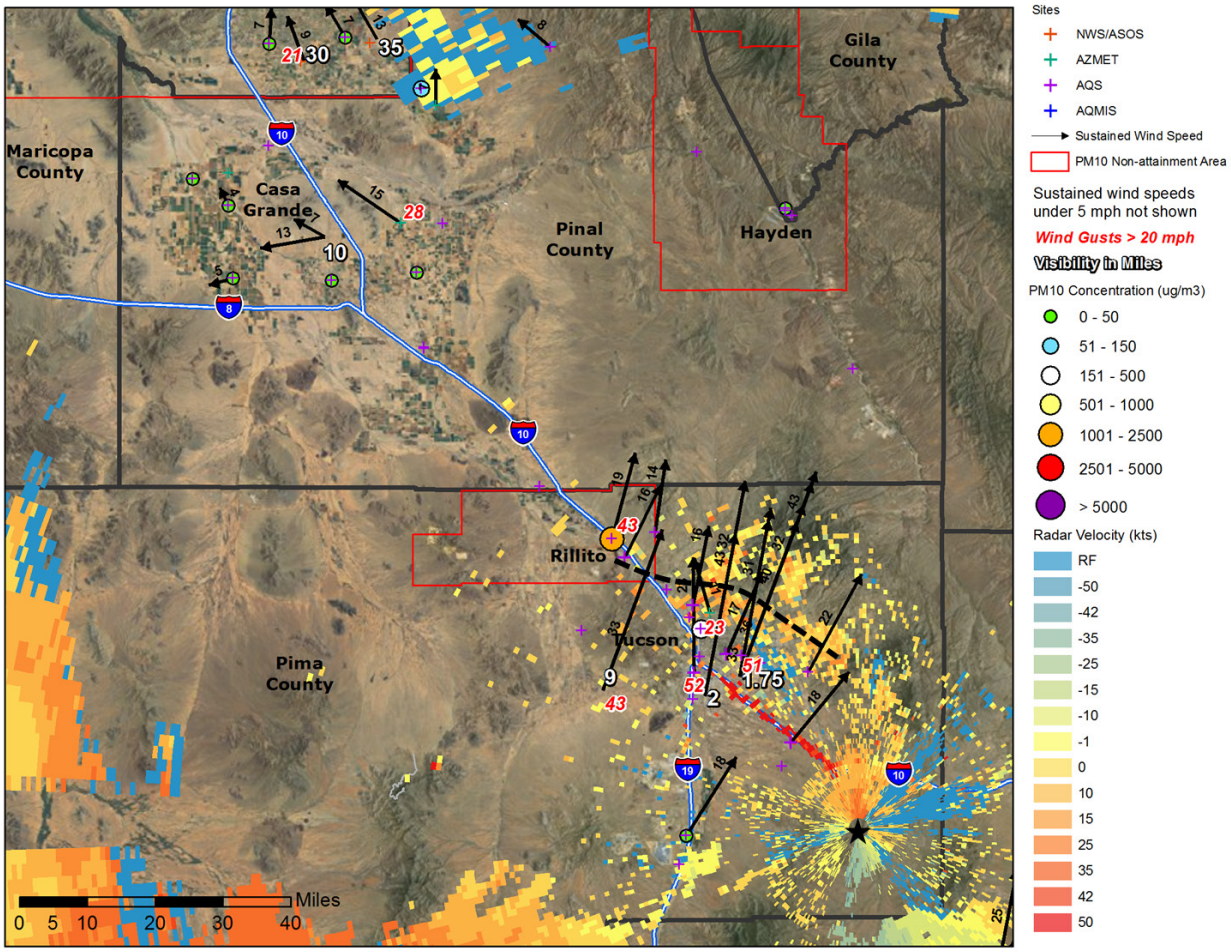


Figure 3-8. Observations at Pima and Pinal county monitors between 14:30 to 15:30 MST on May 9, 2012, of hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts, and minimum visibility (white numbers). An outflow boundary generated by thunderstorms south of Tucson was moving through the Tucson and Rillito areas. Gusty winds, high PM_{10} concentrations, and low visibilities were reported. The black dashed line denotes the estimated location of the outflow boundary around 15:00 MST.

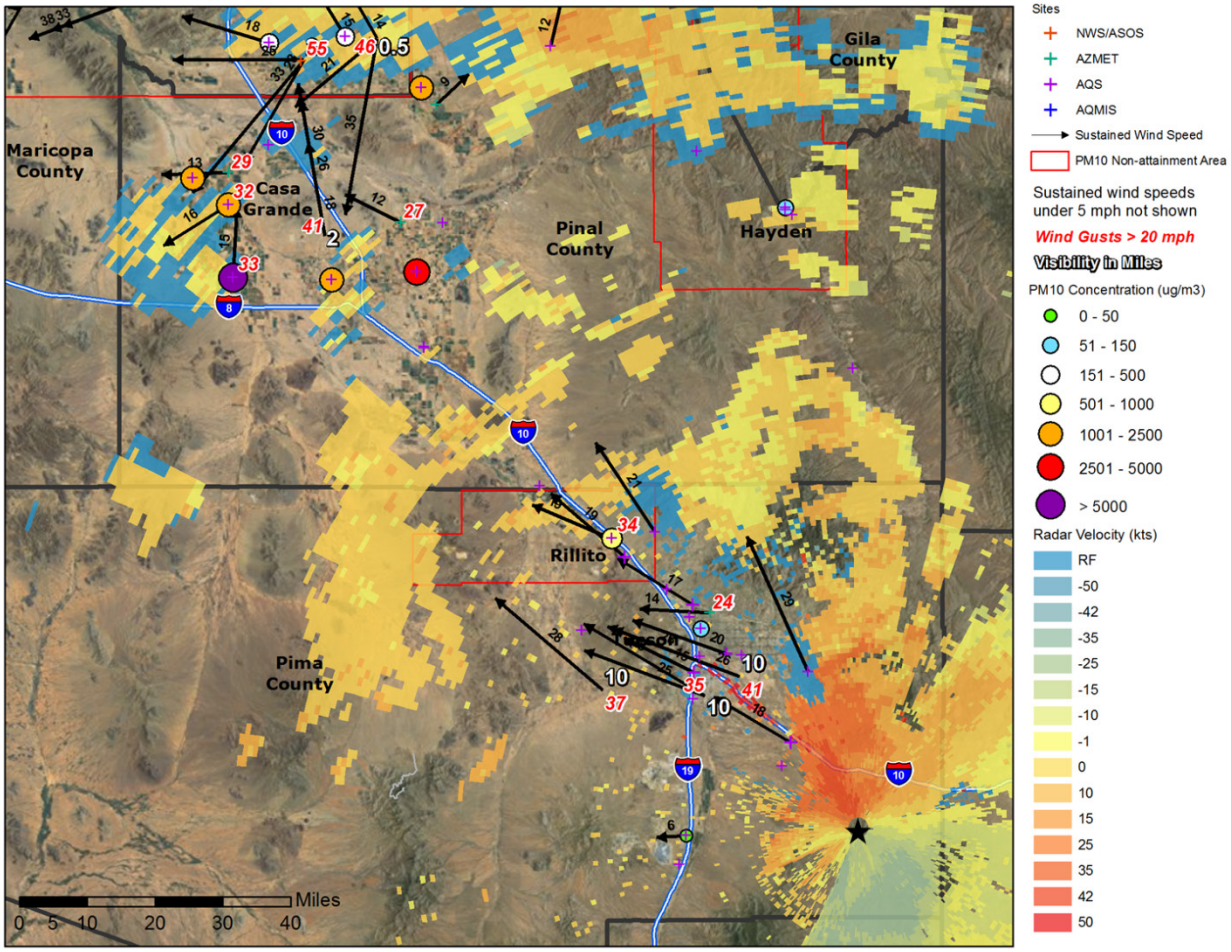


Figure 3-9. Observations at Pima and Pinal county monitors between 16:30 to 17:30 MST on May 9, 2012, of hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts, and minimum visibility (white numbers). Gusty southeasterly winds were reported throughout the Tucson metropolitan area, and high PM_{10} concentrations were reported at Rillito. Radar velocity data also showed very strong southeasterly winds over a wide area. Gusty winds and high PM_{10} concentrations due to thunderstorm outflow were also reported in Pinal County.

As the thunderstorms weakened and moved out of the region, wind speeds and PM_{10} concentrations dropped and visibilities improved across Pima and Pinal counties (Figure 3-10). Heavy rain fell in parts of the Tucson area as the thunderstorms moved through; however, the rain did not begin until after the peak winds. Thus, the surface soils were still dry and were easily lofted by the strong winds preceding the rain. Please note that the radar beam from the NWS radar southeast of Tucson is effectively blocked by surrounding mountains. As a result, radar range and coverage are limited in some directions, especially west and southwest of the radar site.

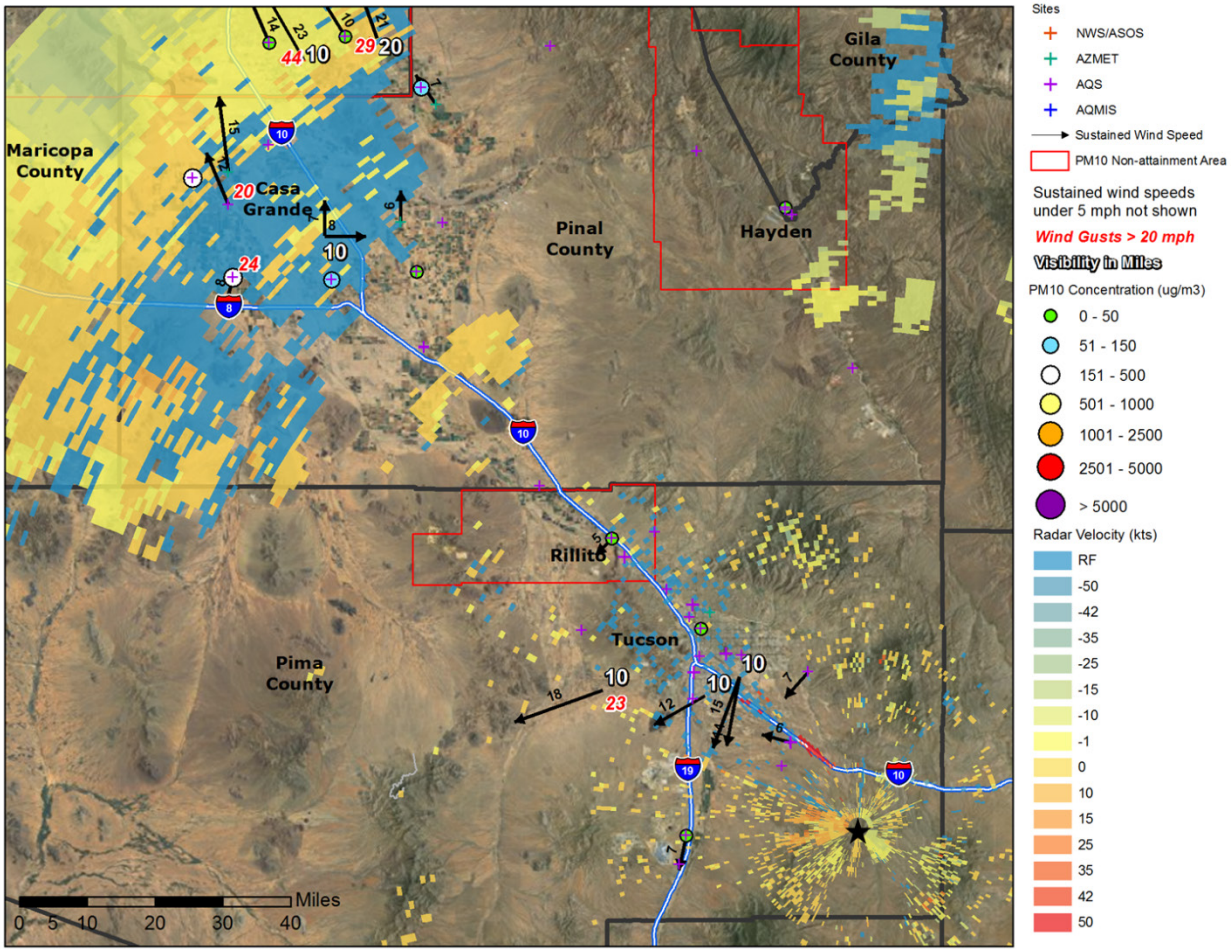


Figure 3-10. Observations at Pima and Pinal county monitors between 18:30 to 19:30 MST on May 9, 2012, of hourly PM_{10} concentrations (colored circles), wind speed and direction (arrows), maximum wind gusts, and minimum visibility (white numbers). Thunderstorms and their associated outflow diminished across southeastern Arizona, resulting in lighter winds, low PM_{10} concentrations, and normal visibilities in Pima and Pinal counties.

3.2 Summary

The information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM_{10} exceedance measured at the Rillito monitor on May 9, 2012. The PM_{10}, wind, visibility, and radar data shown in this section illustrate the spatial and temporal representation of the thunderstorm outflow and windblown dust as it impacted Tucson and Rillito. Widespread, gusty southerly winds likely lofted large amounts of dust and PM_{10} into the lower atmosphere. This dust likely originated in open desert areas south of Tucson near the thunderstorms responsible for the strong winds, and this dust was transported into Tucson, Rillito, and eastern Pinal County.

In addition, the time-series plots of air quality and meteorological data found in this section and in Appendix A show that the sharp increase in PM_{10} concentrations coincided with the onset of gusty southerly winds and low visibilities. Statements and storm reports issued by

the NWS office in Tucson also clearly indicate the presence of a hazardous dust storm moving through the Tucson metropolitan area.

4. Historical Norm

4.1 Analysis

PM_{10} concentrations measured at the Rillito monitor on May 9, 2012, were unusual and in excess of normal historical fluctuations. Time-series plots of the 24-hr average PM_{10} concentrations for the period January 1, 2008, through December 31, 2012, provide a historical perspective of PM_{10} concentrations at Rillito (**Figure 4-1**). The PM_{10} concentrations measured on May 9, 2012, were some of the highest hourly and 24-hr averages measured over the last five years, with hourly concentrations exceeding 1,000 $\mu g/m^3$. Please note that prior to April 1, 2010, the Rillito monitor operated on a one-in-six day schedule.

Historical daily cumulative distributions of the 24-hr average PM_{10} concentrations were created for the Rillito monitor for the same five year data set to provide additional evidence in establishing the severity of this event. **Figure 4-2** shows a histogram of 24-hr average PM_{10} concentrations at the Rillito monitor and the corresponding 95th percentile. The 24-hr average PM_{10} concentration on May 9, 2012, was more than two times higher than the 95th percentile at the Rillito monitor. Concentrations in excess of the 95th percentile are considered to be unusual.[3]

4.2 Summary

Given the recorded values and using similar methodology to the one accepted by EPA, it is clear that the PM_{10} concentrations observed at the Rillito monitor on May 9, 2012, were well above normal historical fluctuations. This analysis provides evidence that the event affected air quality on a historic scale.

[3] Excluding days on which concentrations caused by exceptional events exceed the 95th percentile threshold employs a general test of statistical significance and has the effect of ensuring that such concentrations would clearly fall beyond the range of normal expectations for air quality during a particular time of year. Source: "The Treatment of Data Influenced by Exceptional Events," 71 FR 12598.

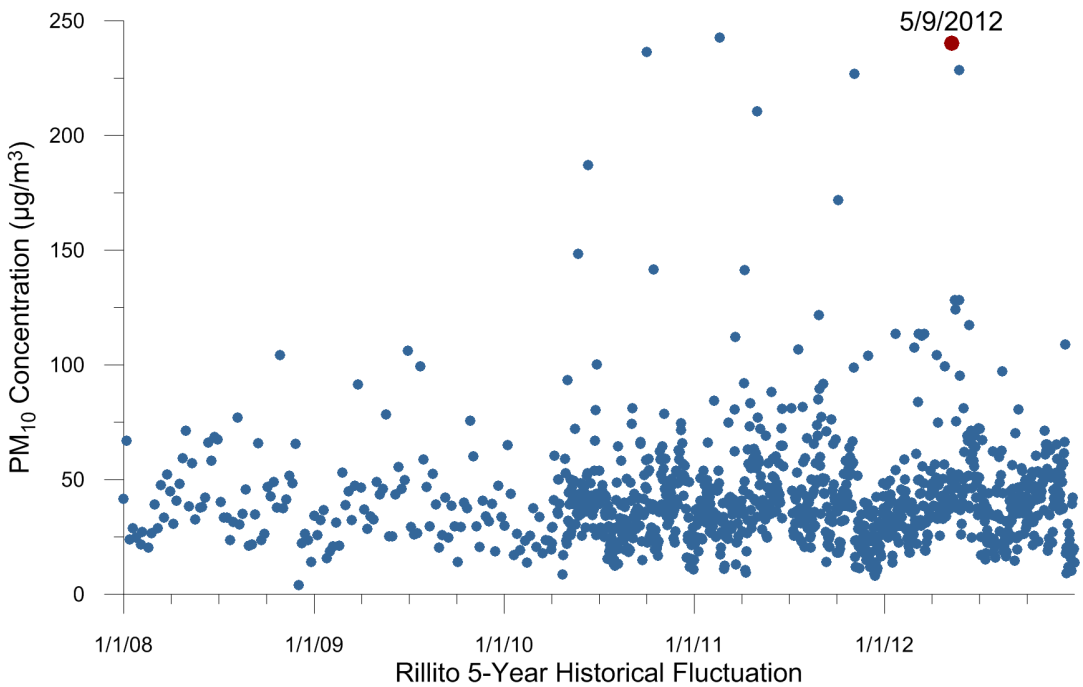


Figure 4-1. Scatter plot of the 24-hr average PM_{10} concentrations at the Rillito monitor for 2008-2012. The 24-hr average PM_{10} concentration on May 9, 2012, is highlighted in red. Prior to April 1, 2010, the Rillito monitor operated on a 1-in-6 day schedule.

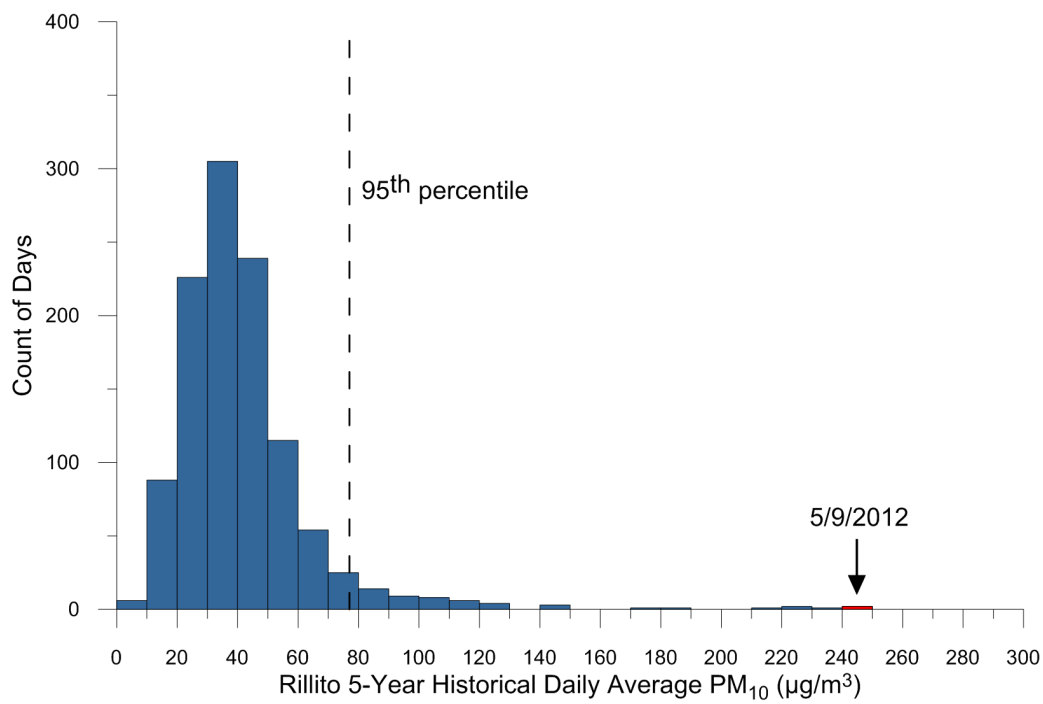


Figure 4-2. Bar graph of the 24-hr average PM_{10} concentrations at the Rillito monitor for 2008–2012. The 24-hr average PM_{10} concentration on May 9, 2012, was in excess of the 95th percentile. The value is also above the 95th percentile when considering only the continuous data since April 1, 2010.

5. Not Reasonably Controllable or Preventable

5.1 Background

Rillito was designated as a moderate PM_{10} nonattainment area by operation of the 1990 CAA. In 2006, following several years of improved air quality, EPA determined that the RNA had met the PM_{10} NAAQS and issued a clean data finding for the RNA. EPA's Clean Data Policy relieves the state of Arizona from certain demonstrations of attainment because qualifying for a clean data finding indicates that attainment has already been achieved. This section of the exceptional events demonstration describes the RACM implemented to bring the RNA into attainment and maintain attainment status.

5.1.1 Control Measures

Details of the RACM implemented in the RNA can be found in the *2008 RNA PM_{10} LMP and Request for Redesignation to Attainment*. The 1994 SIP submitted to EPA contained a series of control measures designed to mitigate PM_{10} emissions. Since then, the RNA has become more urbanized and less agricultural. Thus, some of the control measures included in the 1994 SIP have been discontinued or were one-time actions. **Table 5-1** provides the status of these measures.

Table 5-1. Status of control measures implemented in the RNA from the 1994 Rillito PM_{10} SIP.

Control Measure	Details	Current Status
1. CalPortland cement plant and quarry operations	Comprehensive road stabilization plan to mitigate emissions.	In effect, included in the CPC operating permit issued October 7, 2003
2. Pima County Grading Ordinance, Chapter 18.81 of the Pima County Zoning Code (January 2001)	Permits for earth moving require stabilization to mitigate fugitive emissions.	In effect
3. Bank stabilization of the Santa Cruz River	One-time control measure implemented in 1988 during the development of nearby residential neighborhoods.	Complete
4. Reduced tillage program	United States Department of Agriculture (DOA) pilot program.	Discontinued by U.S. DOA
5. Dust stabilization – Rillito community	Approximately one mile total of dirt road segments within the community are now paved.	Complete
6. Avra Valley road shoulder dust stabilization	Once per year, 2.5 miles of road shoulders undergo blading and rolling, followed by application of magnesium chloride.	In effect on an as-needed basis

The implementation of these control measures helped bring the RNA into timely attainment of the 24-hr standard; thus, the measures meet the CAA requirement for RACM for moderate PM_{10} nonattainment areas. In addition to these RACM, the Arizona Department of Transportation's (ADOT) Standard Specification Section 810 mandates that state contractors use a comprehensive series of control measures designed to mitigate airborne PM_{10} emissions during road construction projects.

5.1.2 Permanent and Enforceable Control Measures

The CAA requires that all types of maintenance plans demonstrate that measures credited with bringing an area into attainment are federally enforceable and continue into the future. Measures 1, 2, and 6 in Table 5-1 meet these requirements. Measure 4 was discontinued by the U.S. DOA and was not replaced, and measures 3 and 5 are no longer necessary because the affected public roadways have since been paved.

New major emissions sources or major modifications to existing sources in nonattainment areas are subject to AAC R18-2-403 (*Permits for Sources Located in Nonattainment Areas*). After an area is redesignated, AAC R18-2-406 (*Permit Requirements for Sources Located in Attainment and Unclassifiable Areas*) will apply for any major source(s) within the maintenance area.

5.1.3 Contingency Measures

Section 175A of the CAA requires a maintenance plan's contingency provisions to be enacted should a violation of the PM_{10} standard occur following redesignation to attainment. EPA's memo, *Limited Maintenance Plan Option for Moderate PM_{10} Nonattainment Areas* (Lydia Wegman, August 9, 2001),[4] states that contingency measures do not have to be fully adopted at the time of redesignation, but that the LMP should identify measures to be implemented if necessary.

The state commits to act promptly if an exceedance of the area's design value occurs following redesignation to attainment. Specifically, the state commits to determine that an exceedance has occurred within six months of the end of the calendar year in which that exceedance occurred. The state also commits to identify and implement the appropriate control measure(s) needed to remedy the situation by the end of the same calendar year.

A redesignated area with an LMP is also required to annually recalculate the average design value for the area to determine whether the area has continued to qualify for an LMP. If, after performing the annual recalculation, the state determines that the area no longer qualifies for an LMP, the state will commit to take actions to reduce PM_{10} concentrations sufficiently to requalify for an LMP, or will prepare a Maintenance Plan.

[4] The EPA memo regarding the LMP option for Moderate PM_{10} Nonattainment Areas can be found at http://www.epa.gov/ttn/oarpg/t1/memoranda/lmp_final.pdf.

5.1.4 Contingency Measure Trigger

The state will consider implementing the contingency measures featured in **Table 5-2** should an exceedance of the critical design value (CDV) occur. In order to prevent an exceedance from occurring, ADEQ opted to identify a specific indicator, or trigger, if PM_{10} concentrations reach a level that signals an imminent exceedance. The trigger will be used by ADEQ to determine the need to implement contingency measures in order to prevent an exceedance.

Table 5-2. Rillito area contingency control measures.

Contingency Control Measure	Implementing Entity
1. If any PM_{10} generating source within the maintenance area is found to be contributing to monitored readings above the LMP allowable limits, ADEQ will review existing air quality permits and/or applicable rules to identify additional control measures that may be needed. If a PM_{10} source does not have a permit, ADEQ will determine whether a permit and PM_{10} controls are needed.	ADEQ
2. Review and revise dust control measures for material storage piles to determine whether additional action is needed.	ADEQ
3. Pave any new unpaved public roads, vacant lots, and unpaved parking lots located in the PM_{10} maintenance area subject to limits of statutory authority.	Pima County
4. Review and, if necessary, revise existing grading ordinances.	Pima County
5. Reduce PM by paving or stabilizing unpaved or unimproved shoulders and alleys.	Pima County and Town of Marana
6. Review and, if necessary, revise standards for installation and maintenance of landscaping and screening.	Pima County
7. Review and, if necessary, revise roadway maintenance practices following exceptional events.	Pima County

Per the LMP submitted in 2008, contingency measures will be considered if ambient concentrations reach 95% of the CDV. The current CDV for the RNA is 135 $\mu g/m^3$. The causes that activated the trigger will help the state to determine the appropriate contingency measure(s) to be implemented. ADEQ believes that identifying a trigger, although not required, will increase protection of public health and help assure that the area continues to qualify for an LMP.

5.1.5 Conformity

The Transportation Conformity Rule (40 CFR Parts 51 and 93) and General Conformity Rule (58 FR 63214; November 30, 1993) apply to nonattainment areas and maintenance areas operating under maintenance plans. Under transportation conformity rules, one way to demonstrate conformity is to indicate that expected emissions from planned actions are

consistent with the emissions budget for the area. Emissions budgets in LMP areas can be treated as essentially non-constraining for the length of the maintenance period because it is unreasonable to expect that an LMP area would experience so much growth during that period of time that a violation of the PM_{10} NAAQS would result. This does not exempt an LMP area from the need to affirm conformity, but it does allow the area to demonstrate conformity without following certain requirements. For transportation conformity purposes, EPA would most likely conclude that emissions in these areas do not require a cap for the duration of the maintenance period and, therefore, that a regional emissions analysis will not be required.

General conformity requires that non-transportation-based projects in areas that have nonattainment or maintenance plans submit a description of the project to the state. The description must show either that the project will not increase the relevant emissions for the area, or that specific control measures will be applied for the duration of the project in order to prevent increased emissions.

5.1.6 Review of Source-Permitted Inspections and Public Complaints

ADEQ's Arizona Unified Repository for Information Tracking of the Environment (AZURITE) database was queried to compile a list of inspections for the permitted sources in the Rillito area around the time of the May 9, 2012, PM_{10} exceedance. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions.

5.2 Forecasts and Warnings

Dust forecasts were released prior to the event by both ADEQ and the NWS office in Tucson (Appendix B). The ADEQ Forecast issued on Tuesday, May 8, 2012, indicated that areas of dense blowing dust due to gusty thunderstorm outflows would be possible on Wednesday, May 9, 2012, especially for areas southeast of Phoenix. The NWS issued Short Term Forecasts and a Dust Storm Warning for the Tucson metropolitan area, including Rillito, during the time of the thunderstorm outflow event. The Dust Storm Warning indicated that wind gusts of up to 50 mph and visibilities below 0.25 miles were possible.

5.3 Wind Observations

Sustained wind speeds of up to 43 mph and wind gusts of up to 52 mph were reported at Tucson International Airport and Davis-Monthan AFB during this thunderstorm outflow event. A peak wind gust of 43 mph was reported at the Rillito monitor. Maximum sustained winds at the Rillito monitor only reached 19 mph, but wind reports at that monitor are averaged over hourly intervals. Wind speeds over shorter time durations can be much higher than the hourly average wind speeds during thunderstorm outflow events. Winds of over 25 mph are normally sufficient to overcome most PM_{10} control measures.

5.4 Summary

The weather forecasts and observations outlined in this section demonstrate that gusty southerly winds generated by nearby thunderstorms caused uncontrollable PM_{10} emissions. The RACM outlined in the Rillito PM_{10} Maintenance Plan were in place at the time of the event. These control measures are required for areas designated as Moderate non-attainment for PM_{10}, such as Rillito. Thus, the RACM in place at the time of the event were reasonable. In addition, surface wind measurements in the Rillito area during the event were high enough (winds gusts of over 25 mph) that most reasonable PM_{10} control measures would have been overwhelmed.

6. But-For Analysis

6.1 Discussion

Section 50.14(c)(3)(iv)(D) in 40 CFR Part 50 requires that an exceptional event demonstration satisfies that "[t]here would have been no exceedance or violation but for the event." The prior sections of this submittal have provided detailed information that, in regard to the PM_{10} exceedance at the Rillito monitor on May 9, 2012,

- The exceedance was not reasonably controllable or preventable, and
- There was a clear causal relationship between PM_{10} transported by strong southerly winds originating in desert areas outside the RNA and the measured PM_{10} exceedance in Rillito.

The weight of evidence in these sections demonstrates that, but for the existence of dust emissions generated by strong southerly winds associated with thunderstorm outflow and the associated transport of PM_{10}, there would have been no exceedance of the NAAQS for 24-hr average PM_{10}.

As shown in Section 3, time-series plots of PM_{10} and wind speeds establish a clear causal relationship between the arrival of dust-laden winds and elevated PM_{10} concentrations at the Rillito monitor. Multiple independent measurements of wind speed, wind direction, and visibility all point to the presence of southerly winds as the mechanism for transport of PM_{10} into the RNA. High PM_{10} concentrations and gusty winds were also reported in other parts of Arizona, illustrating the regional nature of this event. In addition, PM_{10} concentrations were well below the NAAQS on days immediately before and after the windblown dust event. The source regions for the PM_{10} are identified as open desert south of Tucson and the RNA. The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of May 9, 2012, to any causal source except PM_{10} transported by strong southerly winds, confirming that there would have been no exceedance but for the presence of these uncontrollable natural events.

As detailed in Section 5, all reasonable control measures were in place and/or implemented on a continual basis. Air quality-related inspection and compliance data revealed no violations or complaints within three days before and after the time of the event. Local regulatory agencies, industry, and the general public were alerted to the possibility of dust storms due to strong winds associated with thunderstorm outflows.

6.2 Summary

The weight of evidence presented in this submittal provides no alternative that could tie the exceedance of May 9, 2012, to any causal source except PM_{10} transported by strong southerly winds associated with thunderstorm outflow, confirming that there would have been no exceedance but for the presence of these uncontrollable natural events.

7. Conclusions

The PM_{10} exceedance that occurred on May 9, 2012, satisfies the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

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

7.1 Affects Air Quality

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

7.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that, despite reasonable control measures in place within the RNA, high winds overwhelmed all reasonably available controls. The PM_{10} exceedance discussed in this report was caused by naturally occurring southerly winds that transported dust into Rillito from areas largely outside the RNA. The strong winds were due to outflow from strong thunderstorms south of the RNA. These facts provide strong evidence that the PM_{10} exceedance on May 9, 2012, was not reasonably controllable or preventable.

7.3 Natural Event

As discussed above, the PM_{10} exceedance in Rillito on May 9, 2012, was shown to be caused by transport of PM_{10} into Rillito by strong southerly winds associated with thunderstorm outflow. The event therefore qualifies as a natural event.

7.4 Clear Causal Relationship

The following points demonstrate that the high PM_{10} concentrations were caused by windblown dust:

- Time-series of PM_{10} concentrations show that the timing of high PM_{10} at the Rillito monitor was consistent with gusty winds and low visibilities at Rillito-area meteorological stations (Section 3).
- High PM_{10} concentrations and gusty winds were reported at other monitors in southern Arizona, illustrating the regional, uncontrollable nature of this event (Section 3).
- Haze and dust were reported at Tucson International Airport and dust was observed at the NWS Tucson office during the period of high PM_{10} concentrations and strong winds (Section 3).
- PM_{10} concentrations were well below the NAAQS on days immediately before and after the windblown dust event (Section 3).
- Dry conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by high winds (Section 3).

7.5 Historical Norm

The 24-hr average PM_{10} values measured at the Rillito monitor were historically unusual compared to a multi-year data set (Section 4).

7.6 Not Reasonably Preventable

PM_{10} control and prevention measures were in place in the RNA at the time of the event. Measured wind speeds and wind gusts were of sufficient strength to overcome reasonable control measures (Section 5).

7.7 But For

On the basis of the weight of evidence described above and in Section 6, the exceedance of the federal 24-hr PM_{10} standard on May 9, 2012, at the Rillito monitor would not have occurred but for the period of strong, thunderstorm driven southerly winds that transported dust from open desert areas south of Rillito into the RNA.

Appendix A: Air Quality and Meteorological Data for the Rillito Area

This section contains time-series of air quality and meteorological data for Rillito and other regional monitors on May 9 and 10, 2012. The data show a regionwide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations.

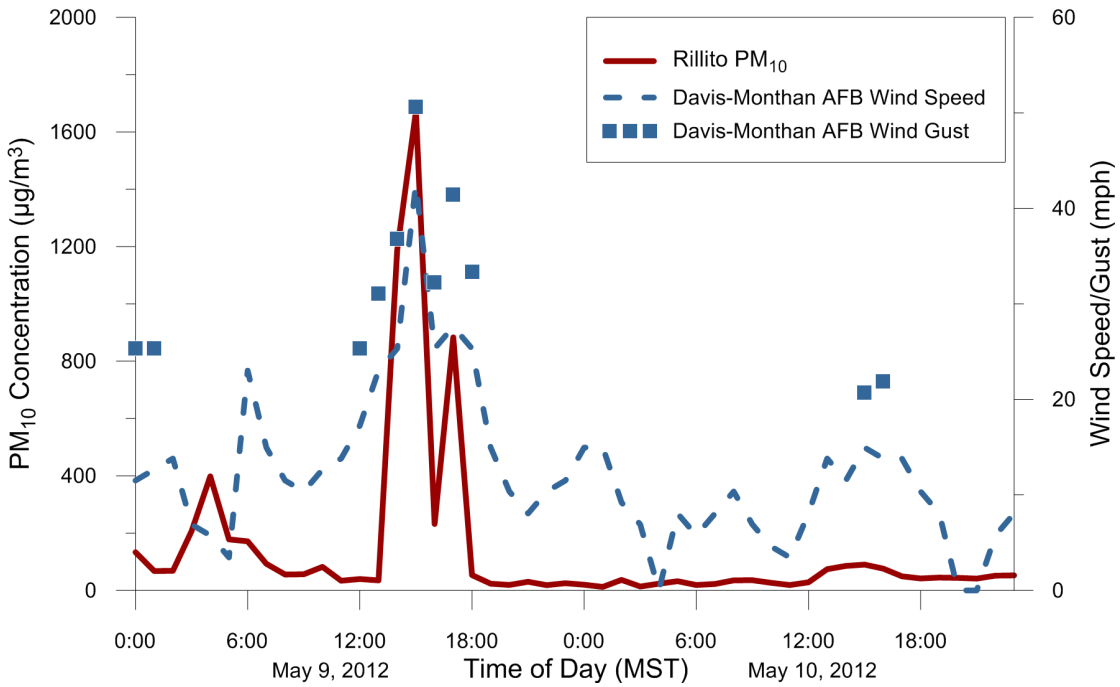


Figure A-1. Hourly PM_{10} concentrations at the Rillito monitor and wind speeds at Davis-Monthan AFB on May 9 and 10, 2012. PM_{10} concentrations sharply increased in coincidence with a sharp increase in wind speeds at 14:00 MST on May 9, indicating the presence of windblown dust.

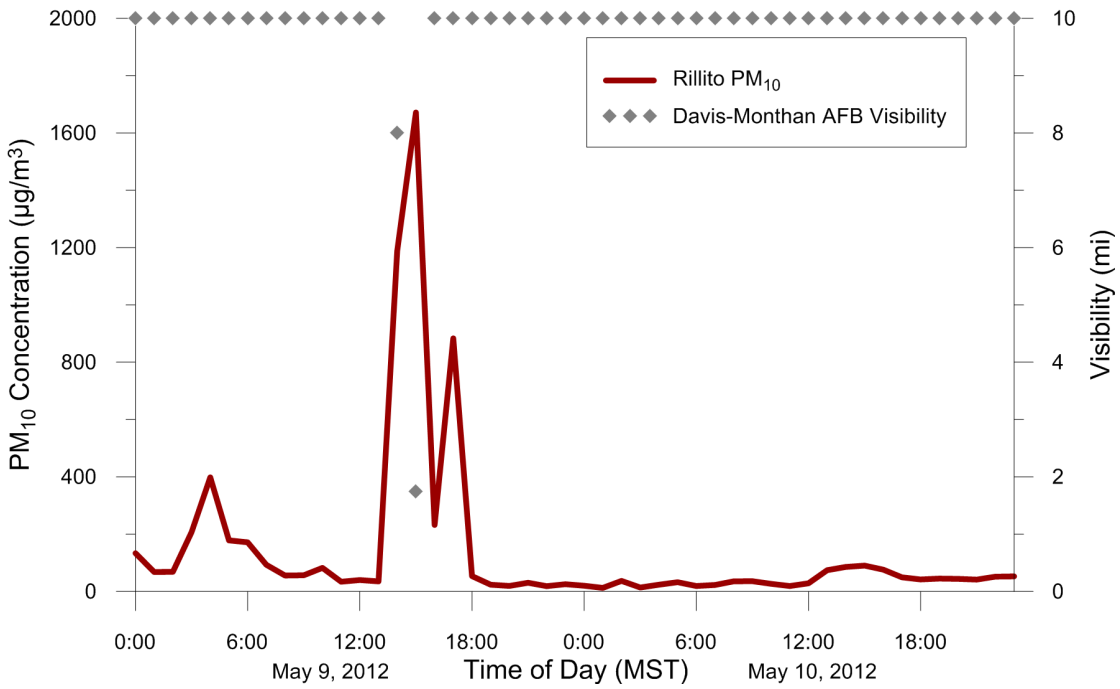


Figure A-2. Hourly PM_{10} concentrations at the Rillito monitor and visibilities at Davis-Monthan AFB on May 9 and 10, 2012. PM_{10} concentrations sharply increased and visibilities decreased at 14:00 MST on May 9, indicating the presence of windblown dust.

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
TUCSON INTERNATIONAL AIRPORT (23160)
TUCSON, AZ (05/09/2012)

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

Elevation: 2549 ft. above sea level
Latitude: 32.131
Longitude: -110.955

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	0006	11	SCT027	10.00		73	23.0	54	12.2	37	3.0	27	20	100	25	27.23			M	SP		29.89
09	0053	11	CLR	10.00		72	22.2	54	12.2	38	3.3	29	15	090	21	27.23			29.76	AA		29.89
09	0153	11	CLR	10.00		72	22.2	55	12.9	41	5.0	33	16	100		27.23	1	008	29.76	AA		29.89
09	0253	11	CLR	10.00		71	21.7	55	12.6	41	5.0	34	6	090	16	27.24			29.76	AA		29.90
09	0353	11	CLR	10.00		70	21.1	54	12.4	41	5.0	35	11	110	23	27.23			29.76	AA		29.89
09	0453	11	CLR	10.00		68	20.0	54	12.0	41	5.0	38	7	160		27.23	8	002	29.76	AA		29.89
09	0553	11	CLR	10.00		69	20.6	54	12.4	42	5.6	38	17	120	24	27.24			29.77	AA		29.90
09	0653	11	CLR	10.00		71	21.7	55	12.9	42	5.6	35	20	110	28	27.26			29.79	AA		29.92
09	0753	11	CLR	10.00		73	22.8	56	13.3	42	5.6	33	15	100		27.27	3	016	29.81	AA		29.94
09	0853	11	CLR	10.00		76	24.4	57	13.9	42	5.6	30	20	110	31	27.28			29.82	AA		29.95
09	0953	11	CLR	10.00		76	24.4	57	13.7	41	5.0	29	11	090	18	27.28			29.83	AA		29.95
09	1053	11	CLR	10.00		80	26.7	59	14.8	42	5.6	26	9	080	20	27.27	8	002	29.80	AA		29.93
09	1153	11	CLR	10.00		78	25.6	58	14.4	42	5.6	28	9	050	21	27.26			29.80	AA		29.92
09	1253	11	SCT095 BKN110	10.00		78	25.6	53	11.6	27	-2.8s	15	26	120	41	27.26			29.80	AA		29.92
09	1353	11	CLR	10.00		80	26.7	55	12.8	32	0.0	17	9	100		27.23	8	015	29.76	AA		29.89
09	1421	11	FEW016	4.00	HZ	73	23.0	54	12.2	37	3.0	27	30	180	37	27.28			M	SP		29.95
09	1423	11	FEW016	0.50	DS	72	22.0	54	12.4	39	4.0	30	28	190	44	27.28			M	SP		29.95
09	1429	11	VV009	0.50	DS	70	21.0	55	12.9	43	6.0	38	38	200	52	27.28			M	SP		29.95
09	1442	11	BKN011	2.00	DS	70	21.0	54	12.4	41	5.0	35	43	190	52	27.29			M	SP		29.96
09	1451	11	BKN011	5.00	DS	70	21.0	54	12.4	41	5.0	35	34	190	49	27.29			M	SP		29.96
09	1453	11	BKN011	5.00	DS	70	21.1	54	12.4	41	5.0	35	32	190	47	27.29			29.85	AA		29.96
09	1530	11	FEW011	8.00	DU	68	20.0	53	11.5	39	4.0	35	31	200	46	27.27			M	SP		29.94
09	1553	11	CLR	10.00	DU	71	21.7	54	12.2	39	3.9	31	31	190	40	27.30			29.86	AA		29.97
09	1653	11	SCT100	10.00		68	20.0	54	12.2	42	5.6	39	25	110	32	27.34	3	016	29.91	AA		30.01
09	1700	11	SCT100	10.00		68	20.0	54	12.4	43	6.0	41	28	120	34	27.35	3	016	29.91	SP	T	30.02
09	1753	11	FEW033	10.00		63	17.2	52	11.3	43	6.1	48	22	120	32	27.32			29.90	AA		29.99
09	1853	11	CLR	10.00		64	17.8	52	11.3	42	5.6	45	11	060		27.28			29.85	AA		29.95
09	1953	11	CLR	10.00		63	17.2	52	11.0	42	5.6	46	7	160		27.30	5	012	29.87	AA		29.97
09	2053	11	CLR	10.00		63	17.2	52	11.3	43	6.1	48	8	170		27.30			29.86	AA		29.97
09	2153	11	CLR	10.00		62	16.7	52	11.3	44	6.7	52	5	VR		27.29			29.85	AA		29.96
09	2253	11	CLR	10.00		61	16.1	52	11.3	45	7.2	56	11	140		27.27	8	010	29.83	AA		29.94
09	2353	11	CLR	10.00		61	16.1	52	11.0	44	6.7	54	11	120		27.28			29.85	AA		29.95

Figure A-3. Quality-controlled local climatological data hourly observations table for Tucson International Airport, Tucson, Arizona (05/09/2012). Note in the Weather Type column that haze (HZ), dust storm (DS), and dust (DU) were reported during the afternoon hours coincident with strong winds and low visibilities, indicating the presence of windblown dust. Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
DAVIS-MONTHAN AFB AIRPORT (23109)
TUCSON, AZ (05/09/2012)

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

Elevation: 2704 ft. above sea level
Latitude: 32.166
Longitude: -110.883

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp (F)	Dry Bulb Temp (C)	Wet Bulb Temp (F)	Wet Bulb Temp (C)	Dew Point Temp (F)	Dew Point Temp (C)	Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	0055	0	CLR	10.00		71	21.7	54	12.0	38	3.6	30	13	070	25	27.07			29.71	AA		29.88
09	0155	0	CLR	10.00		71	21.6	54	12.4	40	4.4	33	14	060		27.06	0	001	29.70	AA		29.87
09	0255	0	CLR	10.00		70	21.2	54	12.2	40	4.5	34	7	VR		27.06			29.70	AA		29.87
09	0355	0	CLR	10.00		69	20.5	54	11.9	40	4.7	35	6	040		27.05			29.71	AA		29.86
09	0455	0	CLR	10.00		69	20.3	54	11.9	40	4.6	35	3	060		27.05	8	002	29.70	AA		29.86
09	0555	0	CLR	10.00		68	20.1	54	11.9	41	5.2	38	23	110		27.07			29.73	AA		29.88
09	0655	0	CLR	10.00		70	21.3	55	12.6	42	5.5	36	15	110		27.09			29.75	AA		29.90
09	0755	0	CLR	10.00		73	22.6	56	13.3	42	5.3	33	11	090		27.10	1	016	29.76	AA		29.91
09	0855	0	CLR	10.00		75	24.0	56	13.5	41	5.2	30	10	060		27.11			29.78	AA		29.92
09	0955	0	FEW170 SCT190	10.00		75	24.1	57	13.7	42	5.6	31	13	040		27.13			29.80	AA		29.94
09	1055	0	SCT140 SCT170 SCT200	10.00		78	25.5	58	14.3	42	5.5	28	14	050		27.11	0	002	29.77	AA		29.92
09	1155	0	FEW130 SCT190	10.00		77	25.1	58	14.4	43	6.0	30	17	060	25	27.09			29.75	AA		29.90
09	1255	0	FEW130	10.00		76	24.7	53	11.6	30	-0.9	18	23	110	31	27.09			29.76	AA		29.90
09	1355	0	FEW140 SCT190	10.00		81	27.0	55	12.8	31	-0.6	16	25	060	32	27.05	8	018	29.71	AA		29.86
09	1429	0	FEW006 SCT160 SCT210	8.00		75	24.0	56	13.5	41	5.0	30	21	190	37	27.11			29.79	AA	0.49	29.92
09	1434	0	SCT006 SCT160 BKN210	2.50	HZ	70	21.0	54	12.4	41	5.0	35	32	200	40	27.12			29.80	AA	0.49	29.93
09	1436	0	SCT006 SCT160 BKN210	2.00	HZ	70	21.0	54	12.0	39	4.0	32	40	200	48	27.13			29.82	AA	0.49	29.94
09	1437	0	SCT006 SCT160 BKN210	1.75	HZ	70	21.0	54	12.0	39	4.0	32	43	200	51	27.13			29.82	AA	0.49	29.94
09	1442	0	FEW006	2.00	HZ	68	20.0	54	11.9	41	5.0	38	36	200	51	27.13			29.83	AA	0.49	29.94
09	1445	0	FEW006	2.50	HZ	68	20.0	54	12.0	41	5.0	38	32	200	51	27.14			29.83	AA	0.49	29.95
09	1447	0	FEW006	3.00	HZ	68	20.0	54	11.9	41	5.0	38	31	190	51	27.13			29.82	AA	0.49	29.94
09	1455	0	FEW006	5.00	HZ	68	20.0	53	11.7	40	4.7	36	33	190	43	27.13			29.82	AA	0.49	29.94
09	1555	0	CLR	10.00		69	20.7	54	12.0	40	4.6	35	25	180	32	27.16			29.85	AA	0.53	29.97
09	1647	0	FEW090	10.00	-RA	66	19.0	55	12.5	45	7.0	47	26	110	41	27.18			29.90	AA	0.02	30.00
09	1655	0	FEW090	10.00	-RA	65	18.1	55	12.7	47	8.2	52	28	110	38	27.18	1	045	29.91	AA	0.02	30.00
09	1739	0	CLR	10.00		61	16.0	52	11.3	45	7.0	56	25	110	33	27.18			29.91	AA	0.01	30.00
09	1755	0	CLR	10.00		61	16.0	52	11.0	44	6.4	54	25	110	33	27.16			29.88	AA	0.01	29.98
09	1850	0	FEW160	10.00		63	17.0	52	11.3	43	6.0	48	15	020		27.12			29.83	AA		29.93
09	1855	0	FEW160	10.00		62	16.4	51	10.8	42	5.8	48	14	010		27.12			29.83	AA		29.93
09	1955	0	CLR	10.00		62	16.5	52	11.0	43	5.9	50	10	080		27.15	5	014	29.85	AA		29.96
09	2055	0	CLR	10.00		60	15.7	51	10.5	43	6.1	54	8	150		27.14			29.84	AA		29.95
09	2155	0	CLR	10.00		60	15.5	52	11.1	45	7.0	58	10	140		27.14			29.84	AA		29.95
09	2255	0	CLR	10.00		60	15.3	52	11.1	45	7.2	58	11	130		27.11	8	012	29.81	AA		29.92
09	2355	0	CLR	10.00		60	15.3	52	10.8	44	6.9	56	15	120		27.13			29.83	AA		29.94

Figure A-4. Quality-controlled local climatological data hourly observations table for Davis-Monthan AFB, Tucson, Arizona (05/09/2012). Note in the Weather Type column that haze (HZ) was reported during the afternoon hours coincident with strong winds and low visibilities, indicating the presence of windblown dust. Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

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

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA (final)
HOURLY OBSERVATIONS TABLE
CASA GRANDE MUNICIPAL ARPT (03914)
CASA GRANDE, AZ (05/09/2012)

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

Elevation: 1462 ft. above sea level
Latitude: 32.95
Longitude: -111.766
Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	0015	0	CLR	10.00		77	25.0	53	11.5	27	-3.0	16	13	060		28.29			M	AA		29.84
09	0035	0	CLR	10.00		77	25.0	54	12.0	30	-1.0	18	11	070	18	28.29			M	AA		29.84
09	0055	0	CLR	10.00		77	25.0	55	12.7	34	1.0	21	14	070		28.28			M	AA		29.83
09	0115	0	CLR	10.00		77	25.0	56	13.1	36	2.0	23	17	080		28.28			M	AA		29.83
09	0135	0	CLR	10.00		77	25.0	56	13.0	36	2.0	23	17	080	23	28.27			M	AA		29.82
09	0155	0	CLR	10.00		75	24.0	55	12.6	36	2.0	24	18	080		28.27	7	003	M	AA		29.82
09	0215	0	CLR	10.00		75	24.0	55	12.8	37	3.0	25	16	080	23	28.27			M	AA		29.82
09	0235	0	CLR	10.00		75	24.0	55	12.8	37	3.0	25	14	080		28.27			M	AA		29.82
09	0255	0	CLR	10.00		75	24.0	55	12.8	37	3.0	25	14	080		28.27			M	AA		29.81
09	0315	0	CLR	10.00		73	23.0	54	12.4	37	3.0	27	11	070		28.27			M	AA		29.81
09	0335	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	11	050		28.27			M	AA		29.82
09	0355	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	9	050		28.27			M	AA		29.82
09	0415	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	10	050		28.27			M	AA		29.82
09	0435	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	10	050		28.28			M	AA		29.83
09	0455	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	10	050		28.28	2	003	M	AA		29.83
09	0515	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	10	050		28.28			M	AA		29.83
09	0535	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	11	050		28.29			M	AA		29.84
09	0555	0	CLR	10.00		72	22.0	54	12.1	37	3.0	28	13	060		28.30			M	AA		29.85
09	0615	0	CLR	10.00		73	23.0	55	12.8	39	4.0	29	15	060		28.30			M	AA		29.85
09	0635	0	CLR	10.00		73	23.0	55	12.8	39	4.0	29	16	070		28.31			M	AA		29.86
09	0655	0	CLR	10.00		75	24.0	56	13.2	39	4.0	27	17	070		28.32			M	AA		29.87
09	0715	0	CLR	10.00		75	24.0	56	13.2	39	4.0	27	18	080		28.33			M	AA		29.88
09	0735	0	CLR	10.00		77	25.0	57	13.7	39	4.0	26	20	070		28.34			M	AA		29.89
09	0755	0	CLR	8.00		79	26.0	57	14.1	39	4.0	24	21	060		28.34	2	020	M	AA		29.89
09	0815	0	CLR	10.00		79	26.0	58	14.5	41	5.0	26	21	080	26	28.35			M	AA		29.90
09	0835	0	CLR	10.00		81	27.0	59	14.9	41	5.0	24	18	070	24	28.35			M	AA		29.90
09	0855	0	CLR	10.00		81	27.0	59	14.9	41	5.0	24	18	080		28.35			M	AA		29.90
09	0915	0	CLR	10.00		82	28.0	59	15.1	41	5.0	23	20	070		28.35			M	AA		29.90
09	0935	0	CLR	10.00		82	28.0	60	15.5	43	6.0	25	18	080	25	28.35			M	AA		29.90
09	0955	0	CLR	10.00		82	28.0	59	15.1	41	5.0	23	22	070	29	28.35			M	AA		29.90
09	1015	0	CLR	10.00		82	28.0	59	15.1	41	5.0	23	23	080	29	28.35			M	AA		29.90
09	1035	0	CLR	10.00		82	28.0	60	15.5	43	6.0	25	16	070	26	28.35			M	AA		29.90
09	1055	0	CLR	10.00		82	28.0	60	15.5	43	6.0	25	17	060		28.34	4	000	M	AA		29.89
09	1115	0	CLR	10.00		84	29.0	61	15.9	43	6.0	24	17	080	22	28.34			M	AA		29.89
09	1135	0	CLR	10.00		82	28.0	60	15.5	43	6.0	25	18	090	23	28.34			M	AA		29.89
09	1155	0	FEW060	10.00		82	28.0	60	15.5	43	6.0	25	18	100		28.33			M	AA		29.88
09	1215	0	FEW060	10.00		84	29.0	61	15.9	43	6.0	24	16	080	21	28.32			M	AA		29.87
09	1235	0	FEW060	10.00		86	30.0	61	16.3	43	6.0	22	14	070	23	28.31			M	AA		29.86

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
09	1255	0	CLR	10.00		84	29.0	61	15.9	43	6.0	24	15	090	22	28.30			M	AA		29.85
09	1315	0	CLR	10.00		84	29.0	61	15.9	43	6.0	24	13	080		28.29			M	AA		29.84
09	1335	0	CLR	10.00		86	30.0	62	16.7	45	7.0	24	17	080	22	28.28			M	AA		29.83
09	1355	0	CLR	10.00		84	29.0	61	15.9	43	6.0	24	13	080	20	28.27	7	024	M	AA		29.82
09	1415	0	CLR	10.00		86	30.0	61	15.9	41	5.0	20	10	050	18	28.27			M	AA		29.82
09	1435	0	CLR	10.00		88	31.0	61	16.3	41	5.0	19	13	080		28.27			M	AA		29.81
09	1455	0	CLR	10.00		88	31.0	61	15.9	39	4.0	18	7	120		28.25			M	AA		29.80
09	1515	0	CLR	10.00		88	31.0	61	16.3	41	5.0	19	0	000		28.25			M	AA		29.80
09	1535	0	FEW110	10.00		88	31.0	61	16.3	41	5.0	19	17	100	22	28.25			M	AA		29.79
09	1555	0	FEW110	10.00		88	31.0	60	15.5	37	3.0	16	17	090	26	28.25			M	AA		29.80
09	1615	0	CLR	2.50		81	27.0	60	15.3	43	6.0	26	29	190	32	28.27			M	AA		29.82
09	1635	0	CLR	2.00		79	26.0	58	14.5	41	5.0	26	30	170	41	28.28			M	AA		29.83
09	1655	0	FEW015	3.00		77	25.0	57	14.1	41	5.0	28	26	170	37	28.30	2	010	M	AA		29.85
09	1715	0	FEW120	10.00		75	24.0	56	13.2	39	4.0	27	18	170	30	28.32			M	AA		29.87
09	1735	0	BKN110	10.00		75	24.0	56	13.2	39	4.0	27	16	070	21	28.40			M	AA		29.95
09	1755	0	SCT095 BKN120	10.00		72	22.0	58	14.6	48	9.0	43	11	040	22	28.44			M	AA		29.99
09	1815	0	SCT055 BKN065	9.00		66	19.0	58	14.4	52	11.0	61	13	040		28.46			M	AA	0.03	30.01
09	1835	0	FEW036 BKN050 BKN065	10.00		64	18.0	58	14.5	54	12.0	70	0	000		28.43			M	AA	0.03	29.98
09	1855	0	FEW048 BKN110	10.00		64	18.0	59	14.8	55	13.0	73	8	270		28.41			M	AA	0.03	29.96
09	1915	0	FEW110	10.00		64	18.0	58	14.5	54	12.0	70	7	180		28.39			M	AA		29.94
09	1935	0	CLR	10.00		64	18.0	58	14.5	54	12.0	70	8	170		28.38			M	AA		29.93
09	1955	0	CLR	10.00		66	19.0	58	14.4	52	11.0	61	10	150		28.38	2	027	M	AA		29.93
09	2015	0	CLR	10.00		66	19.0	57	13.8	50	10.0	57	14	140		28.36			M	AA		29.91
09	2035	0	CLR	10.00		66	19.0	55	12.8	46	8.0	49	10	130		28.36			M	AA		29.91
09	2055	0	CLR	10.00		66	19.0	55	12.8	46	8.0	49	9	110		28.34			M	AA		29.89
09	2115	0	CLR	10.00		66	19.0	56	13.3	48	9.0	52	7	100		28.35			M	AA		29.90
09	2135	0	CLR	10.00		64	18.0	55	12.9	48	9.0	56	9	080		28.35			M	AA		29.90
09	2155	0	CLR	10.00		64	18.0	55	12.9	48	9.0	56	8	050		28.35			M	AA		29.90
09	2215	0	CLR	10.00		63	17.0	56	13.2	50	10.0	63	7	070		28.34			M	AA		29.89
09	2235	0	CLR	10.00		64	18.0	57	14.0	52	11.0	65	6	090		28.35			M	AA		29.90
09	2255	0	CLR	10.00		63	17.0	57	13.7	52	11.0	68	0	000		28.36	7	007	M	AA		29.91
09	2315	0	CLR	10.00		64	18.0	57	14.0	52	11.0	65	7	120		28.35			M	AA		29.90
09	2335	0	CLR	10.00		64	18.0	57	14.0	52	11.0	65	5	130		28.34			M	AA		29.89
09	2355	0	CLR	10.00		63	17.0	57	13.7	52	11.0	68	0	000		28.35			M	AA		29.90

Figure A-5. Quality-controlled local climatological data hourly observations table for Casa Grande Municipal Airport, Casa Grande, Arizona (05/09/2012). Note that strong winds and reduced visibilities were reported from 16:15 to 18:15 MST, indicating the presence of windblown dust. Dynamically generated via http://cdo.ncdc.noaa.gov/qclcd/QCLCD.

Appendix B:
ADEQ and NWS Forecasts and Advisories

ADEQ
Arizona Department of Environmental Quality

AQI AIR QUALITY INDEX

200
150
100
50

VERY UNHEALTHY (201-300)

UNHEALTHY (151-200)

UNHEALTHY FOR SENSITIVE GROUPS (101-150)

MODERATE (51-100)

GOOD (0-50)

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

LINK TO 2012 AIR POLLUTION EXCEEDANCE GRAPH

AIR QUALITY FORECAST FOR WEDNESDAY, MAY 09, 2012

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

FORECAST DATE NOTICES (*SEE BELOW FOR DETAILS) AIR POLLUTANT	YESTERDAY MON 05/07/2012 NONE Highest AQI Reading/Site (Preliminary data only)	TODAY TUE 05/08/2012 OZONE HEALTH WATCH	TOMORROW WED 05/09/2012 OZONE HEALTH WATCH EXTENSION DUST	EXTENDED THU 05/10/2012 OZONE HEALTH WATCH LIKELY OZONE HIGH POLLUTION ADVISORY POSSIBLE
O3*	87 TONTO NATIONAL MONUMENT	97 MODERATE	90 MODERATE	100 MODERATE
CO*	06 GREENWOOD	06 GOOD	06 GOOD	10 GOOD
PM-10*	52 BUCKEYE	41 GOOD	75 MODERATE	53 MODERATE
PM-2.5*	30 DURANGO	36 GOOD	41 GOOD	38 GOOD

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

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

Health message for Tuesday May 08: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Health message for Wednesday May 09: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Synopsis and Discussion

TODAY'S AN OZONE HEALTH WATCH HAS BEEN EXTENDED THRU WEDNESDAY MAY 09

OZONE: A weak upper level low in the southern branch of the mid-latitude storm track is currently located near Yuma and is forecast to migrate west to east over northern Mexico during the next 48 hours. Per the most recent Sky Harbor ACARS sounding data, winds at and above the 5K' level over the Valley have already become northeast to easterly due to the cyclonic (counter-clockwise) circulation around this feature. This type of wind regime often accompanies/contributes to local high ozone levels by inhibiting dispersion of the ozone plume. An even more pronounced easterly wind regime is forecast for Wednesday – in fact, surface winds will likely start out rather gusty with good ozone dispersion but then decrease or become light during the afternoon. In addition, persistent cloud cover may inhibit ozone formation and outflow winds from distant thunderstorms during the late afternoon and evening could also intervene. However, there is enough uncertainty at this point to argue for a continuation of today's Ozone Health Watch thru tomorrow. There are signs that some transport of additional ozone and/or its precursors from the west will begin on Thursday so additional health statements are possible.

PARTICLES: The weather pattern described above is forecast to draw enough moisture over Arizona by Wednesday to produce a few thunderstorms over the higher terrain east and southeast of the Phoenix metro area. For the Valley this means the potential for strong and gusty outflow winds and an increased risk for dense blowing dust – mainly over the east and southeast portions. Thus higher PM-10 (coarse particle) levels are possible on Wednesday.

MONITORING SITE MAPS: STATIC MAP - http://www.azdeq.gov/environ/air/monitoring/images/map.jpg
INTERACTIVE MAPS - http://156.42.96.39/alert/Google/air.html
http://www.airnow.gov/

POLLUTION MONITOR READINGS FOR MONDAY, MAY 07, 2012

O3 (OZONE)

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

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Alamo Lake (La Paz County)	67	74	
Apache Junction (Pinal County)	62	58	
Blue Point	69	80	
Buckeye	59	50	
Casa Grande (Pinal County)	62	58	
Cave Creek	69	80	
Central Phoenix	62	58	
Dysart	58	49	
Falcon Field	NOT AVBL	NOT AVBL	NOT AVBL
Fountain Hills	66	71	
Glendale	64	64	
Humboldt Mountain	69	80	
North Phoenix	68	77	
Phoenix Supersite	63	61	
Pinal Air Park (Pinal County)	66	71	
Pinnacle Peak	NOT AVBL	NOT AVBL	NOT AVBL
Queen Valley (Pinal County)	68	77	
Rio Verde	58	49	
South Phoenix	65	67	
South Scottsdale	62	58	
Tempe	60	51	
Tonto Nat'l Mon. (Gila County)	71	87	
West Chandler	63	61	
West Phoenix	64	64	
Yuma (Yuma County)	63	61	

ADEQ
Arizona Department of Environmental Quality

MARICOPA COUNTY DUST CONTROL FORECAST

ISSUED TUESDAY, MAY 08, 2012

Five-day weather outlook:

A weak upper level low in the southern branch of the mid-latitude storm track is currently located near Yuma and is forecast to migrate west to east over northern Mexico during the next 48 hours. The cyclonic (counter-clockwise) circulation around this feature is expected to transport sufficient moisture over Arizona by Wednesday to produce a few thunderstorms over the higher terrain east and southeast of the Phoenix metro area. For the Valley this means the potential for strong and gusty outflow winds and an increased risk for dense blowing dust – mainly over the east and southeast portions. This has led to the posting of a MODERATE risk for unhealthy PM-10 levels for Wednesday. A typical westerly wind regime will resume by Thursday afternoon with a low risk thru the weekend.

R I S K F A C T O R S

	WINDS		STAGNATION		UNHEALTHY PM-10 RISK LEVEL
Day 1: Wed 05/09/2012	East to southeasterly 10-20 mph except strong and gusty due to outflow from thunderstorms.	+	Somewhat stagnant during the morning hours.	=	MODERATE
Day 2: Thu 05/10/2012	East to southeasterly 5-15 mph during the morning hours becoming westerly during the afternoon.	+	Somewhat stagnant during the morning hours.	=	LOW
Day 3: Fri 05/11/2012	Southwest to westerly 10-20 mph during the afternoon.	+	Somewhat stagnant during the morning hours.	=	LOW
EXTENDED OUTLOOK					
Day 4: Sat 05/12/2012	Westerly 10-20 mph during the afternoon.	+	Somewhat stagnant during the morning hours.	=	LOW
Day 5: Sun 05/13/2012	Westerly 10-20 mph during the afternoon.	+	Somewhat stagnant during the morning hours.	=	LOW

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

CKR 04/28/2011

ADEQ
Arizona Department of Environmental Quality

GREEN VALLEY AND VICINITY
DUST RE-ENTRAINMENT RISK WIND FORECAST

ISSUED TUESDAY, MAY 08, 2012

Three-day weather outlook:

A weak upper level low in the southern branch of the mid-latitude storm track is currently located near Yuma and is forecast to migrate west to east over northern Mexico during the next 48 hours. The cyclonic (counter-clockwise) circulation around this feature is expected to transport sufficient moisture over southeast Arizona by Wednesday to produce a few thunderstorms in the Green Valley area. Thus the risk level for re-entrained dust due to strong gusty outflow winds has been increased to MODERATE for Wednesday.

	WINDS	RE-ENTRAINMENT RISK
Day #1: Wed 05/09/2012	No significant winds expected except strong and gusty due to outflow from thunderstorms.	MODERATE
Day #2: Thu 05/10/2012	No significant winds expected.	LOW
Day #3: Fri 05/11/2012	No significant winds expected.	LOW

PM-10 (COARSE PARTICLES):

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

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

Exposure reduction measures – During high-wind or other events that prompt a forecasted MODERATE or HIGH risk of transported dust over the Green Valley area, sensitive persons should remain indoors and close windows and doors.

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

CKR 02/11/2010

National Weather Service Tucson Forecast Products

HAZARDOUS WEATHER OUTLOOK
NATIONAL WEATHER SERVICE TUCSON AZ
847 PM MST TUE MAY 8 2012

AZZ503>514-092200-
UPPER SANTA CRUZ RIVER VALLEY/ALTAR VALLEY-TUCSON METRO AREA-
SOUTH CENTRAL PINAL COUNTY-SOUTHEAST PINAL COUNTY-
UPPER SAN PEDRO RIVER VALLEY-
EASTERN COCHISE COUNTY BELOW 5000 FEET-UPPER GILA RIVER VALLEY-
WHITE MOUNTAINS OF GRAHAM AND GREENLEE COUNTIES-
GALIURO AND PINALENO MOUNTAINS-CHIRICAHUA MOUNTAINS-
DRAGOON AND MULE AND HUACHUCA AND SANTA RITA MOUNTAINS-
CATALINA AND RINCON MOUNTAINS-
847 PM MST TUE MAY 8 2012

THIS HAZARDOUS WEATHER OUTLOOK IS FOR PORTIONS OF SOUTHEAST
ARIZONA.

.DAY ONE...TONIGHT

GUSTY OUTFLOWS FROM EARLIER THUNDERSTORMS EAST OF THE AREA WILL
PUSH ACROSS THE AREA THIS EVENING WITH A SLIGHT CHANCE OF SHOWERS
AND THUNDERSTORMS OVERNIGHT MAINLY ACROSS GRAHAM AND GREENLEE
COUNTIES.

.DAYS TWO THROUGH SEVEN...WEDNESDAY THROUGH MONDAY

EXPECT MORE WIDESPREAD THUNDERSTORM DEVELOPMENT WEDNESDAY
AFTERNOON AND EVENING. SOME STORMS WILL GENERATE STRONG GUSTY AND
POTENTIALLY DAMAGING WINDS. DRY LIGHTNING WILL BE
POSSIBLE...ESPECIALLY WITH EARLY THUNDERSTORM DEVELOPMENT. HOWEVER
BRIEF LOCALLY HEAVY RAINFALL WILL BE POSSIBLE BY MID TO LATE
WEDNESDAY AFTERNOON.

A FEW MAINLY MOUNTAIN THUNDERSTORMS POSSIBLE THURSDAY AFTERNOON. DRY
AND WARMER CONDITIONS EXPECTED AFTER THURSDAY.

.SPOTTER INFORMATION STATEMENT...

WEATHER SPOTTERS ARE ENCOURAGED TO REPORT SIGNIFICANT WEATHER
CONDITIONS ACCORDING TO STANDARD OPERATING PROCEDURES.

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE TUCSON AZ
1151 PM MST TUE MAY 8 2012

AZZ503-504-506>509-511>514-090900-
UPPER SANTA CRUZ RIVER VALLEY/ALTAR VALLEY-TUCSON METRO AREA-
SOUTHEAST PINAL COUNTY-UPPER SAN PEDRO RIVER VALLEY-
EASTERN COCHISE COUNTY BELOW 5000 FEET-UPPER GILA RIVER VALLEY-
GALIURO AND PINALENO MOUNTAINS-CHIRICAHUA MOUNTAINS-
DRAGOON AND MULE AND HUACHUCA AND SANTA RITA MOUNTAINS-
CATALINA AND RINCON MOUNTAINS-

INCLUDING...NOGALES...TUCSON...GREEN VALLEY...MARANA...VAIL...
MAMMOTH...ORACLE...SIERRA VISTA...BENSON...WILLCOX...DOUGLAS...
CLIFTON...SAFFORD...MOUNT GRAHAM...CHIRICAHUA NM...BISBEE...
CANELO HILLS...MADERA CANYON...MOUNT LEMMON...SUMMERHAVEN
1151 PM MST TUE MAY 8 2012

.NOW...
STRONG GUSTY OUTFLOW WINDS FROM EARLIER THUNDERSTORM ACTIVITY EAST
OF THE AREA WILL PUSH ACROSS THE AREA TONIGHT. EXPECT EASTERLY
WINDS OF 15 TO 30 MPH WITH LOCALLY HIGHER GUSTS. AREAS OF BLOWING
DUST MAY REDUCE VISIBILITIES BRIEFLY BELOW 1 MILE IN SOME LOCATIONS.

HAZARDOUS WEATHER OUTLOOK
NATIONAL WEATHER SERVICE TUCSON AZ
500 AM MST WED MAY 9 2012

AZZ503>514-100600-
UPPER SANTA CRUZ RIVER VALLEY/ALTAR VALLEY-TUCSON METRO AREA-
SOUTH CENTRAL PINAL COUNTY-SOUTHEAST PINAL COUNTY-
UPPER SAN PEDRO RIVER VALLEY-
EASTERN COCHISE COUNTY BELOW 5000 FEET-UPPER GILA RIVER VALLEY-
WHITE MOUNTAINS OF GRAHAM AND GREENLEE COUNTIES-
GALIURO AND PINALENO MOUNTAINS-CHIRICAHUA MOUNTAINS-
DRAGOON AND MULE AND HUACHUCA AND SANTA RITA MOUNTAINS-
CATALINA AND RINCON MOUNTAINS-
500 AM MST WED MAY 9 2012

THIS HAZARDOUS WEATHER OUTLOOK IS FOR PORTIONS OF SOUTHEAST ARIZONA.

.DAY ONE...TODAY AND TONIGHT

MOISTURE WILL CONTINUE TO INCREASE TODAY AS LOW PRESSURE MOVES
ACROSS SONORA MEXICO. EXPECT MORE WIDESPREAD SHOWER AND THUNDERSTORM
DEVELOPMENT THIS AFTERNOON AND EVENING. DRY LIGHTING WILL BE
POSSIBLE...ESPECIALLY WITH THE EARLY THUNDERSTORM DEVELOPMENT.
HOWEVER BRIEF LOCALLY HEAVY RAINFALL WILL BE POSSIBLE BY THE MID
TO LATE AFTERNOON HOURS INTO EARLY THIS EVENING. THUNDERSTORM
OUTFLOWS UP TO 50 MPH ARE POSSIBLE WITH THE STRONGEST CELLS WHICH
MAY PRODUCE AREAS OF BLOWING DUST...WHERE VISIBILITIES MAY BRIEFLY
DROP BELOW A HALF OF A MILE. ALL ACTIVITY WILL COME TO AN END BY
MIDNIGHT.

.DAYS TWO THROUGH SEVEN...THURSDAY THROUGH TUESDAY

NO HAZARDOUS WEATHER IS EXPECTED AT THIS TIME. A FEW SHOWERS AND
THUNDERSTORMS ARE POSSIBLE THURSDAY ACROSS GRAHAM...COCHISE AND
GREENLEE COUNTIES. ELSEWHERE ON THURSDAY IT WILL BE DRY.

MUCH WARMER TEMPERATURES ARE IN THE FORECAST FOR THIS WEEKEND INTO
EARLY NEXT WEEK.

.SPOTTER INFORMATION STATEMENT...

WEATHER SPOTTERS ARE ENCOURAGED TO REPORT SIGNIFICANT WEATHER
CONDITIONS ACCORDING TO STANDARD OPERATING PROCEDURES.

ZONE FORECAST PRODUCT FOR SOUTHEAST ARIZONA...UPDATED
NATIONAL WEATHER SERVICE TUCSON AZ
615 AM MST WED MAY 9 2012

AZZ504-100215-
TUCSON METRO AREA-
INCLUDING...TUCSON...GREEN VALLEY...MARANA...VAIL
615 AM MST WED MAY 9 2012

.TODAY...BREEZY. PARTLY CLOUDY. CHANCE OF SHOWERS AND THUNDERSTORMS IN THE AFTERNOON. AREAS OF BLOWING DUST IN THE AFTERNOON. HIGHS 78 TO 84. EAST WIND 15 TO 25 MPH. CHANCE OF PRECIPITATION 40 PERCENT.
.TONIGHT...PARTLY CLOUDY WITH A 40 PERCENT CHANCE OF SHOWERS AND THUNDERSTORMS. AREAS OF BLOWING DUST. LOWS 53 TO 61. EAST WIND 5 TO 15 MPH.
.THURSDAY...PARTLY CLOUDY. HIGHS 85 TO 91. SOUTHEAST WIND 5 TO 10 MPH BECOMING NORTHWEST IN THE AFTERNOON.
.THURSDAY NIGHT...MOSTLY CLEAR. LOWS 58 TO 64. NORTHWEST WIND 5 TO 15 MPH BECOMING SOUTH AROUND 10 MPH AFTER MIDNIGHT.
.FRIDAY...MOSTLY SUNNY. HIGHS 92 TO 98. SOUTHEAST WIND 5 TO 10 MPH BECOMING NORTHWEST IN THE AFTERNOON.
.FRIDAY NIGHT...MOSTLY CLEAR. LOWS 59 TO 65.
.SATURDAY...MOSTLY SUNNY. HIGHS 95 TO 100.
.SATURDAY NIGHT THROUGH TUESDAY...MOSTLY CLEAR. LOWS 60 TO 68. HIGHS 95 TO 102.

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE TUCSON AZ
836 AM MST WED MAY 9 2012

.SYNOPSIS...A LOW PRESSURE SYSTEM TRACKING THROUGH NORTHERN MEXICO WILL BRING SHOWERS AND THUNDERSTORMS TO THE AREA THIS AFTERNOON AND EVENING. A FEW RESIDUAL SHOWERS AND THUNDERSTORMS WILL BE POSSIBLE NEAR THE NEW MEXICO BORDER THURSDAY. OTHERWISE...DRY CONDITIONS AND WARMING TEMPERATURES ARE THEN EXPECTED INTO THIS WEEKEND.

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.DISCUSSION...LATEST WV SATELLITE IMAGERY SHOWS THE UPPER LOW ACROSS NORTHERN MEXICO. MEANWHILE...DEEP LAYER EASTERLY FLOW HAS BROUGHT IN CONSIDERABLY MORE MOISTURE INTO SOUTHEAST ARIZONA WITH SURFACE DEWPOINTS NOW IN THE LOWER TO MIDDLE 40S FOR MUCH OF THE FORECAST AREA. MOISTURE WAS JUST ON ITS WAY IN DURING THE RELEASE OF THE 12Z KTWC SOUNDING WHICH DEPICTED 0.35 INCHES OF PWAT. MEANWHILE...WE'RE ALREADY SEEING A FEW CONVECTIVE SHOWERS THIS MORNING MAINLY OVER COCHISE COUNTY WITH A FEW CG STRIKES. IT SHOULD EVOLVE INTO A VERY INTERESTING LATE MORNING THROUGH AFTERNOON AS MLCAPE VALUES INCREASE TO ABOUT 1000 J/KG WITH INVERTED V SOUNDINGS AS SURFACE DEWPOINT DEPRESSIONS WILL BE ABOUT 45 TO 50 DEGREES F. AS STORMS DEVELOP EAST OF TUCSON...THEY WILL PUSH TO THE WEST-NORTHWEST WITH 20 KTS OF STEERING FLOW. SOME OF THESE STORMS ARE EXPECTED TO BE STRONG AND OUR MAIN CONCERN CONTINUES TO BE STRONG AND GUSTY WINDS WITH RESULTING BLOWING DUST. CURRENT FORECAST DOES HANDLE THIS WELL WITH

NO CHANGES EXPECTED AT THIS TIME. A SPECIAL NOTE TO OUR DATA CUSTOMERS...WE DO PLAN ON RELEASING A SPECIAL 18Z KTWC SOUNDING TO BETTER CAPTURE THE PROFILE AND MOISTURE INCREASE.

THE UPPER LOW WILL CONTINUE TO PUSH EAST THURSDAY WITH ENOUGH RESIDUAL MOISTURE FOR A SLIGHT CHANCE TO LOW END CHANCE POPS MAINLY NEAR THE NEW MEXICO BORDER. THEREAFTER...GENERALLY DRY CONDITIONS ARE EXPECTED INTO EARLY NEXT WEEK WITH MUCH WARMER TEMPERATURES THIS WEEKEND INTO EARLY NEXT WEEK.

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE TUCSON AZ
122 PM MST WED MAY 9 2012

AZZ502>504-507-513>515-092230-
TOHONO O'ODHAM NATION-UPPER SANTA CRUZ RIVER VALLEY/ALTAR VALLEY-
TUCSON METRO AREA-UPPER SAN PEDRO RIVER VALLEY-
DRAGOON AND MULE AND HUACHUCA AND SANTA RITA MOUNTAINS-
CATALINA AND RINCON MOUNTAINS-BABOQUIVARI MOUNTAINS-
INCLUDING...SELLS...NOGALES...TUCSON...GREEN VALLEY...MARANA...
VAIL...SIERRA VISTA...BENSON...BISBEE...CANELO HILLS...
MADERA CANYON...MOUNT LEMMON...SUMMERHAVEN...KITT PEAK
122 PM MST WED MAY 9 2012

.NOW...
SCATTERED SHOWERS AND THUNDERSTORMS WILL CONTINUE THIS AFTERNOON OVER PORTIONS OF SANTA CRUZ...EASTERN AND CENTRAL PIMA COUNTIES. THE STRONGEST STORMS AT THIS TIME ARE MAINLY ALONG THE INTERNATIONAL BORDER IN SANTA CRUZ AND CENTRAL PIMA COUNTY. LIGHTNING...SMALL HAIL AND WIND GUSTS UP TO 35 MPH ARE ALL EXPECTED WITH THESE STORMS. WIND GUSTS MAY ALSO CREATE AREAS OF BLOWING DUST IN PRONE LOCATIONS...RESULTING IN TEMPORARY VISIBILITY REDUCTIONS TO LESS THAN A MILE. THESE STORMS ARE MOVING TO THE NORTHWEST AT 10 TO 15 MPH. RAINFALL AMOUNTS OF ONE TENTH TO ONE QUARTER OF AN INCH ARE EXPECTED IN MOST LOCATIONS THROUGH 330 PM THIS AFTERNOON...THOUGH ISOLATED LOCATIONS UNDER STRONGER STORMS MAY SEE AS MUCH AS ONE HALF INCH OF RAINFALL.

AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE TUCSON AZ
205 PM MST WED MAY 9 2012

.SYNOPSIS...A LOW PRESSURE SYSTEM TRACKING THROUGH NORTHERN MEXICO WILL BRING SHOWERS AND THUNDERSTORMS TO THE AREA THIS AFTERNOON AND EVENING. A FEW RESIDUAL SHOWERS AND THUNDERSTORMS WILL BE POSSIBLE NEAR THE NEW MEXICO BORDER THURSDAY. OTHERWISE...DRY CONDITIONS AND WARMING TEMPERATURES ARE THEN EXPECTED INTO THIS WEEKEND.

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.DISCUSSION...CONVECTION HAS DEVELOPED AS EXPECTED ACROSS SOUTHEAST ARIZONA OVER THE PAST SEVERAL HOURS. THE BULK OF THE ACTIVITY HAS OCCURRED ACROSS COCHISE...SANTA CRUZ AND CENTRAL PIMA COUNTIES WITH MORE ISOLATED CONVECTION ACROSS GRAHAM/GREENLEE COUNTIES AND LITTLE TO NOTHING SO FAR FROM TUCSON NORTHWARD INTO SOUTHEAST PINAL

COUNTY. WE'VE HAD MANY REPORTS OF DIME SIZE HAIL FROM THESE STORMS FOCUSED ON THE RIO RICO AND DOUGLAS AREAS OVER THE LAST HOUR OR SO. THIS HAIL WAS EVEN COVERING THE GROUND IN SOME LOCATIONS. WINDS HAVE BEEN LESS OF AN ISSUE SO FAR BUT WE'VE SEEN OUTFLOW WIND GUSTS TO ABOUT 30 TO 40 MPH IN THE TUCSON METRO WHICH KICKED UP SOME DUST NEAR THE I-10/I-19 INTERCHANGE THAT WAS VISIBLE FROM THE OFFICE. LATEST RADAR TRENDS SHOW THE STRONGEST STORMS NEAR THE INTERNATIONAL BORDER ACROSS SANTA CRUZ AND SOUTHERN COCHISE COUNTIES WITH A GENERAL WEST TO NORTHWEST MOVEMENT OF ABOUT 10 TO 20 MPH. STILL A TOUGH CALL WHETHER CONVECTIVE ACTIVITY MAKES IT INTO TUCSON BUT WILL MAINTAIN CHANCE POPS INTO THIS EVENING.

THE UPPER LOW NOW ACROSS NORTHERN MEXICO WHICH RESULTED IN THE INCREASED MOISTURE ALONG WITH THE SHOWERS AND THUNDERSTORMS WILL CONTINUE TO PUSH EAST THURSDAY. THERE WILL STILL BE ENOUGH RESIDUAL MOISTURE FOR SLIGHT CHANCE TO LOW END CHANCE POPS MAINLY ACROSS COCHISE/GRAHAM/GREENLEE COUNTIES. THEREAFTER...GENERALLY DRY CONDITIONS ARE EXPECTED THIS WEEKEND WITH MUCH WARMER TEMPERATURES AS RIDGING ALOFT WILL BE IN CONTROL. MOSTLY DRY CONDITIONS ARE EXPECTED INTO NEXT WEEK AS WELL...ALTHOUGH A WEAK AREA OF LOW PRESSURE COMBINED WITH JUST ENOUGH MOISTURE WILL RESULT IN SLIGHT CHANCE POPS FOR THE WHITE MOUNTAINS TUESDAY.

HAZARDOUS WEATHER OUTLOOK
NATIONAL WEATHER SERVICE TUCSON AZ
210 PM MST WED MAY 9 2012

AZZ501>515-101300-
WESTERN PIMA COUNTY-TOHONO O'ODHAM NATION-
UPPER SANTA CRUZ RIVER VALLEY/ALTAR VALLEY-TUCSON METRO AREA-
SOUTH CENTRAL PINAL COUNTY-SOUTHEAST PINAL COUNTY-
UPPER SAN PEDRO RIVER VALLEY-
EASTERN COCHISE COUNTY BELOW 5000 FEET-UPPER GILA RIVER VALLEY-
WHITE MOUNTAINS OF GRAHAM AND GREENLEE COUNTIES-
GALIURO AND PINALENO MOUNTAINS-CHIRICAHUA MOUNTAINS-
DRAGOON AND MULE AND HUACHUCA AND SANTA RITA MOUNTAINS-
CATALINA AND RINCON MOUNTAINS-BABOQUIVARI MOUNTAINS-
210 PM MST WED MAY 9 2012

THIS HAZARDOUS WEATHER OUTLOOK IS FOR PORTIONS OF SOUTHEAST ARIZONA.

.DAY ONE...THIS AFTERNOON AND TONIGHT

SCATTERED SHOWERS AND THUNDERSTORMS WILL CONTINUE ACROSS SOUTHEAST ARIZONA INTO THIS EVENING. THESE THUNDERSTORMS WILL PRODUCE SMALL HAIL AND GUSTY WINDS LOCALLY UP TO 50 MPH. SOME OF THESE STRONG WINDS WILL PRODUCE LOCALIZED AREAS OF BLOWING DUST...WHERE VISIBILITIES MAY BRIEFLY DROP BELOW ONE HALF OF A MILE.

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE TUCSON AZ
234 PM MST WED MAY 9 2012

DUST STORM WARNING
TUCSON METRO AREA-
INCLUDING THE CITIES OF...TUCSON...GREEN VALLEY...MARANA...VAIL

244 PM MST WED MAY 9 2012

...DUST STORM WARNING REMAINS IN EFFECT UNTIL 4 PM MST THIS AFTERNOON...

THE NATIONAL WEATHER SERVICE IN TUCSON HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 4 PM MST THIS AFTERNOON.

* TIMING...AN AREA OF BLOWING DUST WITH LOW VISIBLITY IS MOVING NORTHWARD THROUGH THE CITY OF TUCSON INTO MARANA AND ORO VALLEY. THIS WILL CONTINUE THROUGH ABOUT 4 PM.

* WINDS...WINDS UP TO 35 TO 45 MPH ARE POSSIBLE THROUGH 4 PM.

* VISIBILITY...VISIBILITY WILL BE LOCALLY LESS THAN ONE QUARTER OF A MILE.

* IMPACTS...MOTORISTS SHOULD EXERCISE EXTRA CAUTION AS WELL AS PEOPLE WHO ARE ESPECIALLY SENSITIVE TO DUST.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A DUST STORM WARNING MEANS SEVERELY LIMITED VISIBILITIES ARE EXPECTED WITH BLOWING DUST. BLOWING DUST CAN QUICKLY REDUCE VISIBILITY...CAUSING ACCIDENTS THAT MAY INVOLVE CHAIN COLLISIONS AND MULTIPLE PILEUPS. IF DENSE DUST IS OBSERVED BLOWING ACROSS OR APPROACHING A ROADWAY...PULL YOUR VEHICLE OFF THE PAVEMENT AS FAR AS POSSIBLE TO STOP. TURN OFF THE LIGHTS...SET THE EMERGENCY BRAKE...AND TAKE YOUR FOOT OFF OF THE BRAKE PEDAL TO ENSURE BRAKE LIGHTS ARE NOT ILLUMINATED.

PERSONS WITH RESPIRATORY PROBLEMS SHOULD STAY INDOORS UNTIL THE STORM PASSES.

STAY TUNED TO NOAA WEATHER RADIO...COMMERCIAL RADIO OR TELEVISION STATIONS...OR YOUR CABLE TELEVISION PROVIDER FOR LATER STATEMENTS CONCERNING THIS DUST STORM.

DUST STORM WARNING
SOUTHEAST PINAL COUNTY-
INCLUDING THE CITIES OF...MAMMOTH...ORACLE
300 PM MST WED MAY 9 2012

...DUST STORM WARNING IN EFFECT UNTIL 5 PM MST THIS AFTERNOON...

THE NATIONAL WEATHER SERVICE IN TUCSON HAS ISSUED A DUST STORM WARNING...WHICH IS IN EFFECT UNTIL 5 PM MST THIS AFTERNOON.

* TIMING...AN AREA OF BLOWING DUST WITH LOW VISIBLITY IS MOVING NORTHWARD INTO SOUTHERN PORTIONS OF EASTERN PINAL COUNTY AND WILL BE MOVING INTO SADDLEBROOK AND ORACLE BY 330 PM.

* WINDS...WINDS UP TO 35 TO 45 MPH ARE POSSIBLE THROUGH 5 PM.

* VISIBILITY...VISIBILITY WILL BE LOCALLY LESS THAN ONE QUARTER OF A MILE.

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* IMPACTS...MOTORISTS SHOULD EXERCISE EXTRA CAUTION AS WELL AS
  PEOPLE WHO ARE ESPECIALLY SENSITIVE TO DUST.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A DUST STORM WARNING MEANS SEVERELY LIMITED VISIBILITIES ARE
EXPECTED WITH BLOWING DUST. BLOWING DUST CAN QUICKLY REDUCE
VISIBILITY...CAUSING ACCIDENTS THAT MAY INVOLVE CHAIN COLLISIONS
AND MULTIPLE PILEUPS. IF DENSE DUST IS OBSERVED BLOWING ACROSS OR
APPROACHING A ROADWAY...PULL YOUR VEHICLE OFF THE PAVEMENT AS FAR
AS POSSIBLE TO STOP. TURN OFF THE LIGHTS...SET THE EMERGENCY
BRAKE...AND TAKE YOUR FOOT OFF OF THE BRAKE PEDAL TO ENSURE BRAKE
LIGHTS ARE NOT ILLUMINATED.

PERSONS WITH RESPIRATORY PROBLEMS SHOULD STAY INDOORS UNTIL THE
STORM PASSES.

STAY TUNED TO NOAA WEATHER RADIO...COMMERCIAL RADIO OR TELEVISION
STATIONS...OR YOUR CABLE TELEVISION PROVIDER FOR LATER STATEMENTS
CONCERNING THIS DUST STORM.
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PRELIMINARY LOCAL STORM REPORT
NATIONAL WEATHER SERVICE TUCSON AZ
938 AM MST THU MAY 10 2012

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

0236 PM      DUST STORM        1 S TUCSON               32.22N 110.94W
05/09/2012                     PIMA                AZ   NWS OFFICE

             VISIBILITY 0.25 MILES.
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PRELIMINARY LOCAL STORM REPORT
NATIONAL WEATHER SERVICE TUCSON AZ
939 AM MST THU MAY 10 2012

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

0253 PM      DUST STORM        7 NW SOUTH TUCSON        32.26N 111.07W
05/09/2012                     PIMA                AZ   TRAINED SPOTTER

             WIND SPEED AROUND 25 MPH. VISIBILITY LESS THAN 2 BLOCKS
             DUE TO DUST.
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Appendix C:
Affidavit of Public Notice