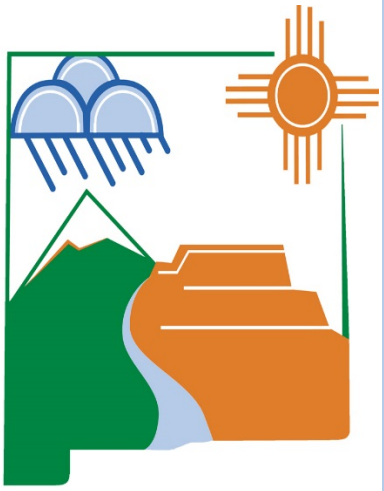
Exceptional Events Demonstration April 1-June 30, 2013

NMED
New Mexico Environment Department



Public Review Draft

Air Quality Bureau

Control Strategies Section

May 2016

The New Mexico Environment Department's Air Quality Bureau prepared this document. It is available for review at the website located at www.env.nm.gov/aqb or in person at the address listed below. The Air Quality Bureau will accept public comment on this document from May 27, 2016 to June 27, 2016. For further information or to request a copy of this document, please contact the bureau by phone or in writing at:

NMED AQB
Planning Section
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505
Phone: (505) 476-4300
Toll free: 1-800-224-7009

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1 Introduction

Purpose

The U.S Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM) with an aerodynamic diameter of 10 microns or less (PM_{10}). The level of the PM_{10} NAAQS is set at a 24-hour average of 150 µg/m^3.

From April 1-June 30, 2013, the New Mexico Environment Department (NMED) Air Quality Bureau (AQB) recorded 45 exceedances of the PM_{10} NAAQS on 13 days due to high wind dust events.

The evidence presented in this document substantiates the AQB's request to exclude exceedance data from the PM_{10} NAAQS attainment determinations for Doña Ana, Luna, and San Juan Counties in New Mexico. Table 1-1 lists the dates, monitoring sites and 24-hour averages of the exceedances requested for exclusion (highlighted yellow) when the EPA makes a determination that a county meets the PM_{10} NAAQS. The elevated levels of PM recorded on the dates highlighted below were due to high winds entraining dust in the air and transporting it to the monitoring sites or smoke impacts from wildfires. ND stands for no data for that day due to malfunctioning equipment.

Site	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa	Farmington
Pollutant	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}
4/8/2013	515	ND	305	314	248	281	
4/9/2013	277	ND	470	302	294	487	
4/16/2013							210
4/17/2013	519	ND	556	502	660	416	
4/23/2013	243	164	147	109	67	91	
5/2/2013	393	204	206	246	430	321	
6/1/2013	106	90	173	79	42	47	
6/2/2013	304	217	293	144	312	132	
6/6/2013	314	404	183	246	119	169	
6/8/2013	131	90	94	126	197	99	
6/20/2013	186	84	164	118	57	182	
6/22/2013	72	49	59	48	48	228	
6/30/2013	258	155	64	99	135	100	

Table 1-1. 24-Hour PM_{10} concentrations requested for exclusion.

2 Background

Exceptional Events Rule

On March 22, 2007, the EPA adopted its final rule for state and local air quality management agencies regarding the review and handling of certain air quality monitoring data (72 FR 13560). The regulation, "Treatment of Data Influenced by Exceptional Events", or more commonly called the Exceptional Events Rule (EER), became effective on May 22, 2007 (40 CFR Part 50.14). The EER allows the EPA to exclude data affected by an exceptional event that caused an exceedance of a NAAQS when determining an area's ability to meet the standard for a given criteria pollutant. The rule does not include specific requirements concerning the type or level of evidence an agency must provide due to the wide range of events and circumstances covered under the rule. Hence, EPA determines data exclusion on a case-by-case basis after considering the weight of evidence provided in a demonstration. The procedural requirements of the EER are:

1. flagging of data in EPA's Air Quality System (AQS) database by air quality management agencies,
2. submission of demonstrations proving an exceptional event caused an exceedance within three years of the calendar quarter in which it was recorded, and
3. EPA placing a concurrence flag in AQS for those dates that are exceptional events.

In order for EPA to concur on a demonstration and exclude data under the EER, an agency must meet six technical elements. These elements include:

1. whether the event in question was not reasonably controllable or preventable (nRCP),
2. whether there was a clear causal relationship (CCR),
3. whether there would have been no exceedance or violation but for the event in question (NEBF),
4. whether the event affects air quality (AAQ),
5. whether the event was caused by human activity unlikely to reoccur or it was a natural event (HAURL/Natural Event), and
6. whether the event was in excess of normal historical fluctuations (HF).

This report demonstrates that NMED met the procedural and technical requirements for excluding data due to exceptional events in New Mexico for the first quarter of calendar year 2013.

2.2 Monitoring Network and Data Collection

The AQB operates a State and Local Air Monitoring Stations (SLAMS) network to measure the concentration of criteria pollutants and meteorological parameters (Table 2-1). The Bureau maintains five PM_{10} monitoring sites in Doña Ana County and one each in Luna County and San Juan County to track windblown dust. All monitoring sites in Doña Ana and Luna Counties are equipped with continuous Federal Equivalent Method (FEM) Tapered Element Oscillating

Microbalance (TEOM) PM_{10} instruments, with the Anthony (Doña Ana County) and Farmington (San Juan County) sites equipped with filter-based Federal Reference Method (FRM) Hi-Volume Wedding PM_{10} Monitors. The Anthony Wedding monitor did not record any exceedances during this quarter.

The Bureau maintains seven meteorological monitoring sites in Doña Ana and Luna Counties. The Anthony site does not have a standard 10 m wind tower and the La Union monitoring site is used for measuring meteorological parameters due to their proximity. The Santa Teresa, Carlsbad, and Hobbs Jefferson monitoring sites are included in this report because they may inform wind speeds at areas upwind of PM_{10} monitors in Doña Ana County. Similarly, the Farmington site does not measure meteorological parameters and the Navajo Lake, Bloomfield, and Substation monitoring sites are included in this report to determine wind speed and direction. Figure 2-2 and Figure 2-3 show the location of the monitoring sites listed in Table 2-1. Gaps in the charts below depicting hourly PM_{10} or meteorological data are due to routine operation and maintenance, malfunctioning equipment or invalid data.

Site Name	AIRS Number	County	Sampling Frequency	Parameters
Holman	35-013-0019	Doña Ana	Continuous	PM_{10} and Meteorological
Chaparral	35-013-0020	Doña Ana	Continuous	PM_{10} and Meteorological
Anthony	35-013-0016	Doña Ana	Continuous and 1-in-6 Day	PM_{10}
Desert View	35-013-0021	Doña Ana	Continuous	PM_{10} and Meteorological
West Mesa	35-013-0024	Doña Ana	Continuous	PM_{10} and Meteorological
La Union	35-013-0008	Doña Ana	Continuous	Meteorological
Santa Teresa	35-013-0022	Doña Ana	Continuous	Meteorological
Deming Airport	35-029-0003	Luna	Continuous	PM_{10} and Meteorological
Farmington	35-045-0019	San Juan	1-in-6 Day	PM_{10}
Navajo Lake	35-045-0018	San Juan	Continuous	Meteorological
Bloomfield	35-045-0009	San Juan	Continuous	Meteorological
Substation	35-045-1005	San Juan	Continuous	Meteorological
Carlsbad	35-015-1005	Eddy	Continuous	Meteorological
Hobbs Jefferson	35-025-0008	Lea	Continuous	Meteorological

Table 2-1. SLAMS designated monitoring sites operated by NMED in 2013. The Anthony Site has collocated TEOM and Wedding instruments.

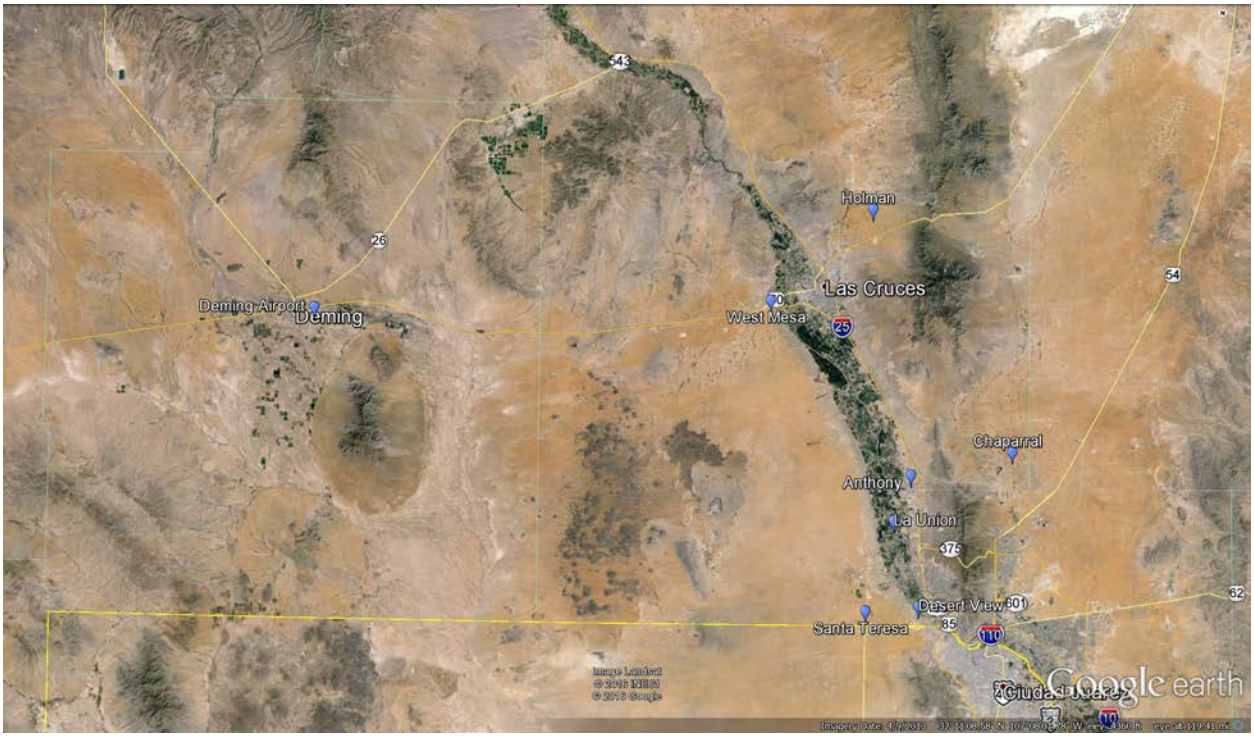


Figure 2-1. PM_{10} and meteorological monitoring sites in Luna and Doña Ana Counties.

Figure 2-2. PM_{10} and meteorological monitoring sites in San Juan County.

3 Exceptional Event: April 8, 2013

Summary of the Event

The passing of a spring storm caused high winds and blowing dust in Doña Ana and Luna Counties resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Holman, Desert View, Deming and West Mesa monitoring sites on this date. The FEM TEOM continuous monitors at these sites recorded 24-hour average concentrations of 515 $\mu g/m^3$, 305 $\mu g/m^3$, 314 $\mu g/m^3$, 248 $\mu g/m^3$, and 281 $\mu g/m^3$ respectively. The Chaparral monitor did not record data on this date due to malfunctioning equipment.

As the event unfolded, the wind blew from the southwest throughout the border region. These high velocity winds passed over large areas of desert within Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites ranging from 8.6 m/s to 12.8 m/s. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico (see satellite imagery below).

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at six of the seven meteorological monitoring sites and wind gusts exceeded the NEAPs agreed upon threshold at these same sites (Figures 3-1 and 3-2). Although the Desert View monitoring site did not record sustained wind speeds above the 11.2 m/s threshold, the nearby and upwind monitoring site of Santa Teresa did.

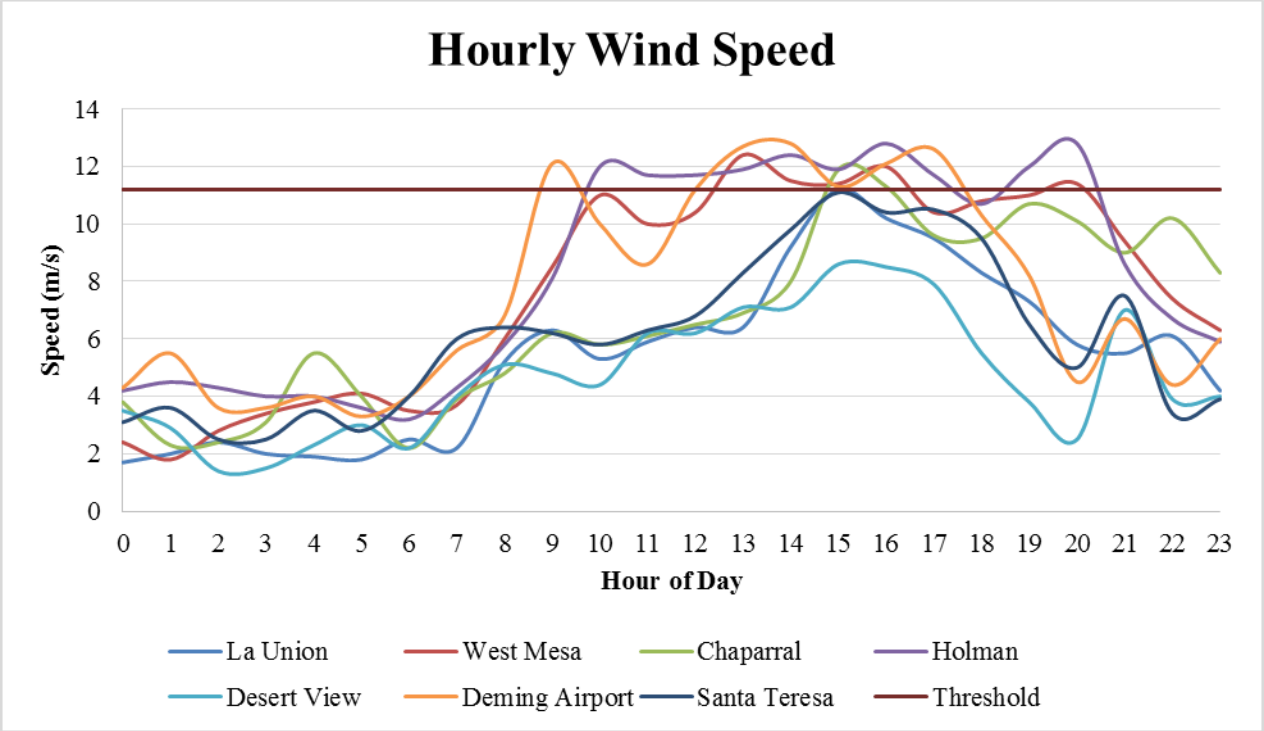


Figure 3-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

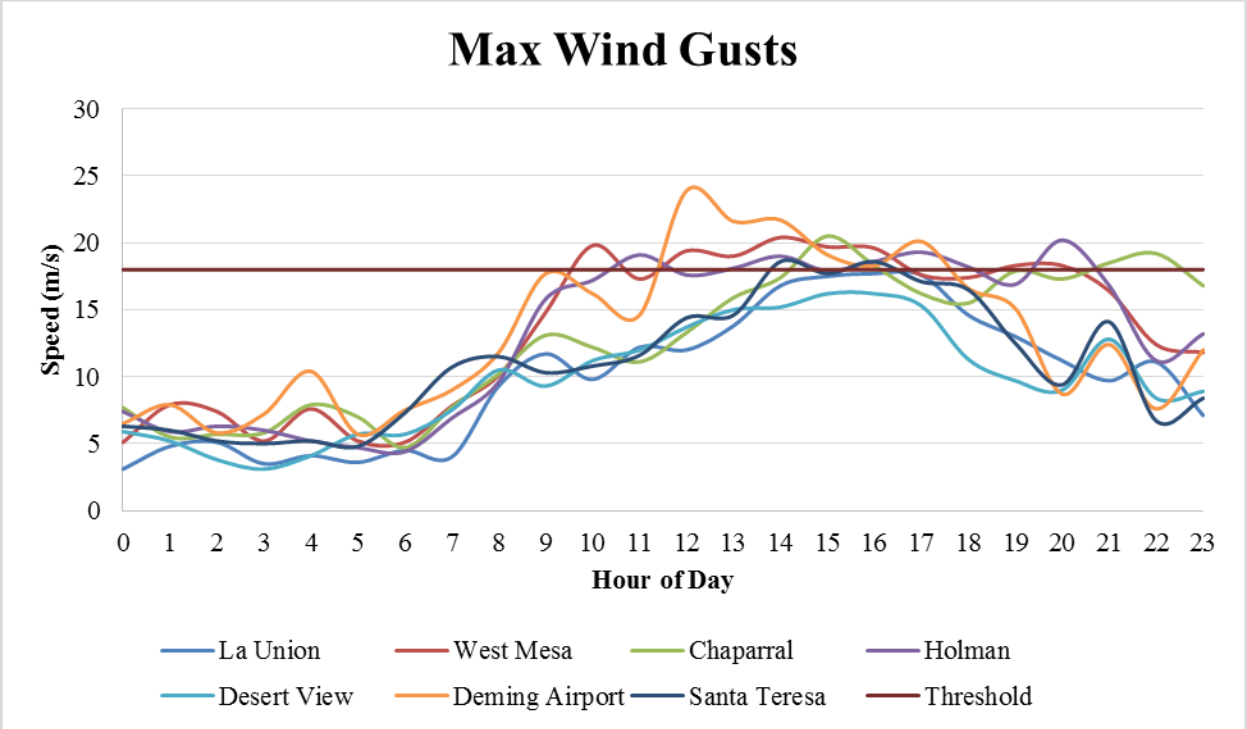


Figure 3-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 3-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95^{th} percentile of all 24-hour averages

recorded. The Anthony, Chaparral, Holman, Desert View and West Mesa sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	515	ND	305	314	248	281

Table 3-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 3-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. Spring is considered the windy season with the highest blowing dust activity, as reflected in the increased 99th and 95th percentiles compared to the annual values. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony and West Mesa sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	505	527	467	411	774	263
95th Percentile	176	200	172	144	176	86
Event Day	515	ND	305	314	248	281

Table 3-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong winter storm passed through New Mexico on April 8. A deep upper low pressure system over northern Arizona and associated cold front moved into western New Mexico and created a pressure gradient over southeastern Arizona, southwestern New Mexico and northern Mexico. As the storm system moved through northern New Mexico, the surface pressure gradient tightened and winds became stronger (Figure 3-3). Surface winds flow perpendicular to the isobars from high to low pressure. Diurnal heating of the surface allowed winds aloft to mix downward, increasing the surface wind velocities and provided the turbulence required for vertical mixing and horizontal transport of dust.

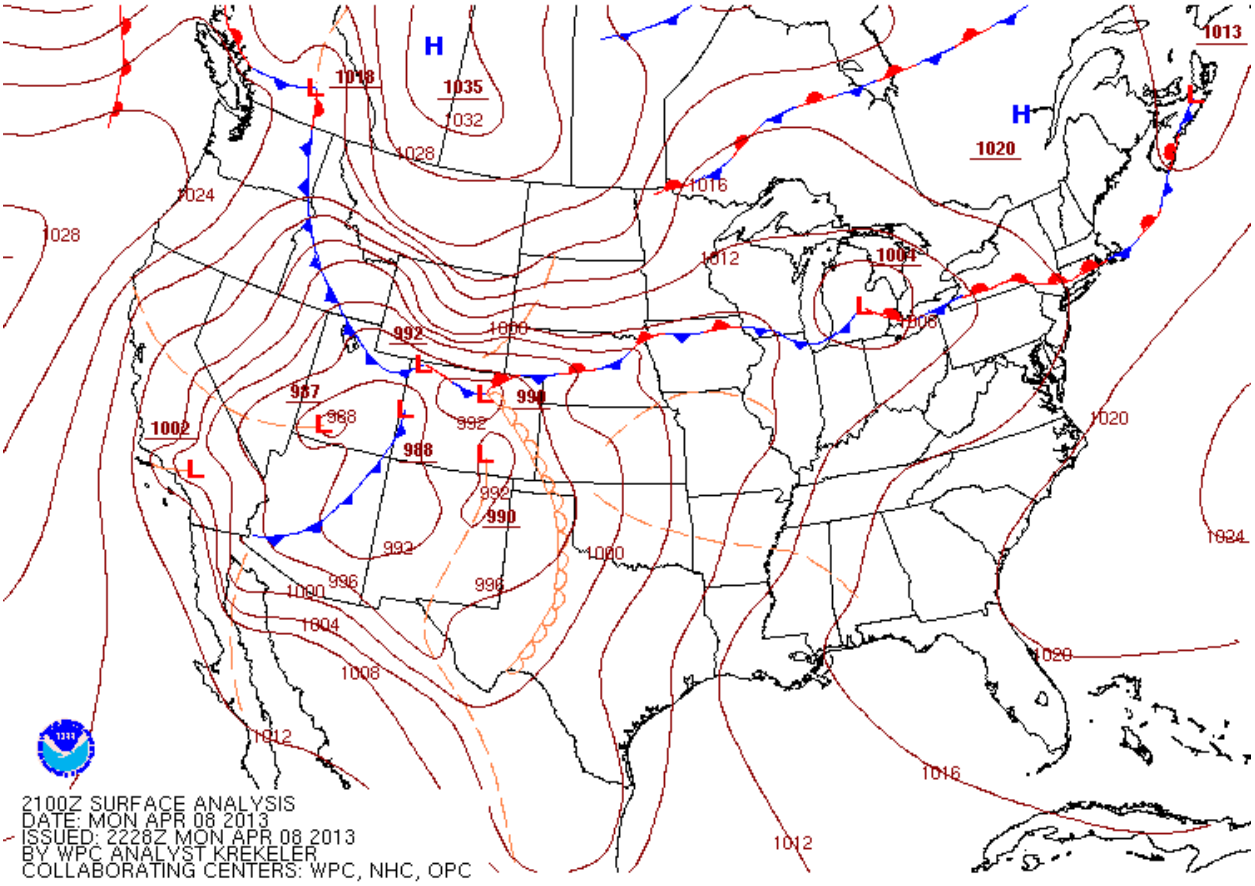
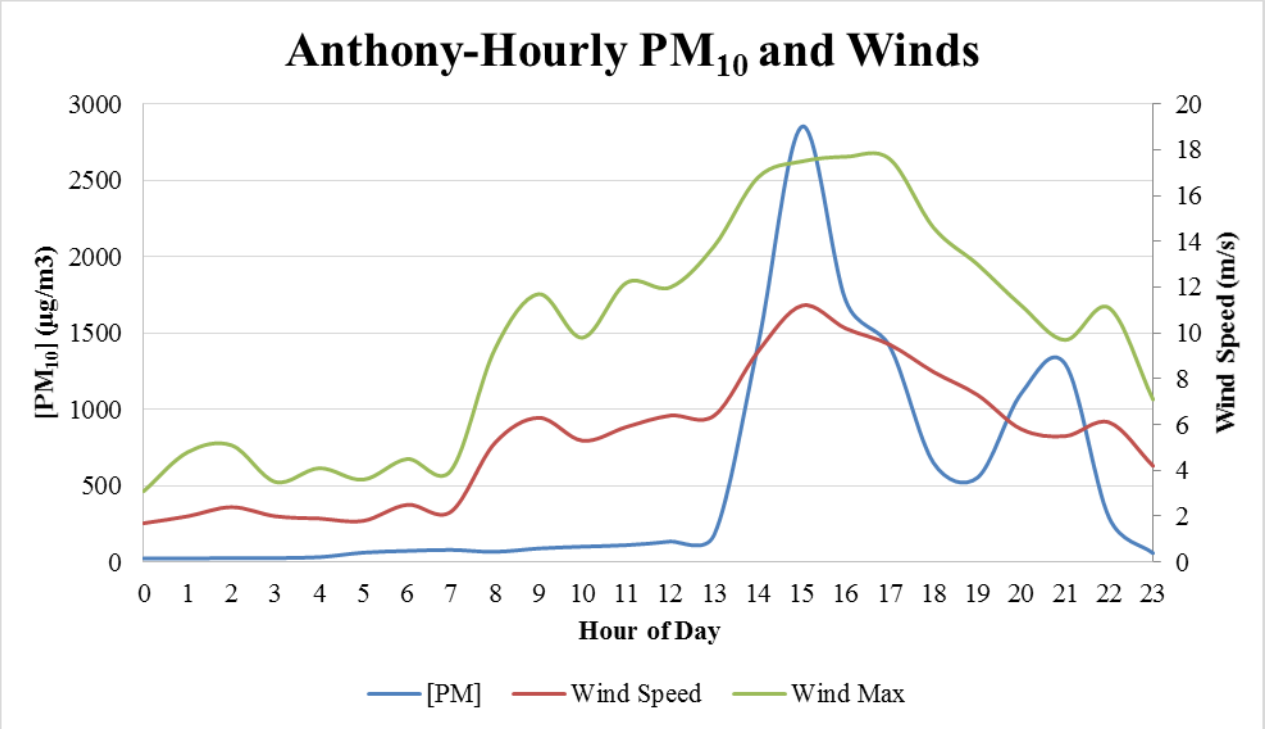
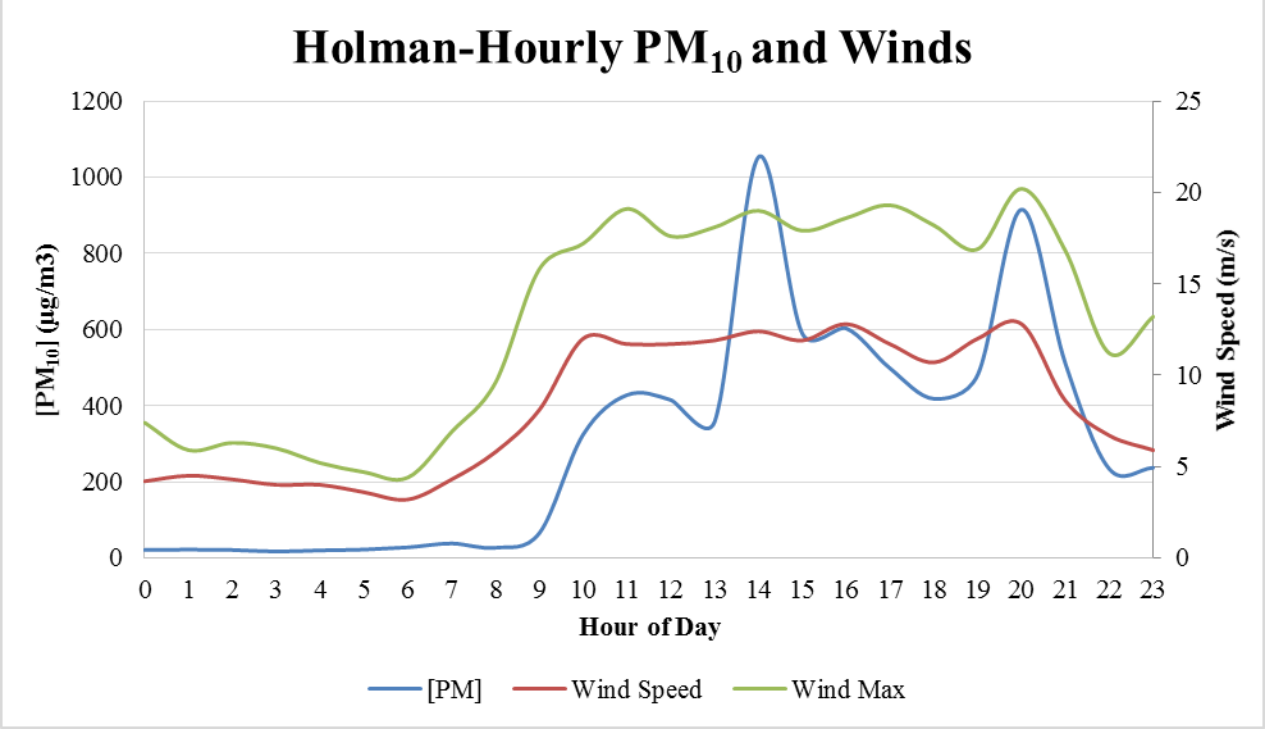
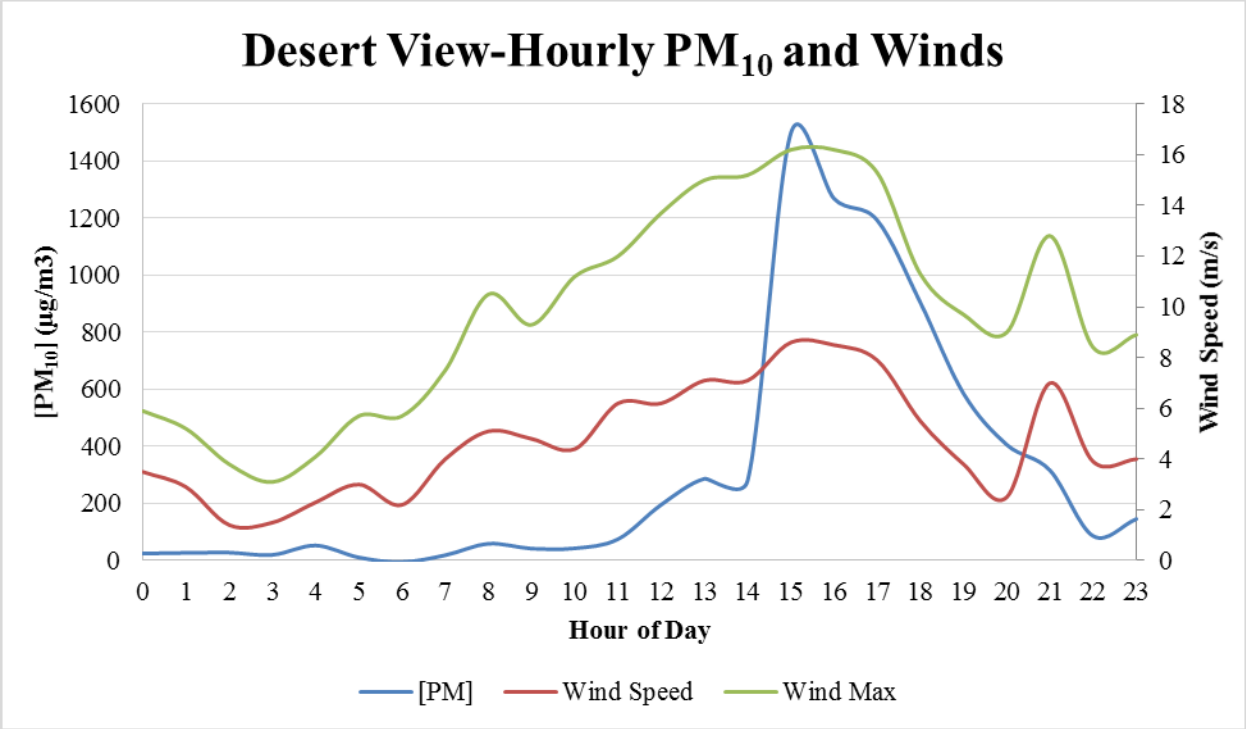


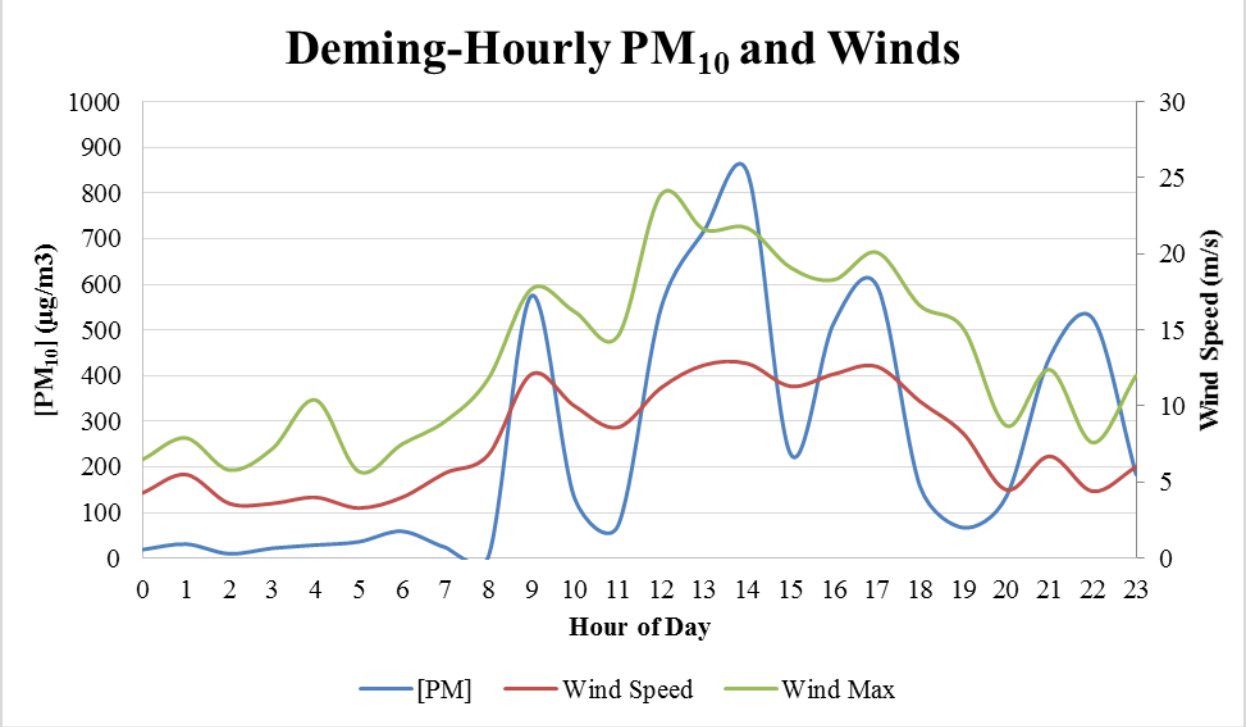
Figure 3-3. Surface weather map showing winter storm and isobars of constant pressure (red lines).

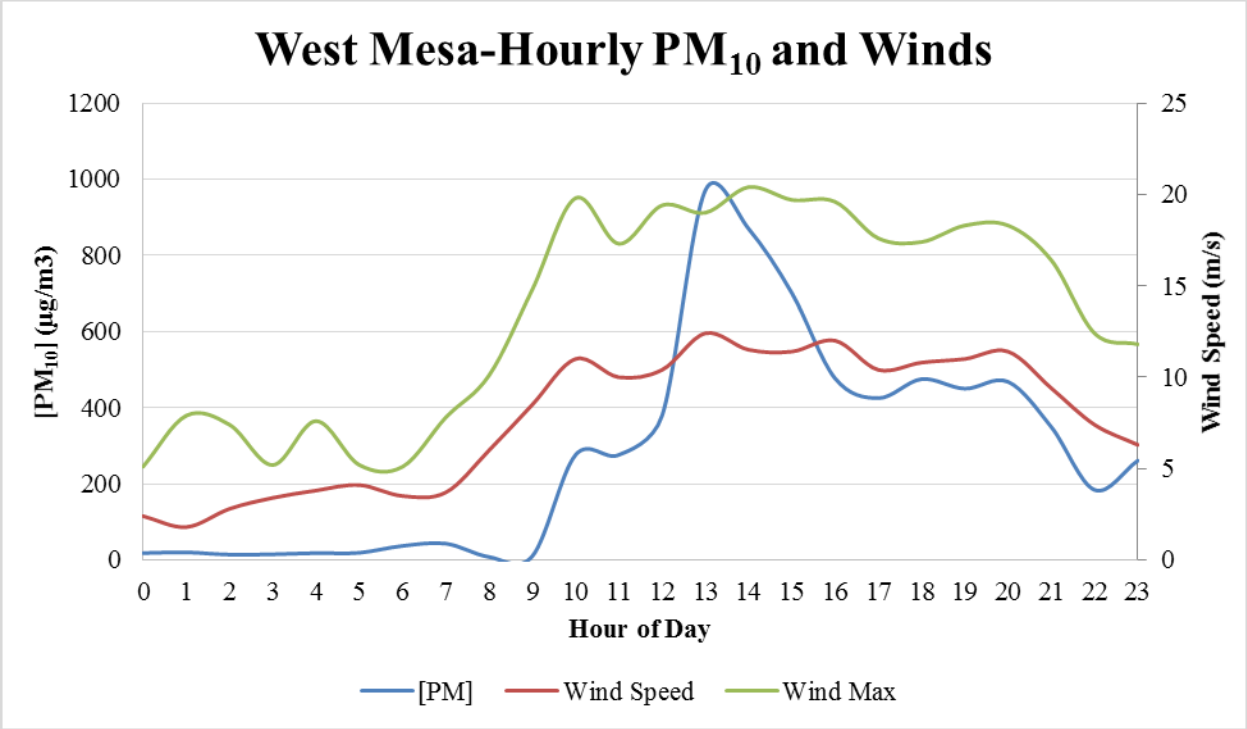
The weather pattern described above generated strong winds beginning at the 900 hour and lasted through the 2000 hour. Beginning at the 900 hour, wind speeds exceeded 11.2 m/s at the Deming site as shown in Figure 3-1. Peak wind speeds ranged from 8.6 m/s at Desert View to 12.8 m/s at Holman and Deming (Figure 3-1). Peak wind gusts ranged from 16.2 m/s at Desert View to 23.9 m/s at the Deming Airport (Figure 3-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 3-4 a-e. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 3-5).


Anthony-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Holman-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Desert View-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Deming-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max



Figures 3-4 a-e. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

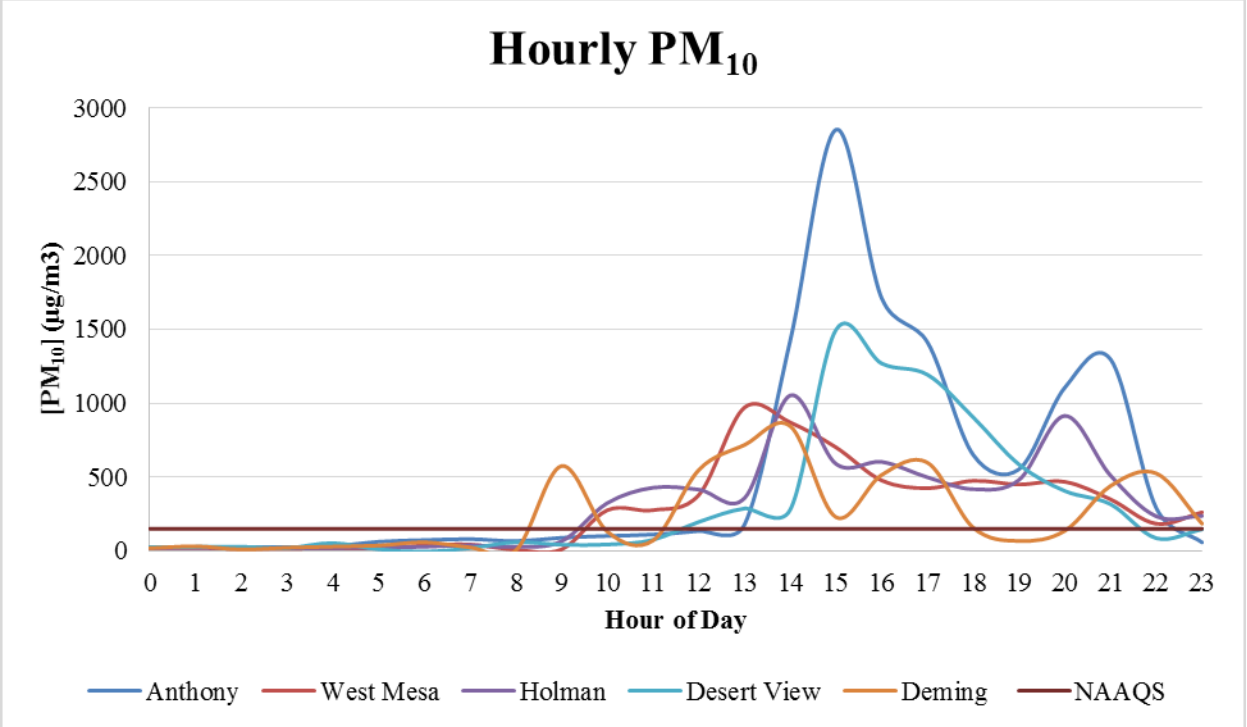


Figure 3-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Blowing Dust Advisory, Wind Advisory and High Wind Warning for this date. A Wind Advisory is issued by NWS when sustained winds of

30 to 39 mph are expected for 1 hour or longer. A High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. A Blowing Dust Advisory is issued when blowing dust is expected to reduce visibility to between ¼ to 1 mile, generally with winds of 25 mph or greater. These were in place for southwestern New Mexico and west Texas to warn the public of the high wind event. The hazardous weather outlook stated that:

> WEST TO SOUTHWEST WINDS WILL HAVE SUSTAINED SPEEDS AROUND 35 TO 45 MPH WITH GUSTS TO 60 MPH. BLOWING DUST WILL REDUCE VISIBILITIES TO LESS THAN A QUARTER MILE OVER ISOLATED LOCATIONS...ESPECIALLY ALONG INTERSTATE 10 FROM EL PASO TO THE ARIZONA BORDER.

The event was also captured on satellite imagery showing dust plumes originating in southeastern Arizona, southwestern New Mexico, and northern Mexico (Figure 3-6). The Las Cruces Sun-News also reported on the event (Figure 3-7).

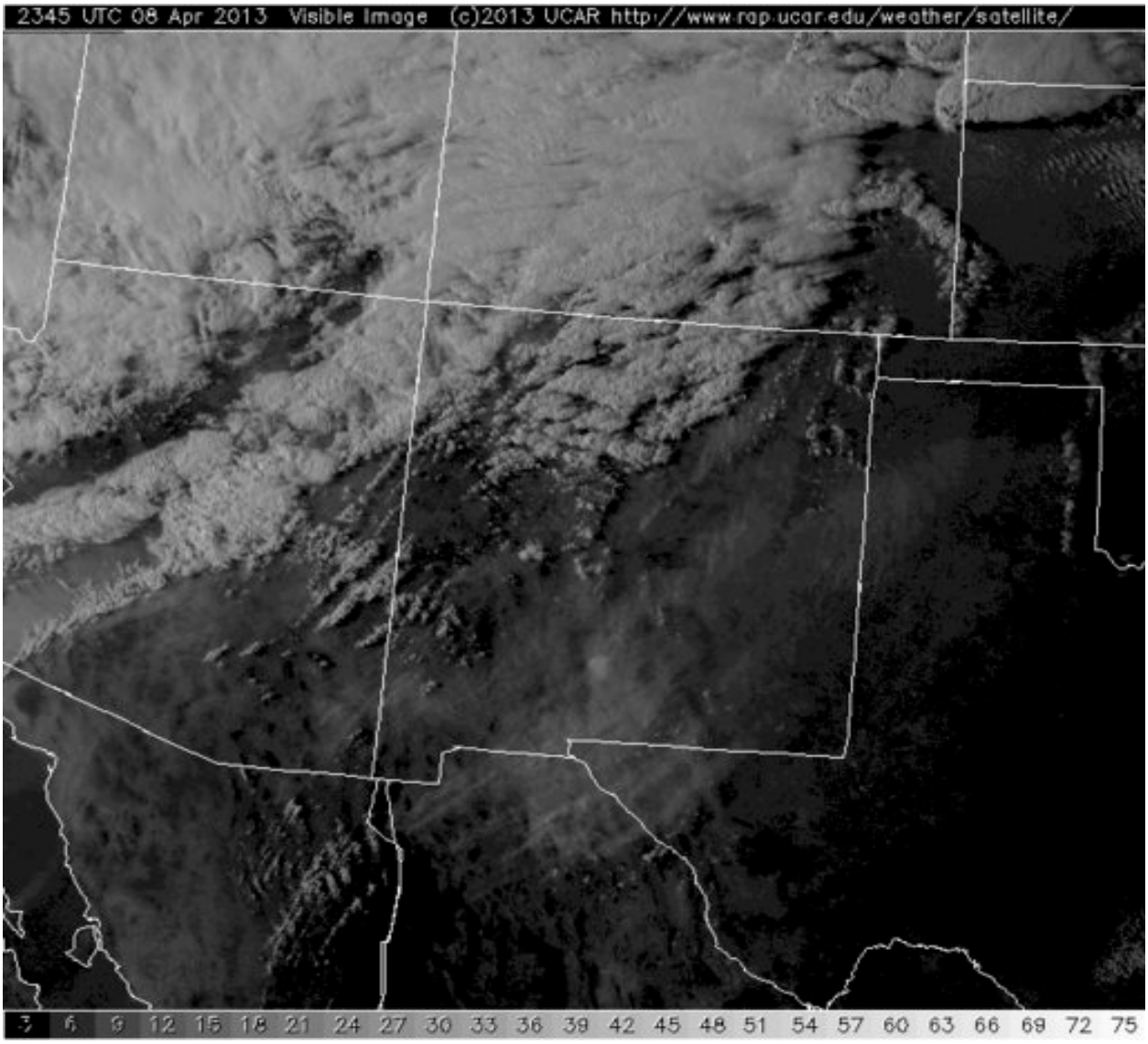


Figure 3-6. NASA Goes satellite imagery of the border area.

ROBIN ZIELINSKI / SUN-NEWS

A MOUNTAIN can barely be seen Tuesday, with the Organ Mountains in the background even less visible due to dusty conditions.

Crazy spring weather smacks Las Cruces

By Steve Ramirez
SRAMIREZ@
LCSUN-NEWS.COM

LAS CRUCES — It's spring, but it still feels like winter to many Las Crucens.

It was 80 degrees on Sunday and Monday, but it will be about 20 degrees cooler today as a storm stretching into as many as 10 states continues to pass to the east.

"This is what I hate most about the spring," sighed Teresa Hernandez, as she rubbed her arms, underneath the oversized hooded sweatshirt she wore Tuesday. "We get those days where it's hot, almost summer-like hot, and then it changes like this. It makes me feel kind of sick because the weather gets so miserable. I'll be glad when the winds and cold goes away for good.

"The last few days, Sunday and Monday, I was even thinking about getting my air conditioner going."

By mid-afternoon Tuesday, Las Cruces' temperature was 63, and the west winds had already gusted to 45 mph. The weather was reminiscent of three weekends ago when the wind never seemed to stop.

A gray, cloudy Tuesday morning gave way to a brown sky in the afternoon as gusty winds continued for the second consecutive day.

The unsettled weather conditions factored into outdoor activities Tuesday. All city of Las Cruces Parks and Recreation outdoor athletic facilities were closed, and rec league games were canceled because of inclement weather. Also canceled were high school junior varsity baseball games.

Monday, peak gusts reached 44 mph in Las Cruces. The strongest gust Monday was 70 mph at San Augustin Pass — a good 20 mph more than top wind speeds anywhere else.

"I retired here from Michigan," said Tom Grazer, who moved to Las Cruces in August. "Until (Monday) I'd never seen brown sky caused by dust like that. To a Michigan guy like me, that was really something to see."

More changes are coming. The good news is winds will be noticeably less through Friday, with gusts less than 25 mph in the forecast. But the bad news is if you felt cold Tuesday, it could be even cooler today, with a forecast high that will push 60 degrees.

But expect a quick rebound in daytime temperatures as Thursday's high is anticipated to jump to 72 degrees and it's supposed to get back to the lower 80s by Saturday.

Steve Ramirez can be reached at 575-541-5452. Follow him on Twitter @SteveRamirez6

The forecast

Today: Mostly sunny with a high near 60. Northwest wind 6 mph to 15 mph with gusts as high as 21 mph.

Thursday: Sunny with a high near 71. West to southwest wind 6 mph to 16 mph with gusts as high as 23 mph.

Friday: Sunny with a high near 76. West wind 7 mph to 14 mph becoming south-to-southeast in the afternoon. Winds could gust as high as 20 mph.

Saturday: Sunny with a high near 81. Breezy, with a light and variable wind becoming west-to-southwest 17 mph to 22 mph in the morning. Winds could gust as high as 31 mph.

Sunday: Sunny and breezy with a high near 82.

Monday: Sunny and windy with a high near 82.

Source: National Weather Service

Figure 3-7. Las Cruces Sun-News Report from April 10, 2013.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

4 Exceptional Event: April 9, 2013

Summary of the Event

The passing of a spring storm caused high winds and blowing dust in Doña Ana and Luna Counties resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Holman, Desert View, Deming and West Mesa monitoring sites on this date. The FEM TEOM continuous monitors at these sites recorded 24-hour average concentrations of 277 µg/m^3, 470 µg/m^3, 302 µg/m^3, 294 µg/m^3, and 487 µg/m^3 respectively. The Chaparral PM_{10} monitor did not record data on this date due to malfunctioning equipment.

As the event unfolded, the wind blew from the west to southwest throughout the border region. These high velocity winds passed over large areas of desert within Arizona, Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites ranging from 9.1 m/s to 14.3 m/s. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and

daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at four of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at all of these sites (Figures 4-1 and 4-2). Although the Desert View, La Union, and Chaparral monitoring sites did not record sustained wind speeds above the 11.2 m/s threshold, the nearby and upwind monitoring site of Santa Teresa did.

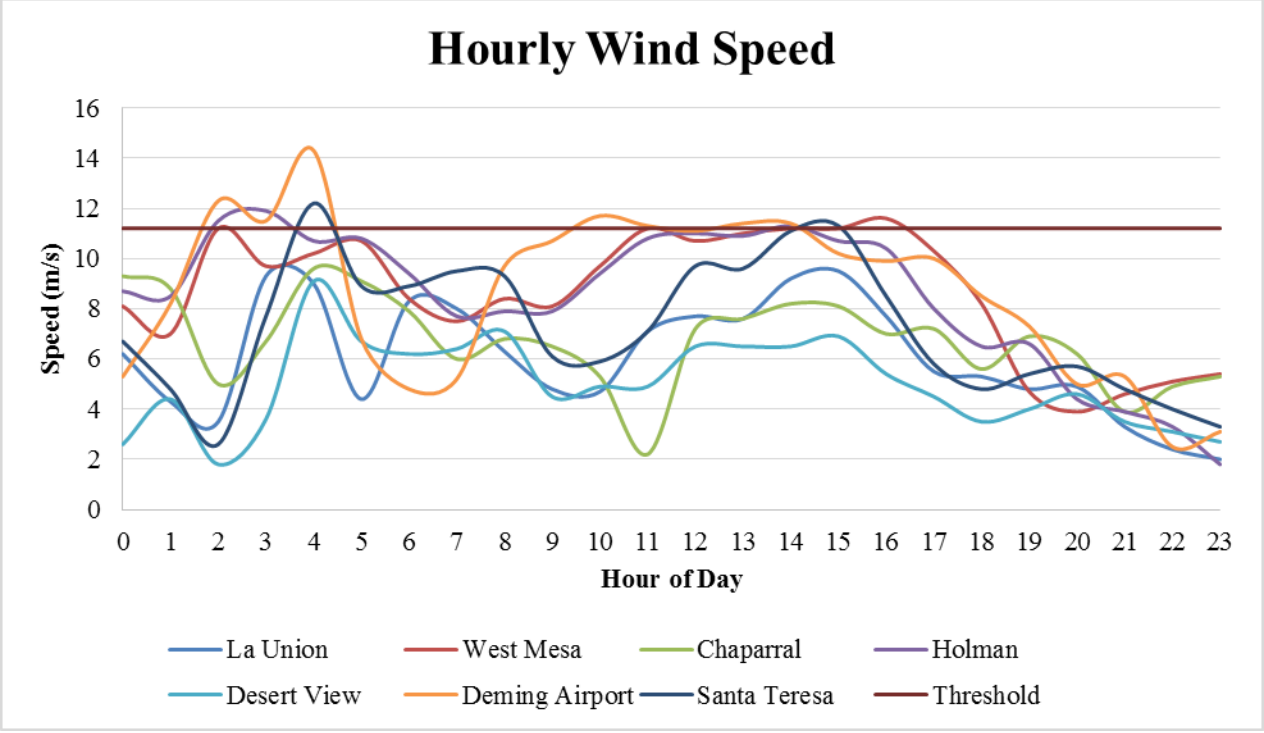


Figure 4-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

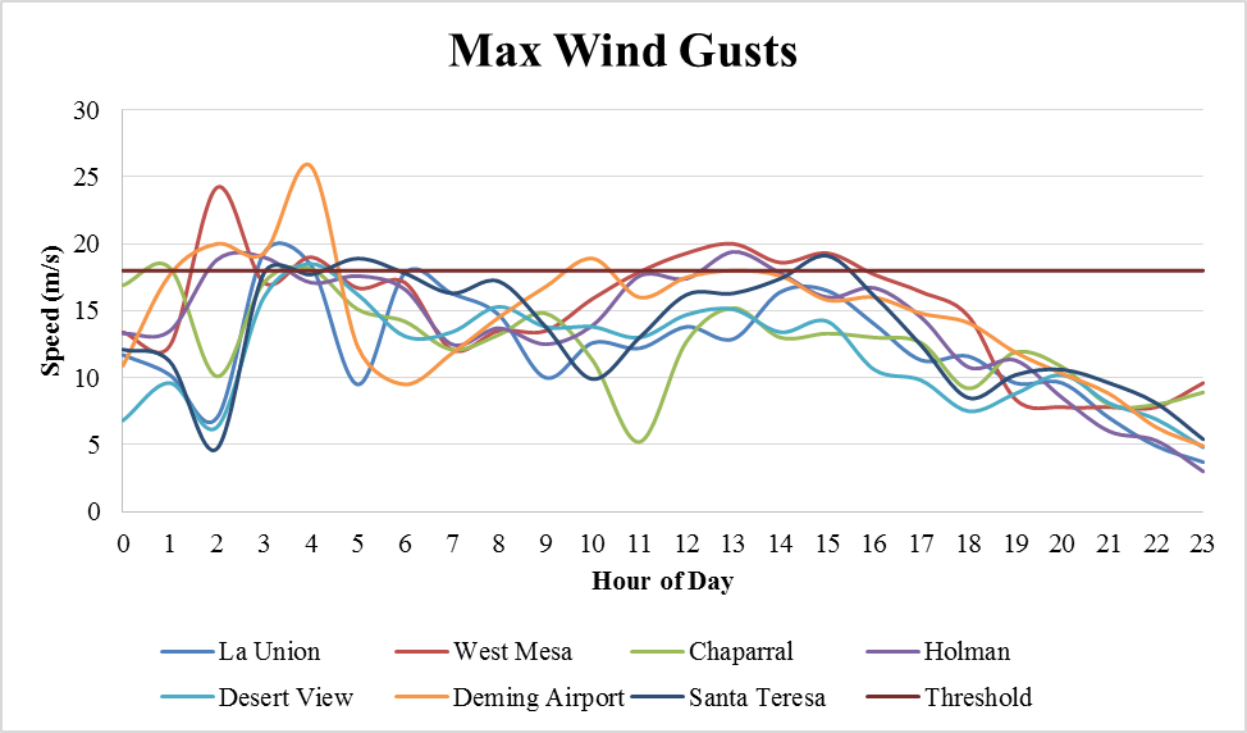


Figure 4-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 4-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded. All of the sites recorded values above the 99th percentile of data except for Deming. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	277	ND	470	302	294	487

Table 4-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 4-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. Spring is considered the windy season with the highest blowing dust activity, as reflected in the increased 99th and 95th percentiles compared to the annual values. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Holman and West Mesa sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust

events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	505	527	467	411	774	263
95th Percentile	176	200	172	144	176	86
Event Day	277	ND	470	302	294	487

Table 4-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong spring storm and pacific cold front continued passing through New Mexico on April 9. An area of low pressure centered in northern New Mexico created a pressure gradient over southeastern Arizona, southwestern New Mexico and northern Mexico. As the storm system moved through northern New Mexico, the surface pressure gradient tightened and winds became stronger (Figure 4-3).

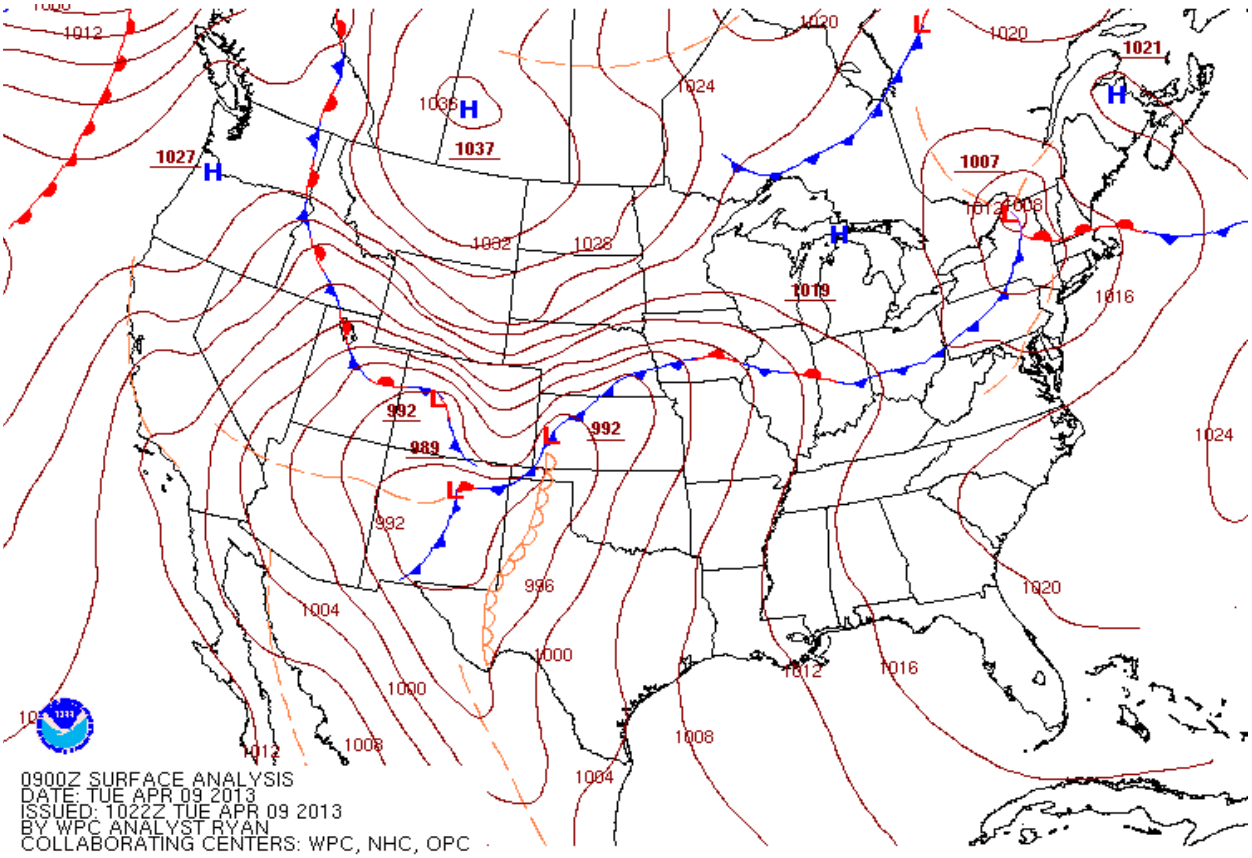
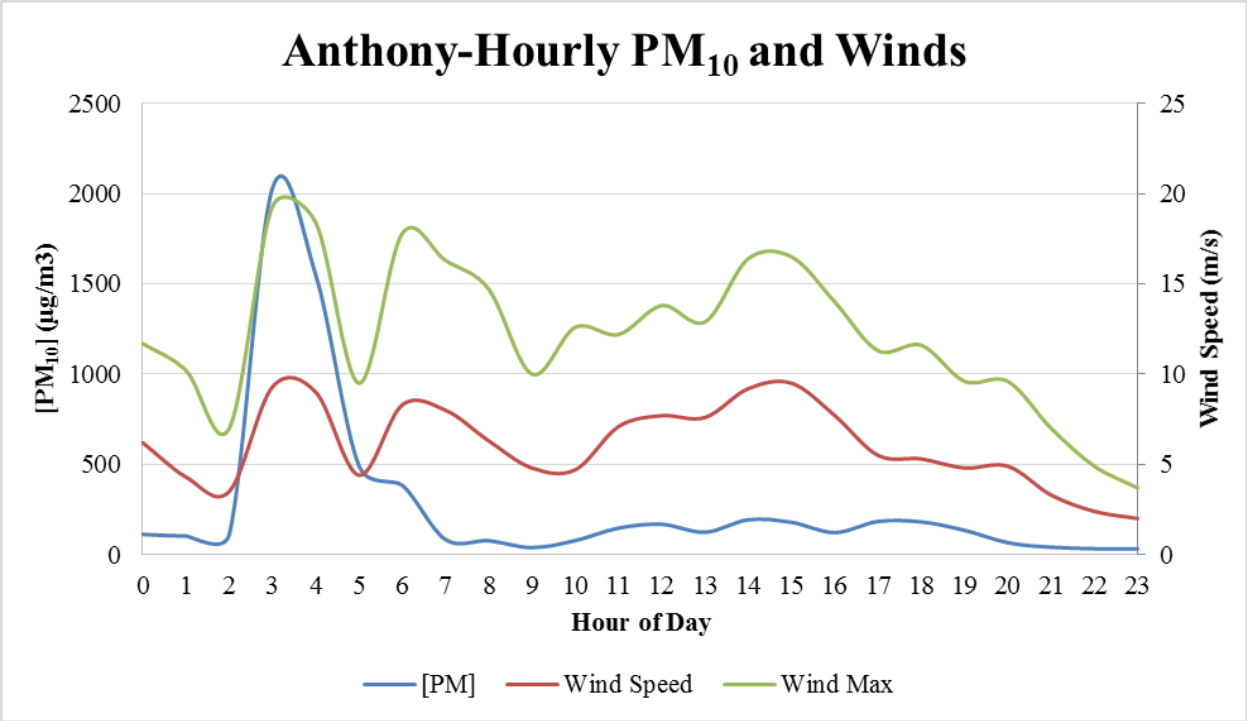
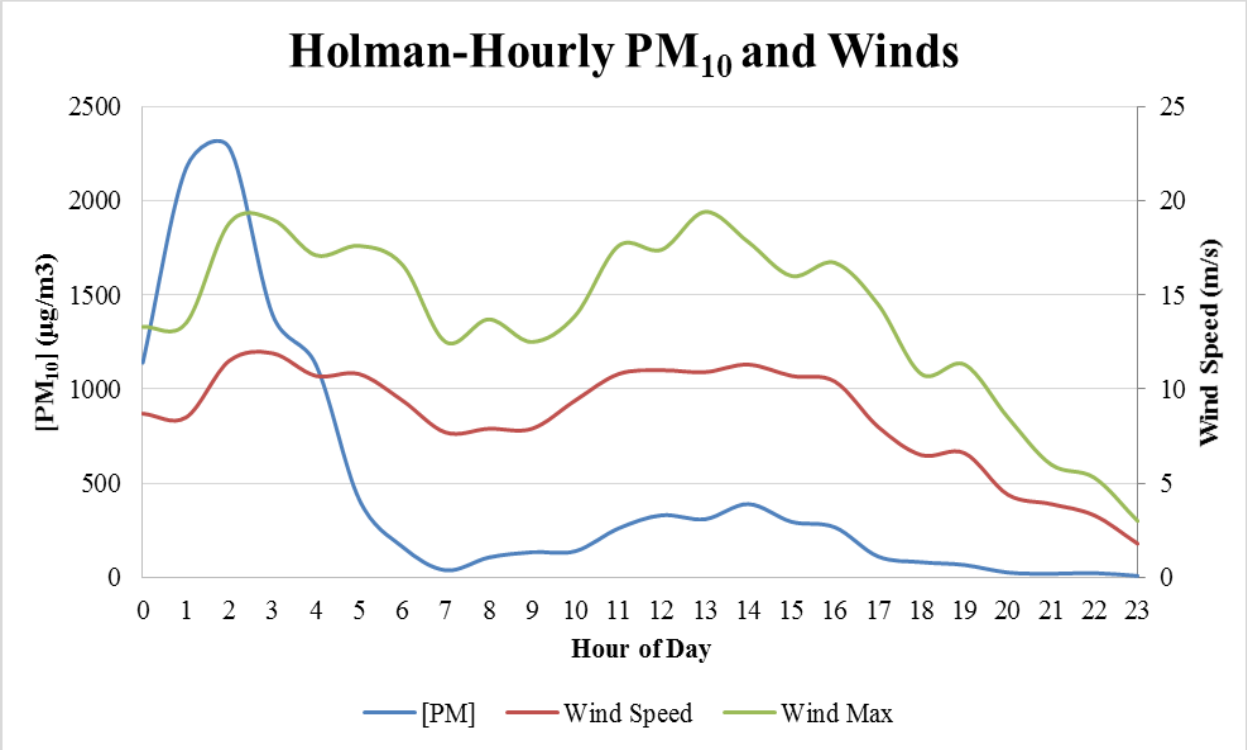
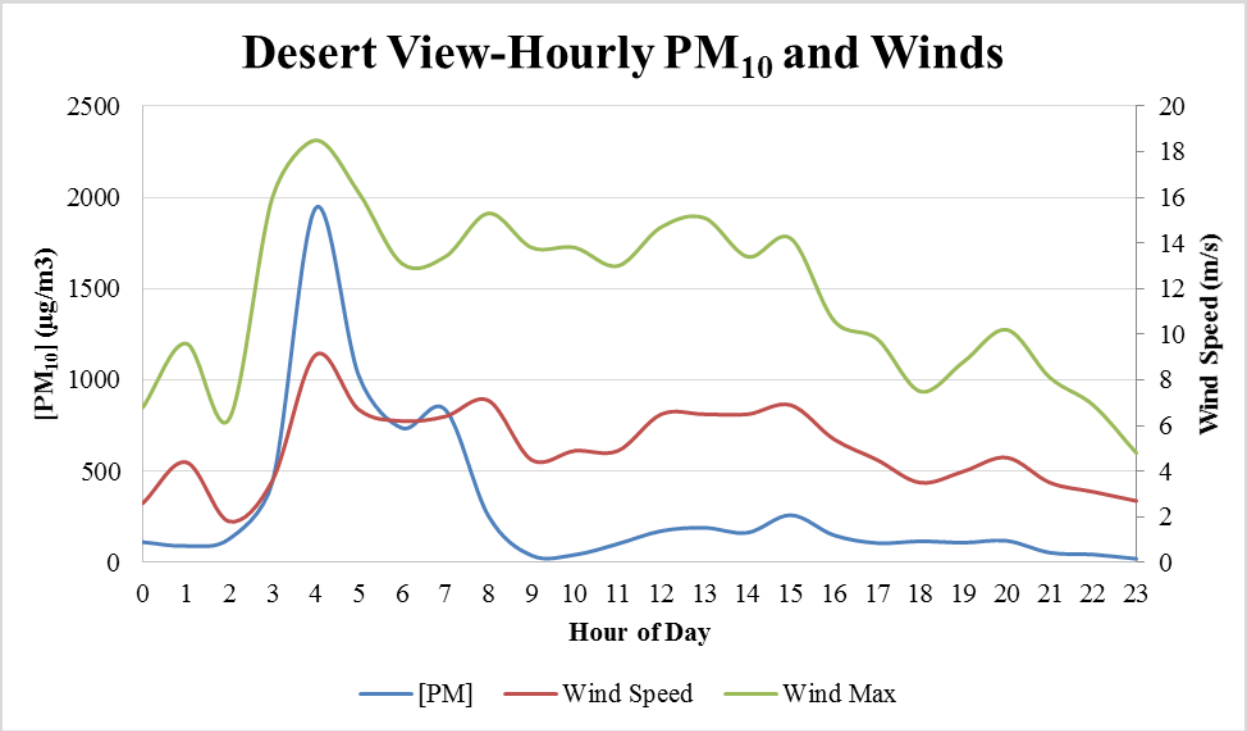


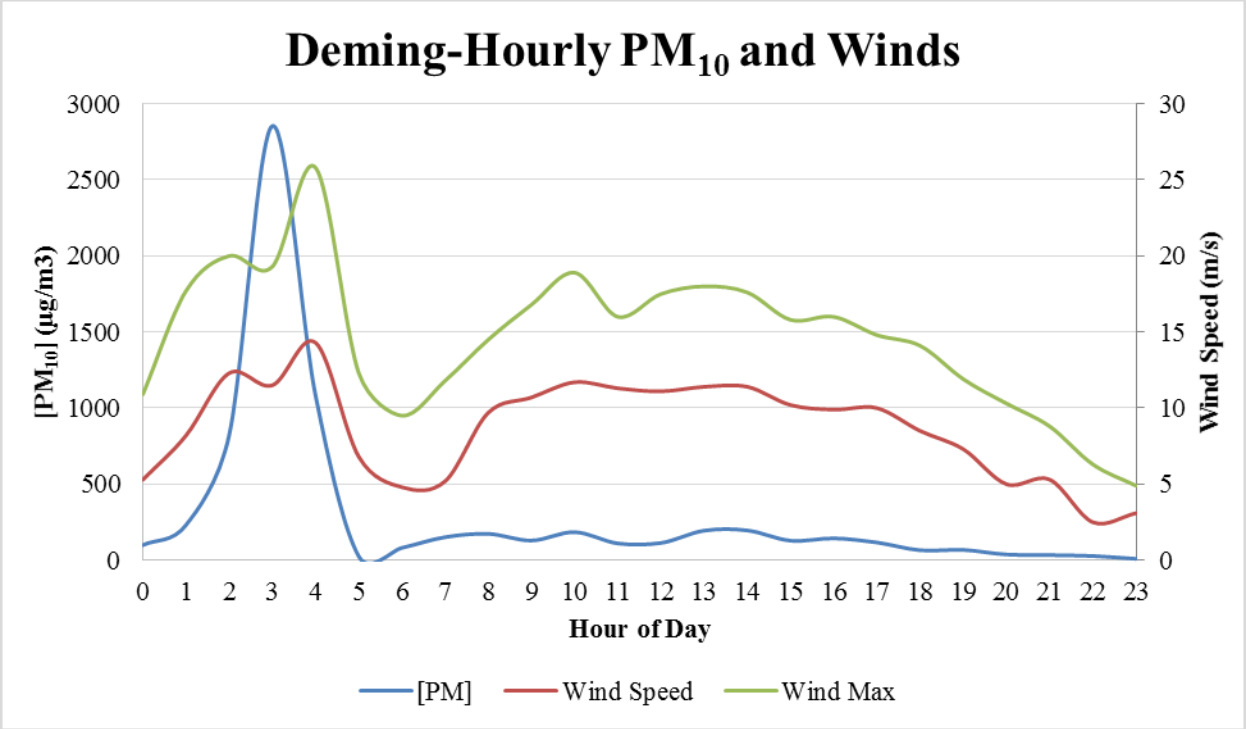
Figure 4-3. Surface weather map showing winter storm and isobars of constant pressure (red lines).

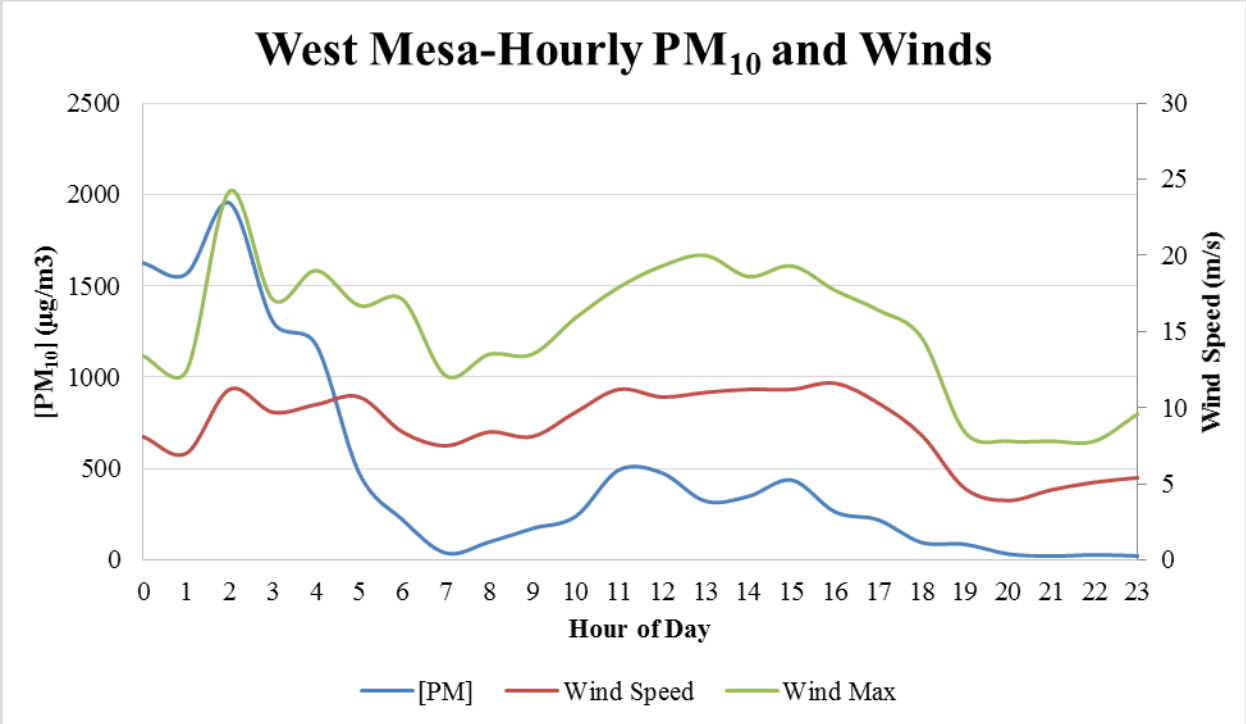
The weather pattern described above generated strong west winds beginning in the early morning hours and continued through the early afternoon hours. Beginning at the 200 hour, wind speeds exceeded 11.2 m/s at West Mesa, Holman and Deming as shown in Figure 4-1. Peak wind speeds ranged from 9.1 m/s at Desert View to 14.3 m/s at Deming (Figure 4-1). Peak wind gusts ranged from 18.2 m/s at Chaparral to 25.8 m/s at Deming (Figure 4-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 4-4 a-e. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 4-5).




Holman-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Desert View-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max





Figures 4-4 a-e. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

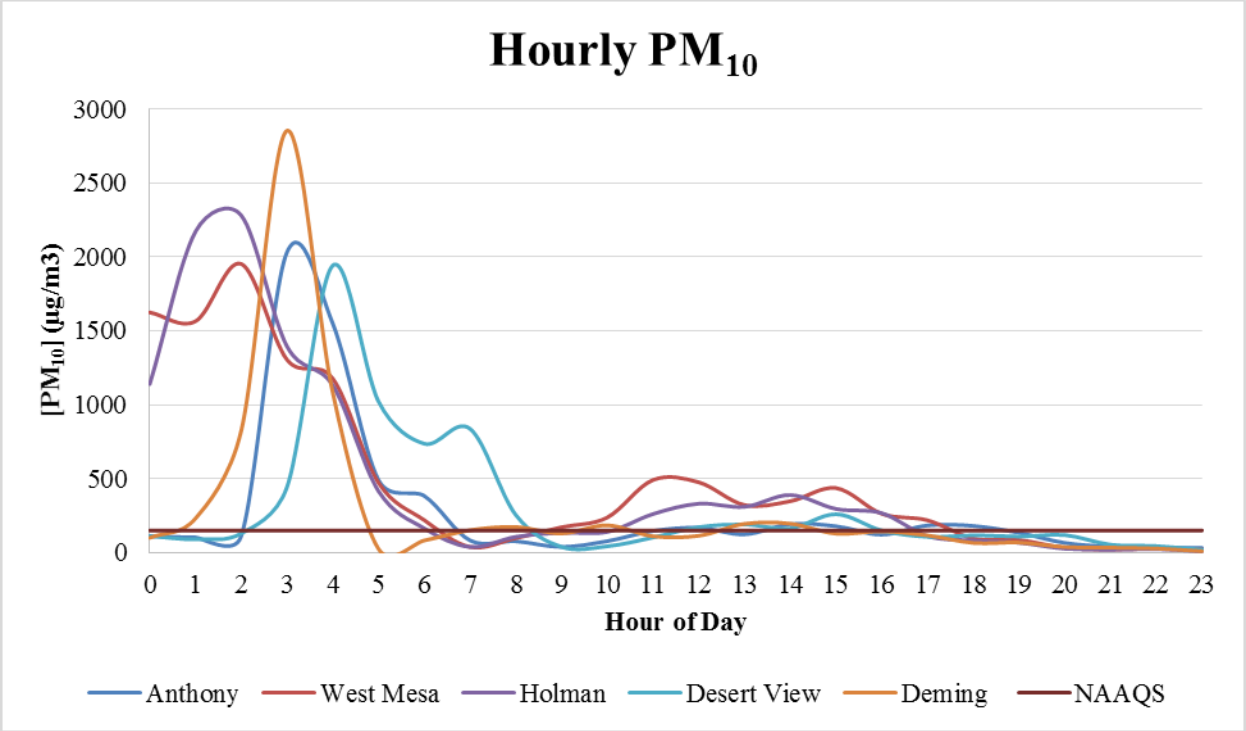


Figure 4-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Wind Advisory for this date. A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer These were in place for southwestern New Mexico and west Texas to warn the public of the high wind event. An excerpt from the NWS text product can be found below.

> A DEEP LOW PRESSURE SYSTEM WITH A COLD FRONT WILL MOVE ACROSS SOUTHERN NEW MEXICO AND WESTERN TEXAS GENERATING STRONG WINDS ACROSS THE REGION THIS MORNING AND THIS AFTERNOON. WEST WINDS WILL HAVE SUSTAINED SPEEDS FROM 25 TO 35 MPH WITH GUSTS AROUND 50 MPH. BLOWING DUST WILL REDUCE VISIBILITIES TO LESS THAN A MILE OVER A FEW AREAS.

The event was not captured on satellite imagery because the majority of blowing dust occurred during the nighttime hours. The Las Cruces Sun-News reported on the event as discussed in section 3 (Figure 3-6).

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

5 Exceptional Event: April 16, 2013

Summary of the Event

The passing of a spring storm caused high winds and blowing dust in San Juan County resulting in exceedances of the PM_{10} 24-hour NAAQS on this date. The FRM Wedding monitor at the Farmington site recorded a 24-hour average concentration of 210 µg/m^3. This is the only PM_{10} monitoring site in New Mexico in the four corners area.

As the event unfolded, the wind blew from the southwest throughout the region. These high velocity winds passed over large areas of desert within Arizona and New Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites ranging from 10.7 m/s to 15.2 m/s. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high daily PM_{10} concentration support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Bisti Wilderness Area, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert in New Mexico and Arizona (see satellite imagery below).

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. Since this is the only exceedance ever recorded at the Farmington site, we use the NEAP threshold for comparison. On this day, sustained wind speeds exceeded EPA's default threshold at two of the three meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at all of these sites (Figures 5-1 and 5-2).

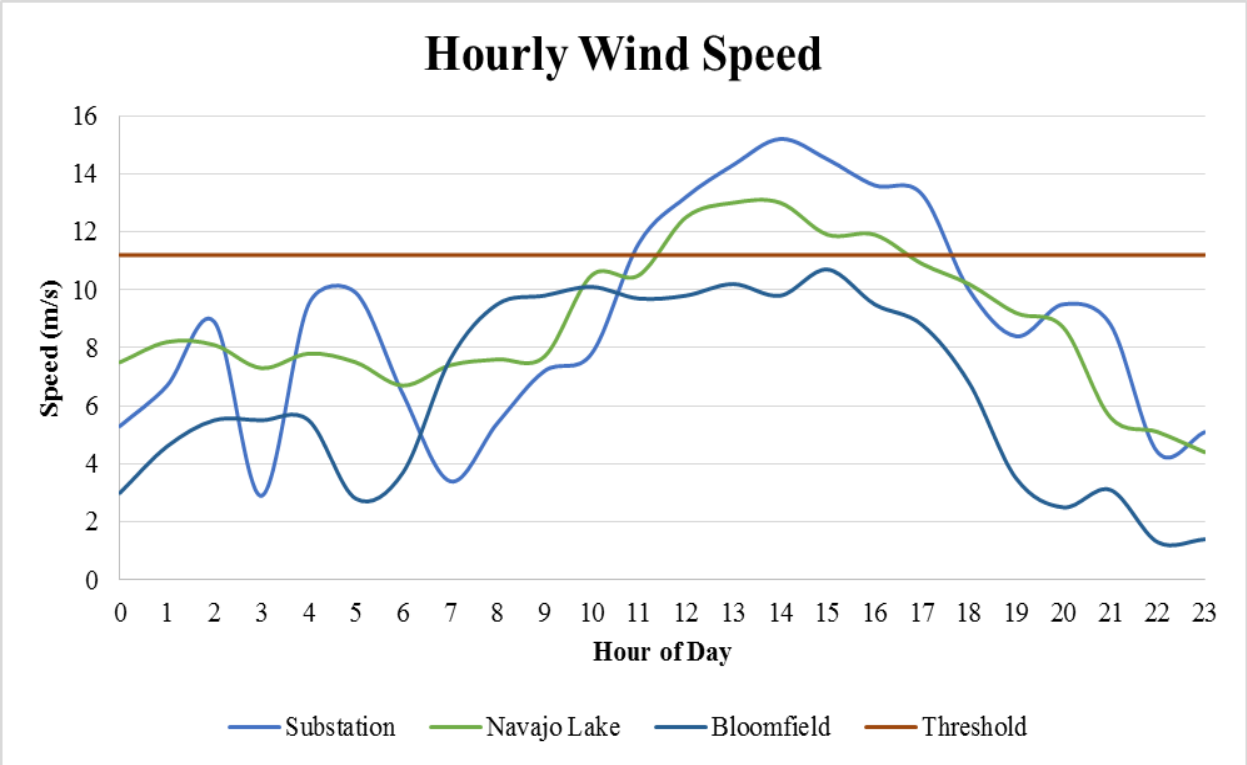


Figure 5-1. Sustained wind speeds at monitoring sites in San Juan County.

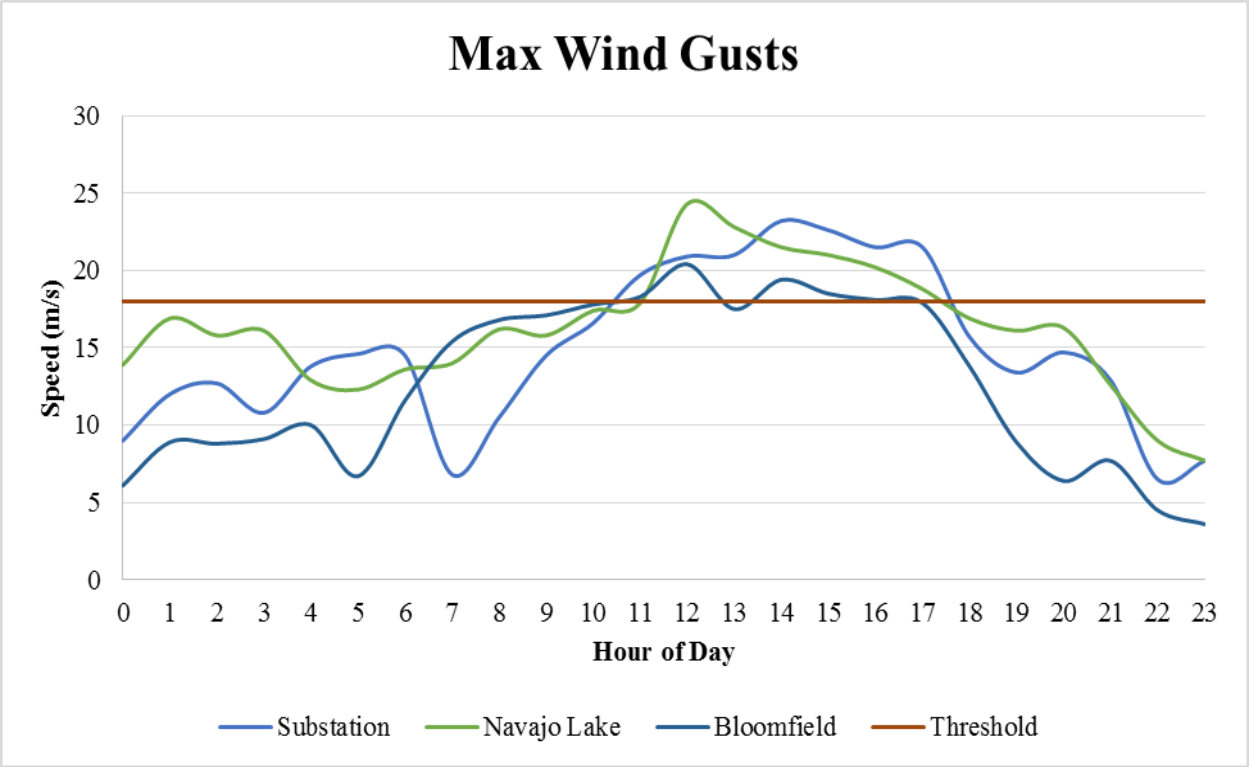


Figure 5-2. Maximum wind gusts at monitoring sites in San Juan County.

Basic Controls Analysis

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on San Juan County's attainment designation with no history of recorded exceedances, NMED believes that no control measures to reduce windblown dust should have been in place. Implementation of such control measures on source areas would also be a challenge as much of the land is on Navajo Reservation or tribal trust land. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring site in San Juan County has never recorded an exceedance of the PM_{10} Standard (Appendix-A). Most days with high winds occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season.

Table 5-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements and seasonal measurements from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FRM Wedding measurements only since it is the only PM_{10} monitor operated by NMED in the area. The recorded value for this day is the Maximum value ever recorded at this site.

Farmington	Annual	Spring
Max	73	73
99th Percentile	44	49
95th Percentile	19	20
Event Day	210	210

Table 5-1. Percentile comparison of event day 24-hour average to annual and seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong spring storm approached New Mexico on April 16. An area of low pressure centered in western Colorado created a pressure gradient over northeastern Arizona and northwestern New Mexico. As the storm system continued moving east into New Mexico, the surface pressure gradient tightened and winds became stronger (Figure 5-3). Surface winds flow perpendicular to the isobars from high to low pressure. Diurnal heating of the surface allowed winds aloft to mix downward, increasing the surface wind velocities and provided the turbulence required for vertical mixing and horizontal transport of dust.

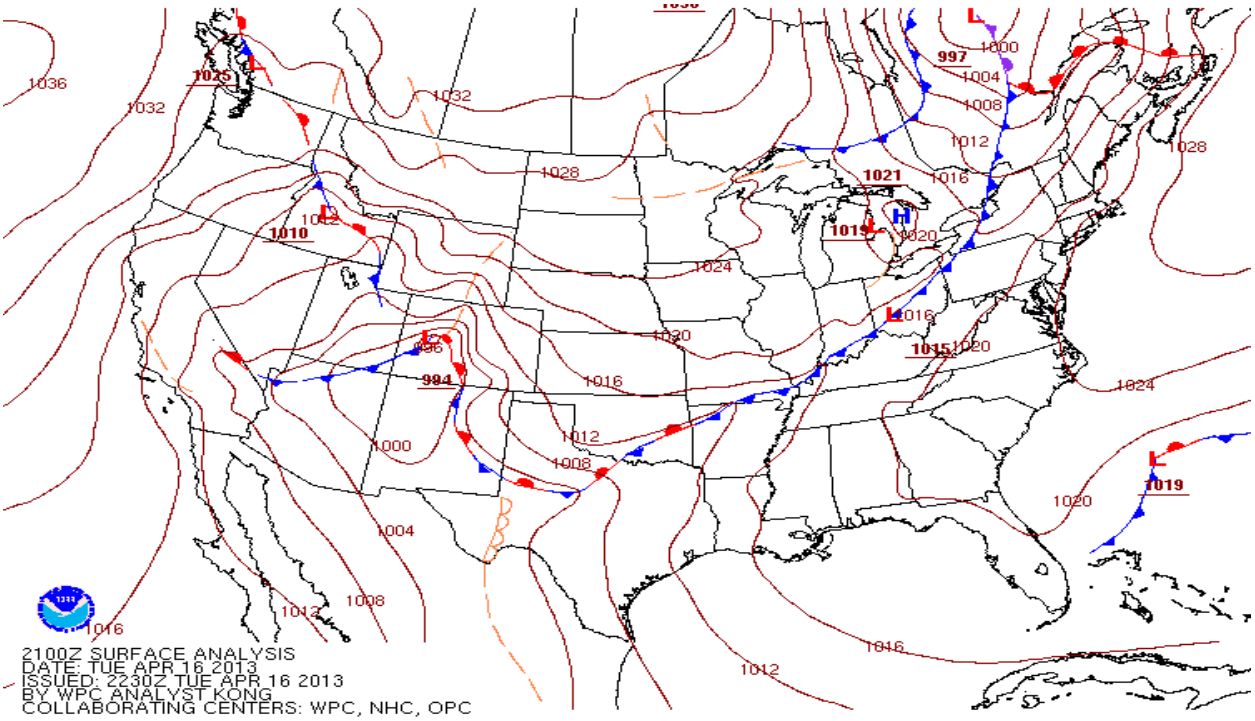


Figure 5-3. Surface weather map showing winter storm and isobars of constant pressure (red lines).

The weather pattern described above generated strong winds beginning at the 1100 hour and lasted through the 1700 hour. Beginning at the 1100 hour, wind speeds exceeded 11.2 m/s at Substation as shown in Figure 5-1. Peak wind speeds ranged from 10.7 m/s at Bloomfield to 15.2 m/s at Substation (Figure 5-1). Peak wind gusts ranged from 20.4 m/s at Bloomfield to 24.3 m/s at Navajo Lake (Figure 5-2). The FRM Wedding monitor runs an integrated 24-hour sample and no hourly data are available for this date.

The National Weather Service (NWS) issued a High Wind Warning for this date. A High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. This was in place for northwestern New Mexico to warn the public of the high wind event. An excerpt from the NWS text product can be found below.

> A BROAD UPPER LEVEL LOW PRESSURE SYSTEM CROSSING THE GREAT BASIN STEERS THE JET STREAM OVER THE STATE. PLENTY OF SUNSHINE WILL ENABLE DEEP VERTICAL MIXING IN THE ATMOSPHERE...WHICH WILL TRANSFER THE STRONGER MOMENTUM ALOFT TO THE SURFACE WITH WIND GUSTS FROM 45 TO POTENTIALLY OVER 55 MPH. AREAS OF BLOWING DUST WILL RESTRICT VISIBILITY AT LOWER ELEVATIONS.

The event was also captured on satellite imagery showing dust plumes originating northeast of Flagstaff, AZ and along Highway 491 between Gallup and Shiprock, NM (Figure 5-4). The event was featured on NASA's daily natural hazard blog and numerous news outlets reported on the event (Figure 5-5 and 5-6).

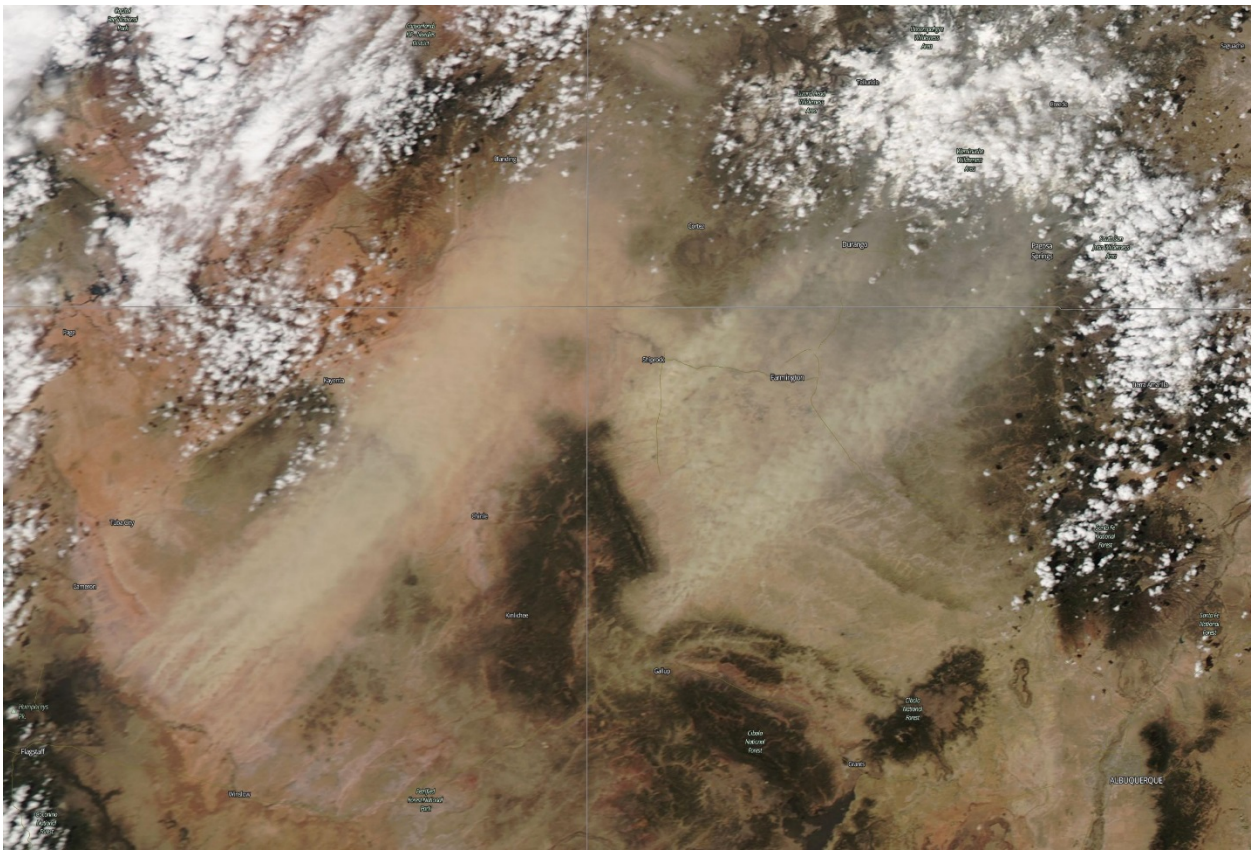
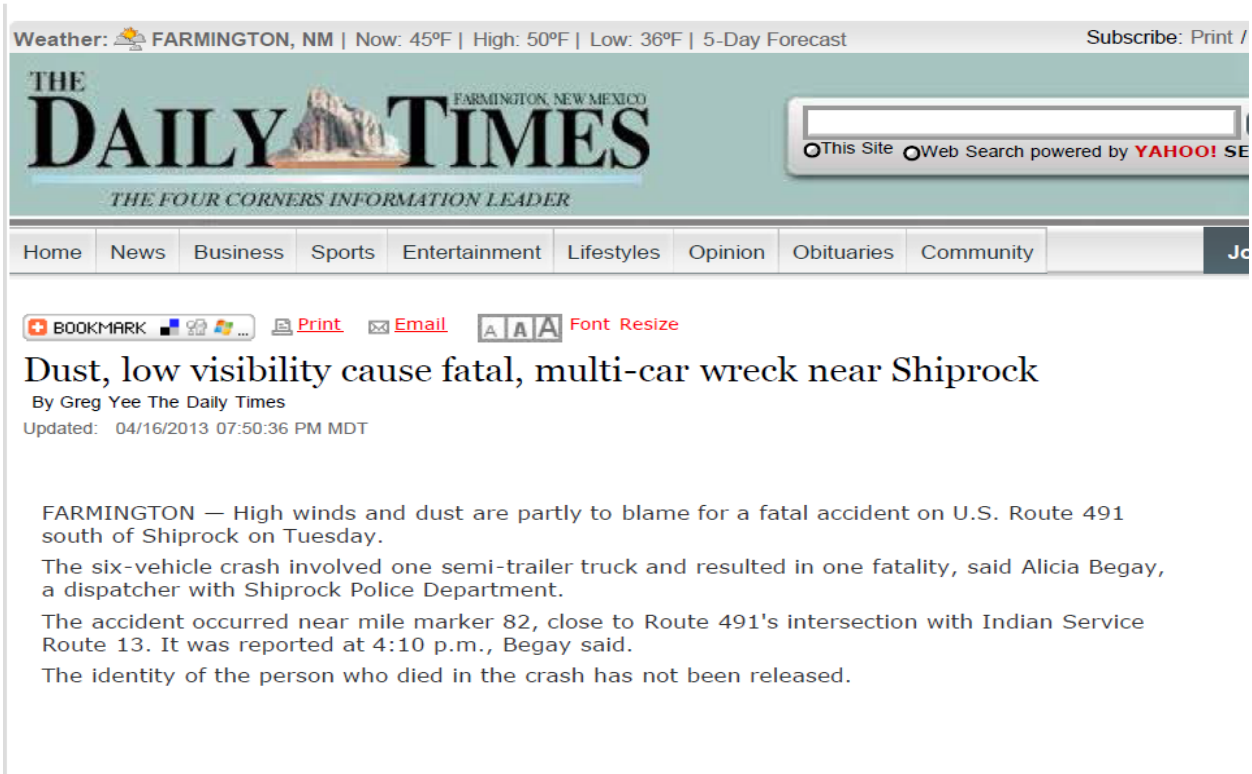


Figure 5-4. NASA satellite imagery of the Four Corners Area.



Weather: FARMINGTON, NM | Now: 45ºF | High: 50ºF | Low: 36ºF | 5-Day Forecast Subscribe: Print /

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Dust, low visibility cause fatal, multi-car wreck near Shiprock

By Greg Yee The Daily Times

Updated: 04/16/2013 07:50:36 PM MDT

FARMINGTON — High winds and dust are partly to blame for a fatal accident on U.S. Route 491 south of Shiprock on Tuesday.

The six-vehicle crash involved one semi-trailer truck and resulted in one fatality, said Alicia Begay, a dispatcher with Shiprock Police Department.

The accident occurred near mile marker 82, close to Route 491's intersection with Indian Service Route 13. It was reported at 4:10 p.m., Begay said.

The identity of the person who died in the crash has not been released.

Figure 5-5. News report from the Farmington Daily Times of a fatal car accident due to the event.

Article published Apr 16, 2013

Durango gets dusty, again

Winds cause 1,000 in La Plata County to lose power

Photo by: JERRY McBRIDE/Durango Herald
Get ready to wash your windows and cars again after another dust storm consumed the sky and air in Durango on Tuesday.

By Shane Benjamin Herald staff writer

A widespread dust storm clouded Durango-area skies and diminished air quality for the second time in about a week Tuesday.

Blustery winds were blamed for causing several electrical outages affecting about 1,000 customers in La Plata County, according to a news release issued Tuesday by La Plata Electric Association.

The wind knocked down trees in the Forest Lakes area north of Bayfield, affecting about 739 customers.

The state Department of Public Health and Environment issued a blowing-dust advisory, meaning people in sensitive health populations should take extra precautions, said Christopher Dann, spokesman with the state Air Pollution Control Division of the state health agency.

People with pre-existing conditions such as heart or lung problems should limit prolonged exposure and activities that increase respiration rates, he said.

The dust storm was the result of a low-pressure system centered over Utah and Nevada that contributed to a strong southwest flow over this part of the state, said Joe Ramey, forecaster with the National Weather Service in Grand Junction.

Figure 5-6. Durango Herald Article reporting about the event.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitor is significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the county. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 99th percentile concentration for 24-Hour averages (44 µg/m^3) were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

6 Exceptional Event: April 17, 2013

Summary of the Event

The passing of a spring storm caused high winds and blowing dust in Doña Ana and Luna Counties resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Holman, Desert View, Deming and West Mesa monitoring sites on this date (Table 1-1). The Chaparral monitor did not record data on this date due to malfunctioning equipment.

As the event unfolded, the wind blew from the west to southwest throughout the border region. These high velocity winds passed over large areas of desert within Arizona, Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico (see satellite imagery below).

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at six of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at all of these sites (Figures 6-1 and 6-2). Although the Desert View monitoring site did not record sustained wind speeds above the 11.2 m/s threshold, the nearby and upwind monitoring site of Santa Teresa did.

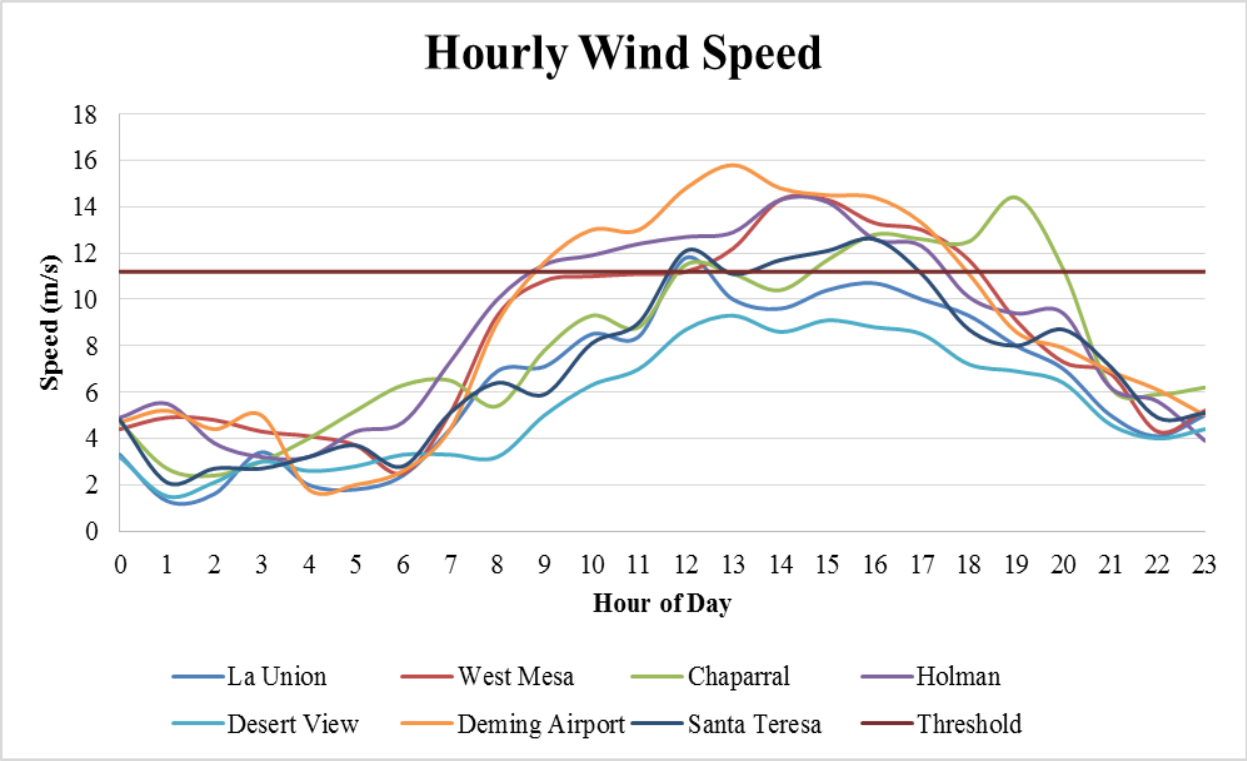


Figure 6-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

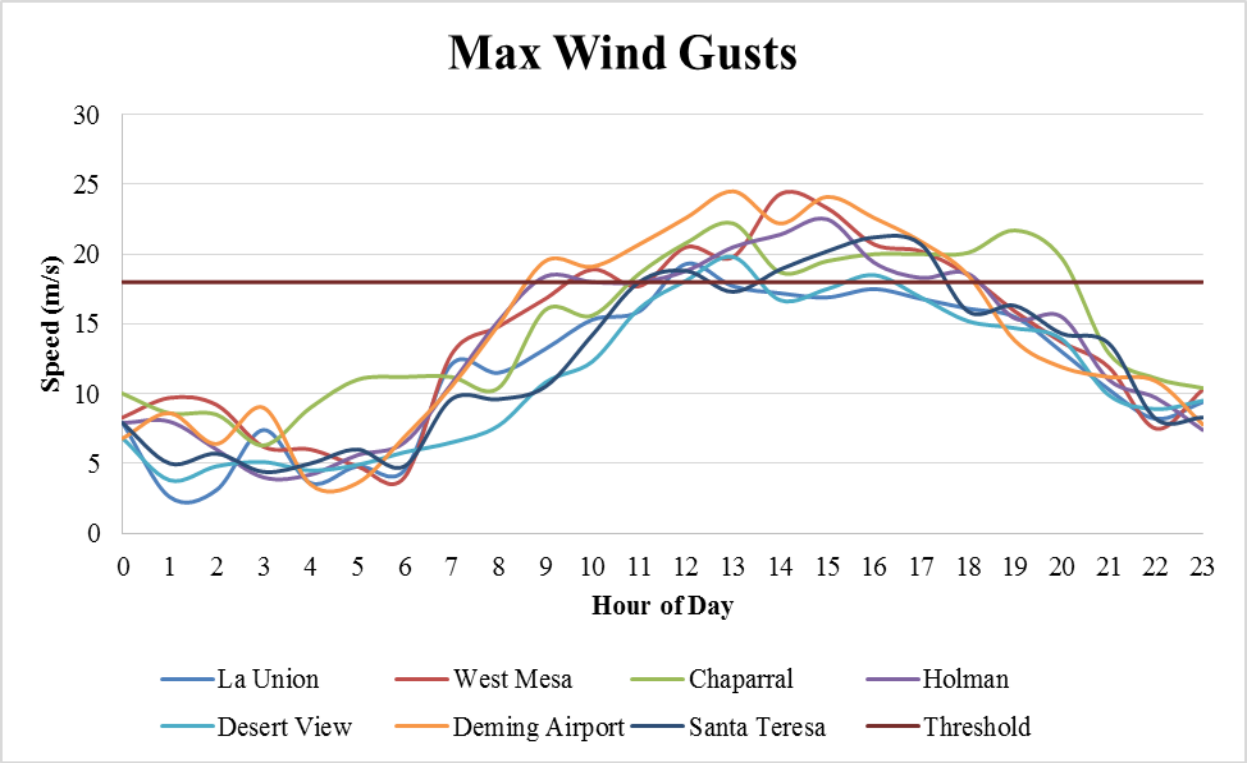


Figure 6-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 6-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 99^{th} percentile of all 24-hour averages recorded at all of the monitoring sites. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99^{th} Percentile	268	297	212	231	300	135
95^{th} Percentile	105	101	71	91	69	47
Event Day	519	ND	556	502	660	416

Table 6-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 6-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. Spring is considered the windy season with the highest blowing dust activity, as reflected in the increased 99^{th} and 95^{th} percentiles compared to the annual values. The recorded values for this day are above the 95^{th} percentile of the seasonal 24-hour averages recorded. The Anthony, Holman, Desert View and West Mesa sites recorded

values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	505	527	467	411	774	263
95th Percentile	176	200	172	144	176	86
Event Day	519	ND	556	502	660	416

Table 6-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong upper level low and associated cold front over the Great Basin swept across the borderland on this date. An upper low over eastern Nevada traveled into Utah and into Colorado by the evening. The associated cold front trailed this low through western Arizona, maximizing wind speeds as mid-level winds and upper trough coincided to reinforce surface wind speeds. The cold front moved through New Mexico during the morning and early afternoon hours (Figure 6-3).

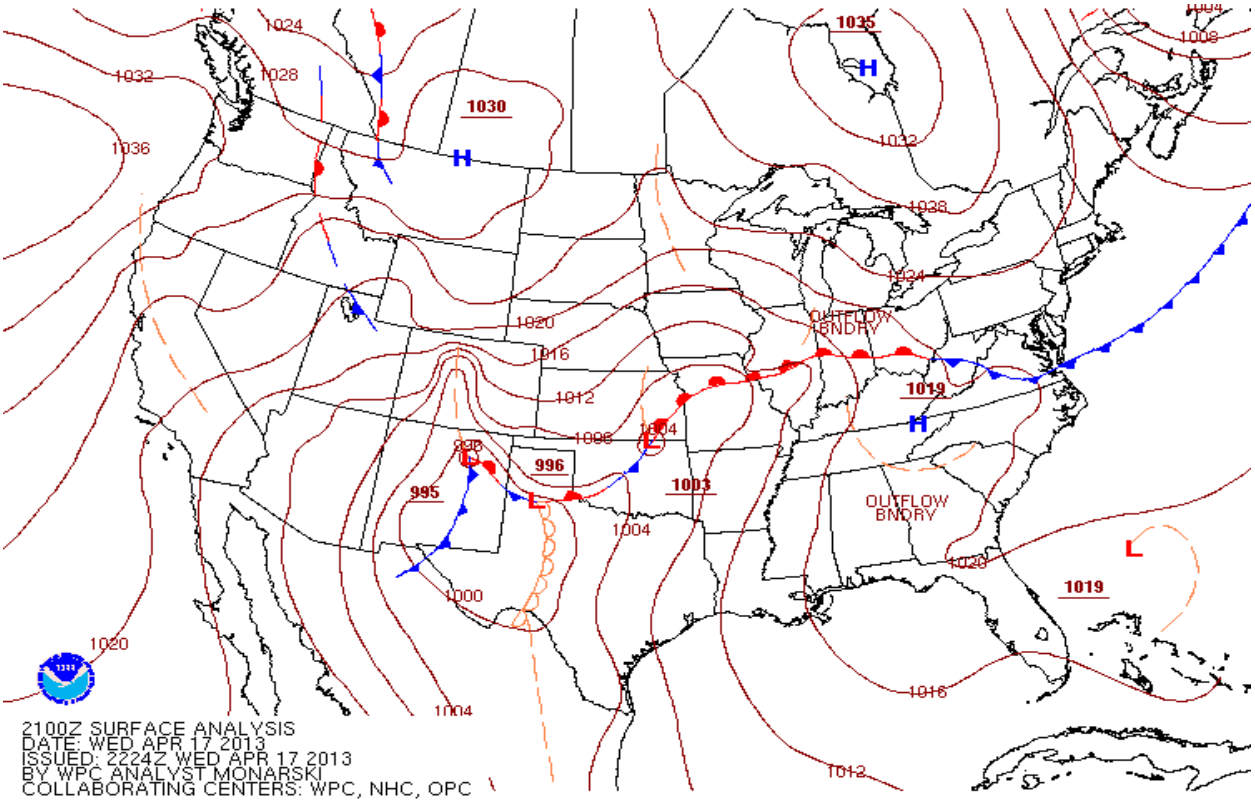
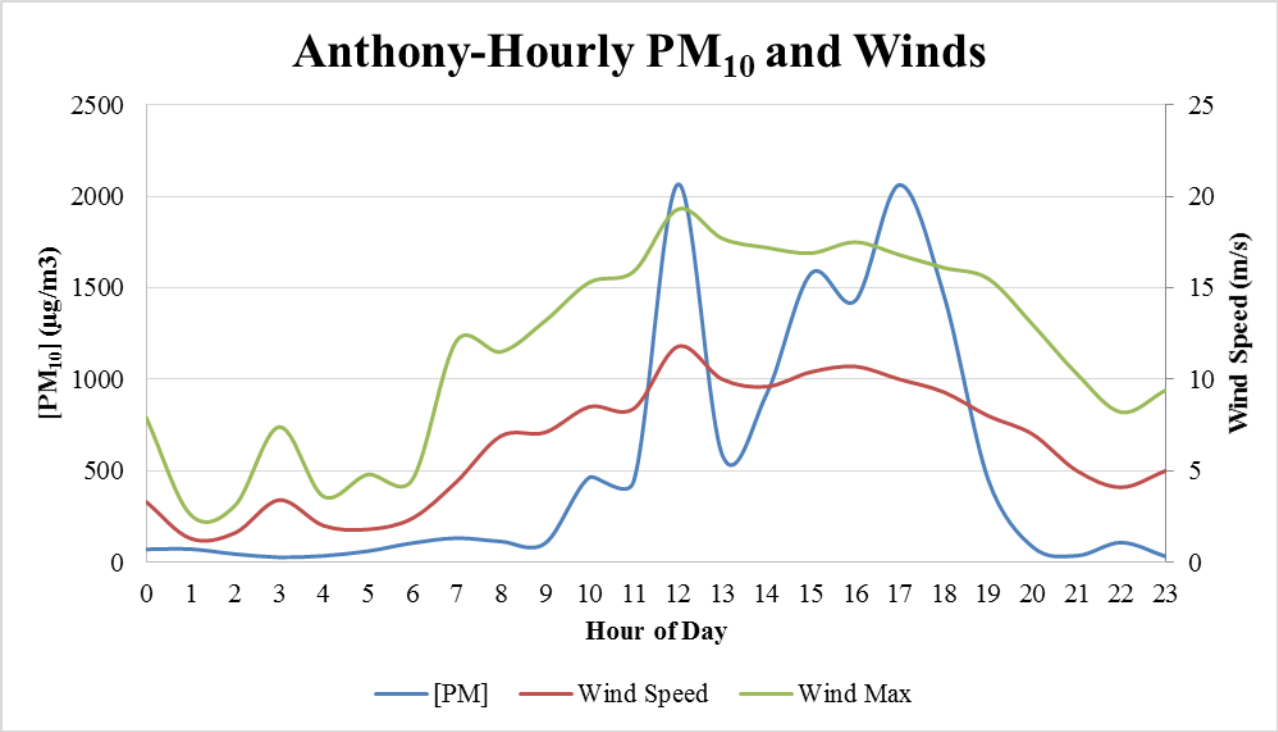
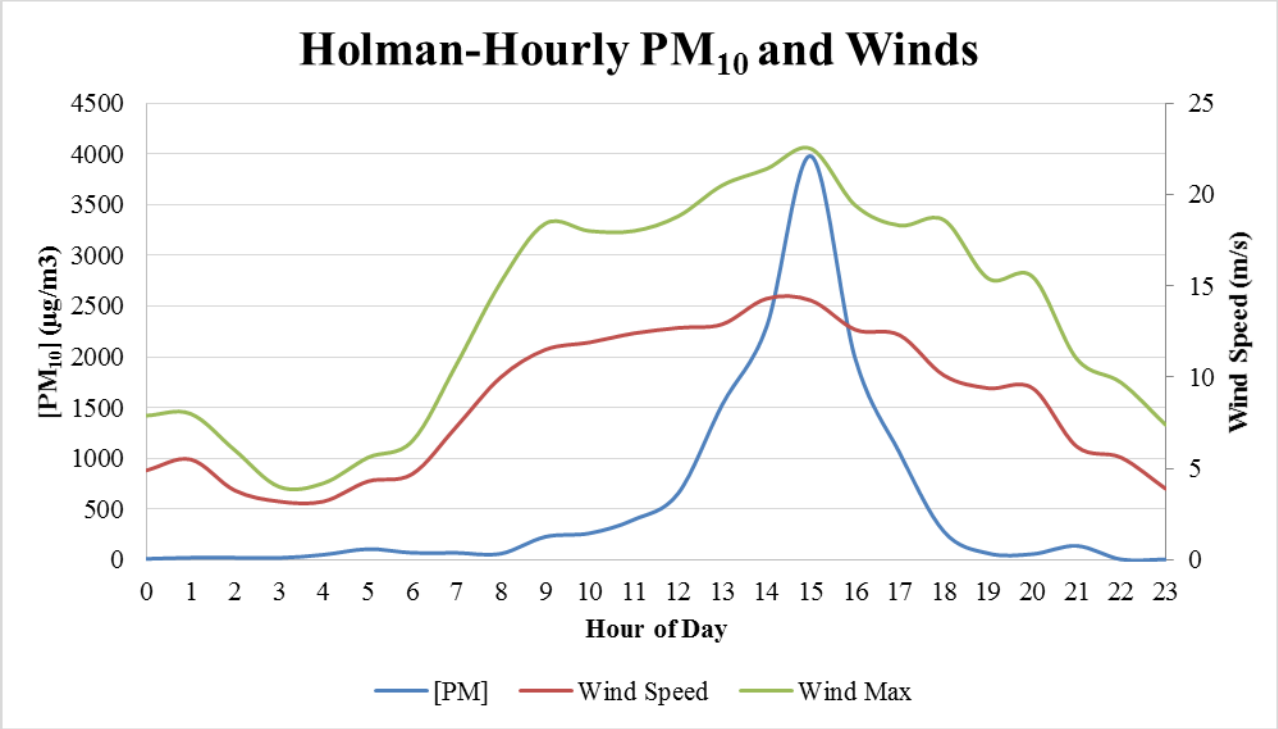
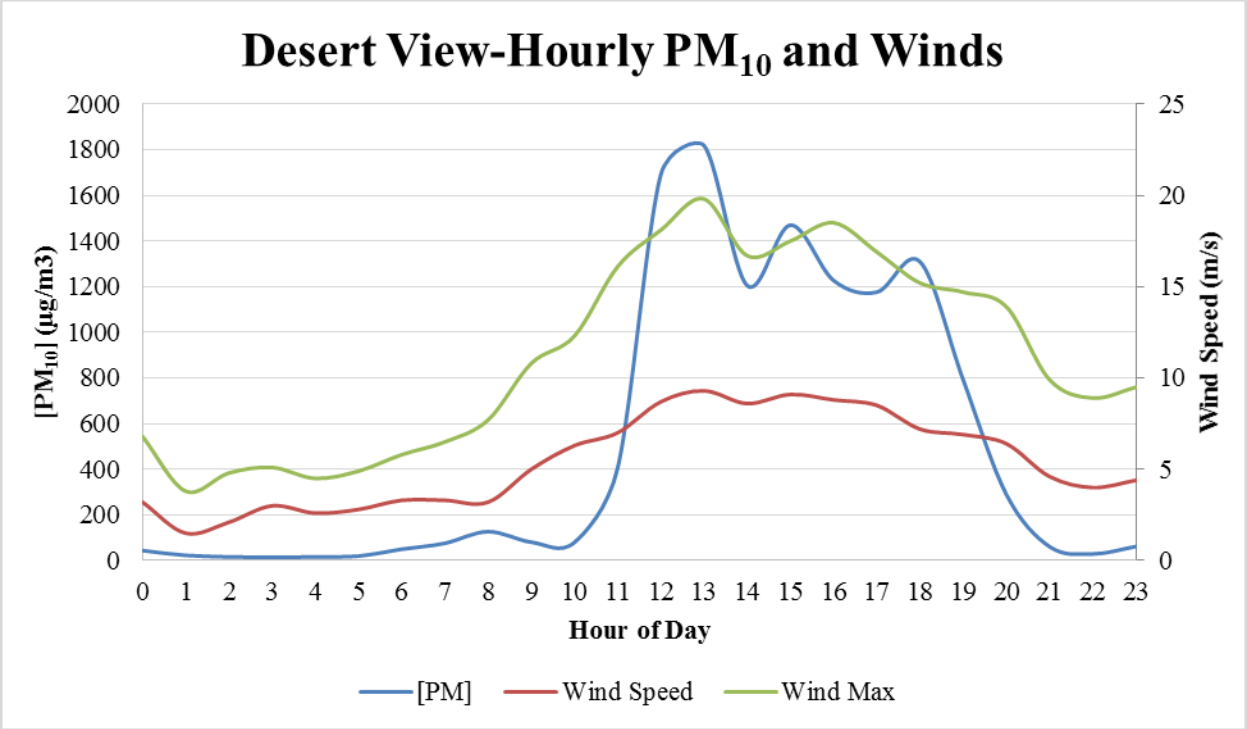


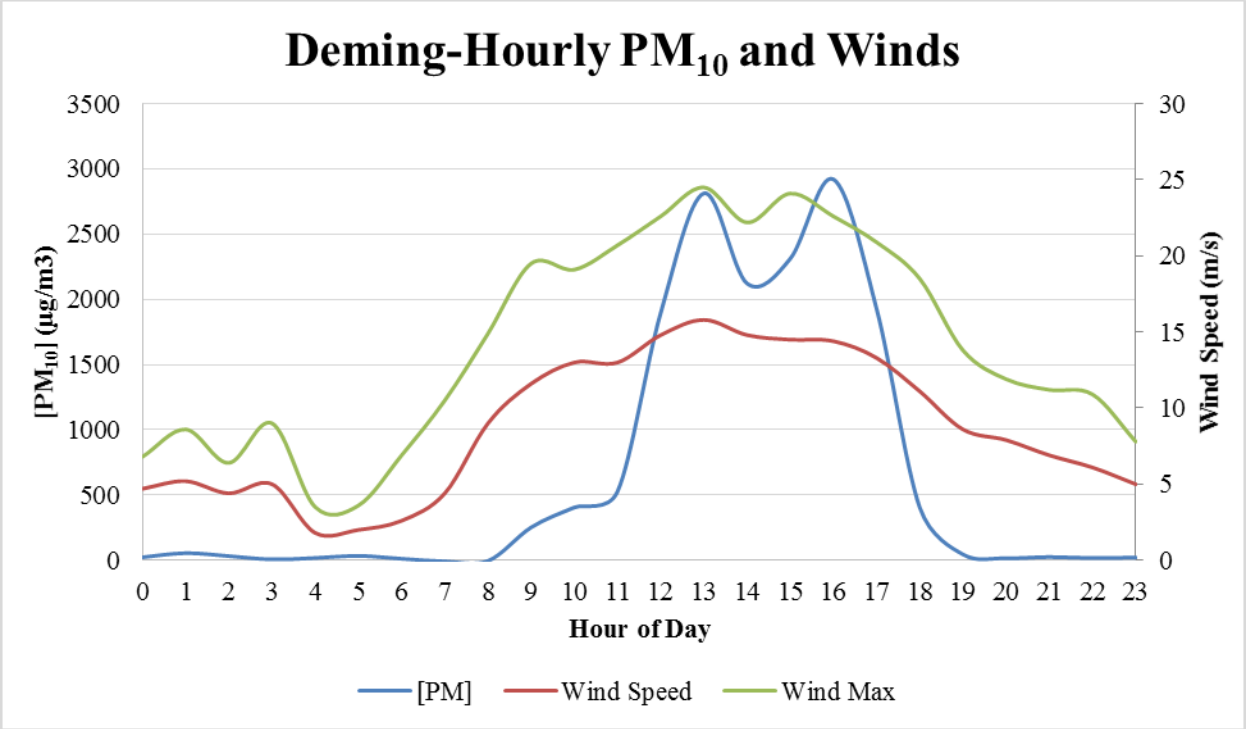
Figure 6-3. Surface weather map showing pacific storm and isobars of constant pressure (red lines).

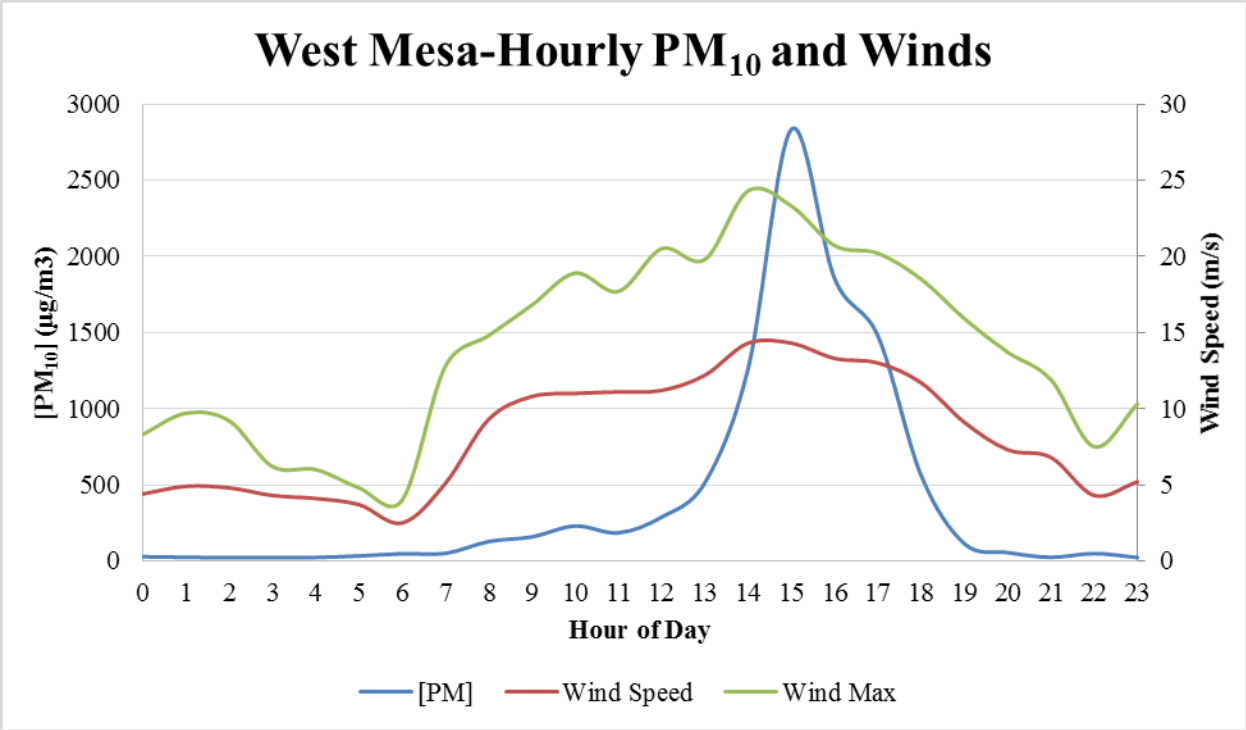
The weather pattern described above generated strong winds beginning at the 900 hour and lasted through the 2000 hour. Beginning at the 900 hour, wind speeds exceeded 11.2 m/s at Holman and Deming as shown in Figure 6-1. Peak wind speeds ranged from 9.3 m/s at Desert View to 15.8 m/s at the Deming Airport (Figure 6-1). Peak wind gusts ranged from 19.3 m/s at La Union to 24.5 m/s at the Deming Airport (Figure 6-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 6-4 a-e. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 6-5).




Holman-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Desert View-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max





Figures 6-4 a-e. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

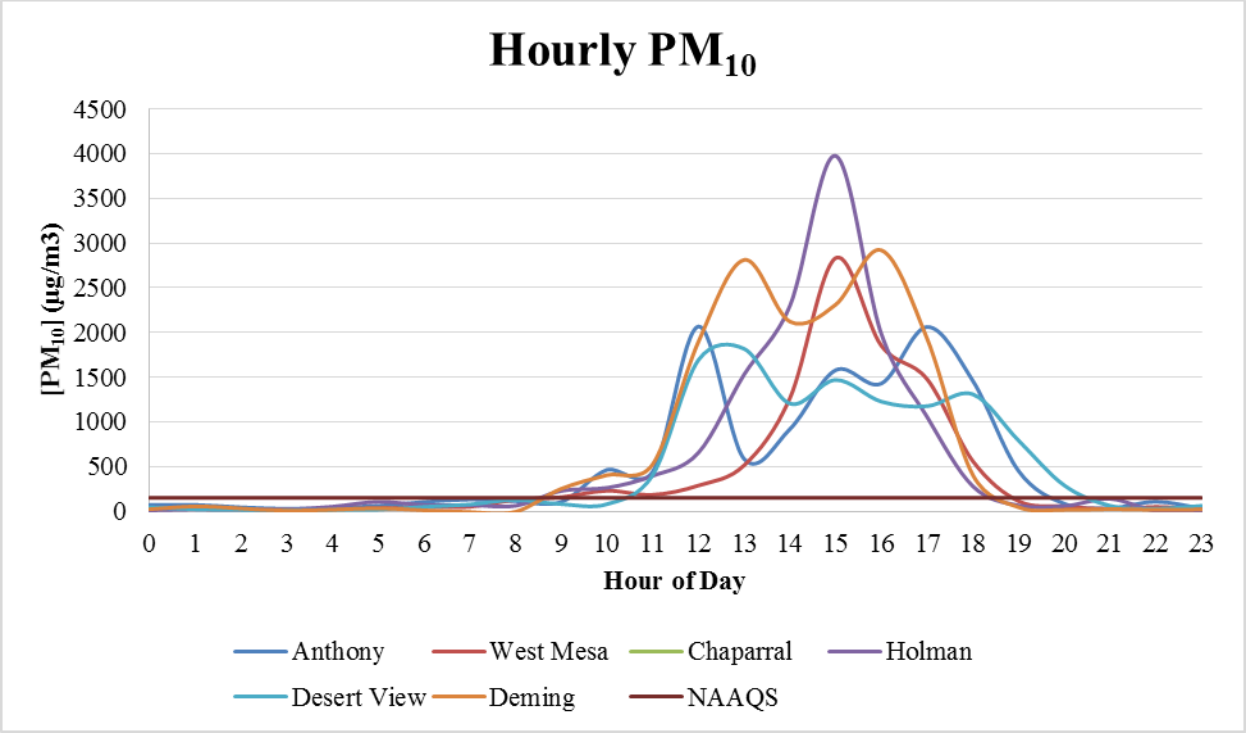


Figure 6-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Blowing Dust Advisory, Wind Advisory and High Wind Warning for this date. A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer. A High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. A Blowing Dust Advisory is issued when blowing dust is expected to reduce visibility to between ¼ to 1 mile, generally with winds of 25 mph or greater. These were in place for southwestern New Mexico and west Texas to warn the public of the high wind event. The NWS graphicast can be found below (Figure 6-6).

Figure 6-6. NWS graphicast showing the storm with advisory and warning messages.

The event was also captured on satellite imagery showing dust plumes originating along the I-10 corridor and northern Mexico (Figure 6-7). These plumes blanketed southern and eastern New Mexico extending into the panhandles of Texas and Oklahoma. The New Mexico State Police closed I-10 from Las Cruces to Lordsburg, US 180 between Deming and Hurley, and New Mexico Highway 11 due to high winds and low visibility (Figure 6-8). The El Paso Times and Las Cruces Sun-News also reported on the event (Figure 6-9).

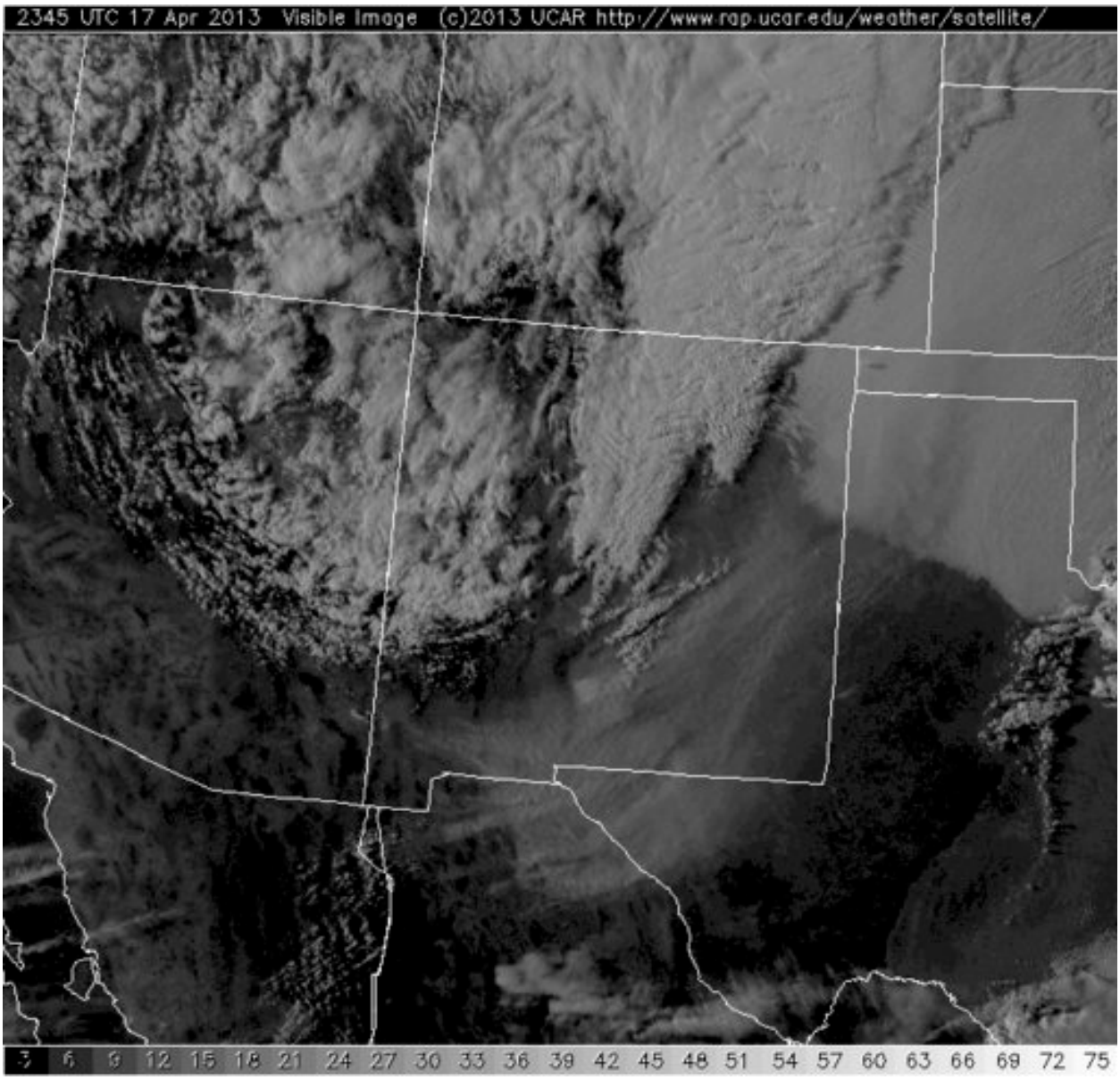


Figure 6-7. GOES satellite imagery of the border area.

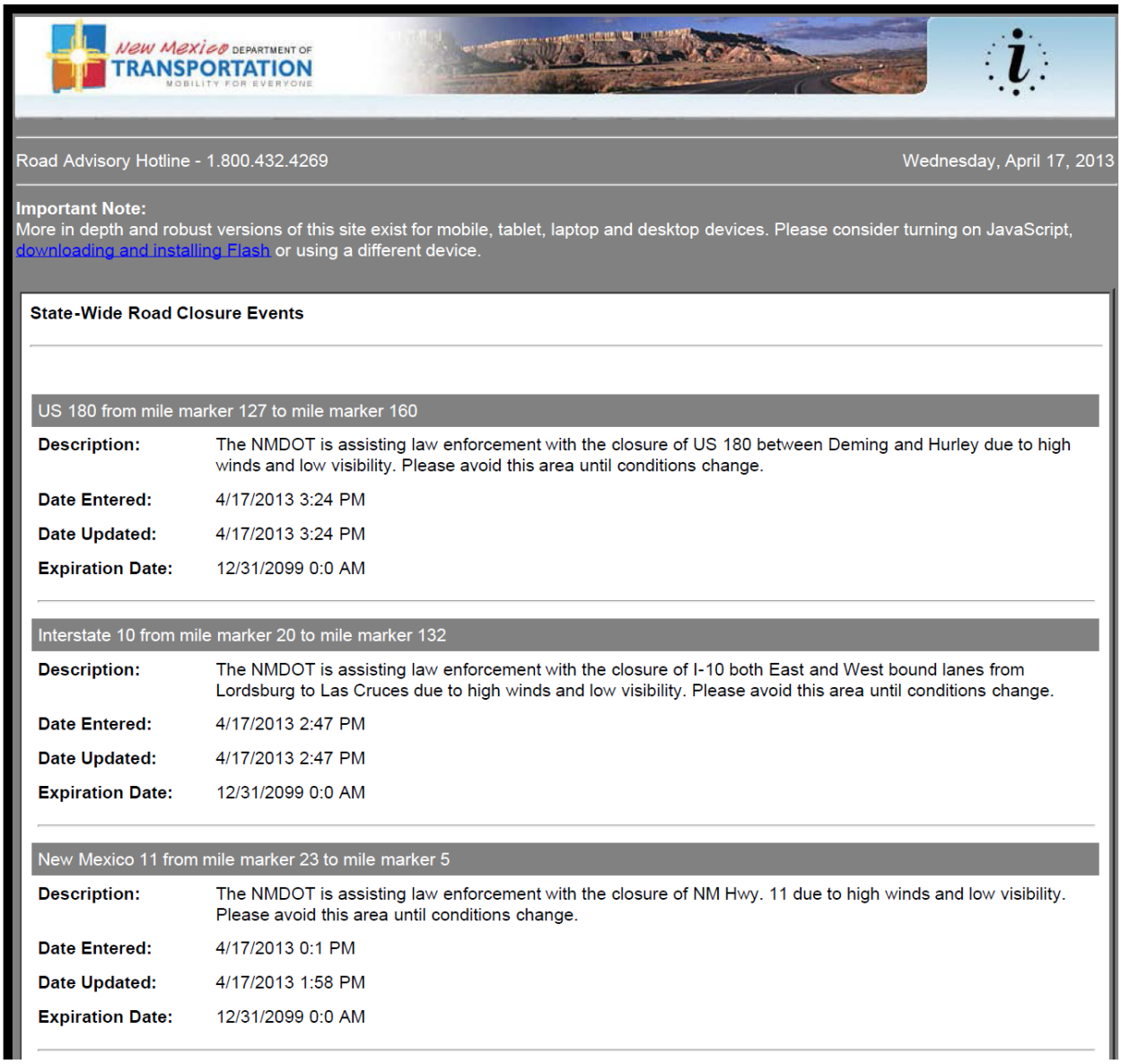


Figure 6-8. New Mexico Department of Transportation Road Closure Information.

Figure 6-9. I-10 on ramp closure in Las Cruces. Photo courtesy of the Las Cruces Sun-News.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

7 Exceptional Event: April 23, 2013

Summary of the Event

The passing of a spring storm caused high winds and blowing dust in Doña Ana County resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony and Chaparral monitoring sites on this date (Table 1-1). Although the Holman, Desert View, Deming and West Mesa sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the north, northeast and east throughout the border region. These high velocity winds passed over large areas of desert within Texas and New Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Organ Mountains, Chihuahuan Desert, White Sands National Monument, Tularosa Basin, residential and commercial properties, and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert in New Mexico and Texas.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at two of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at three sites (Figures 7-1 and 7-2).

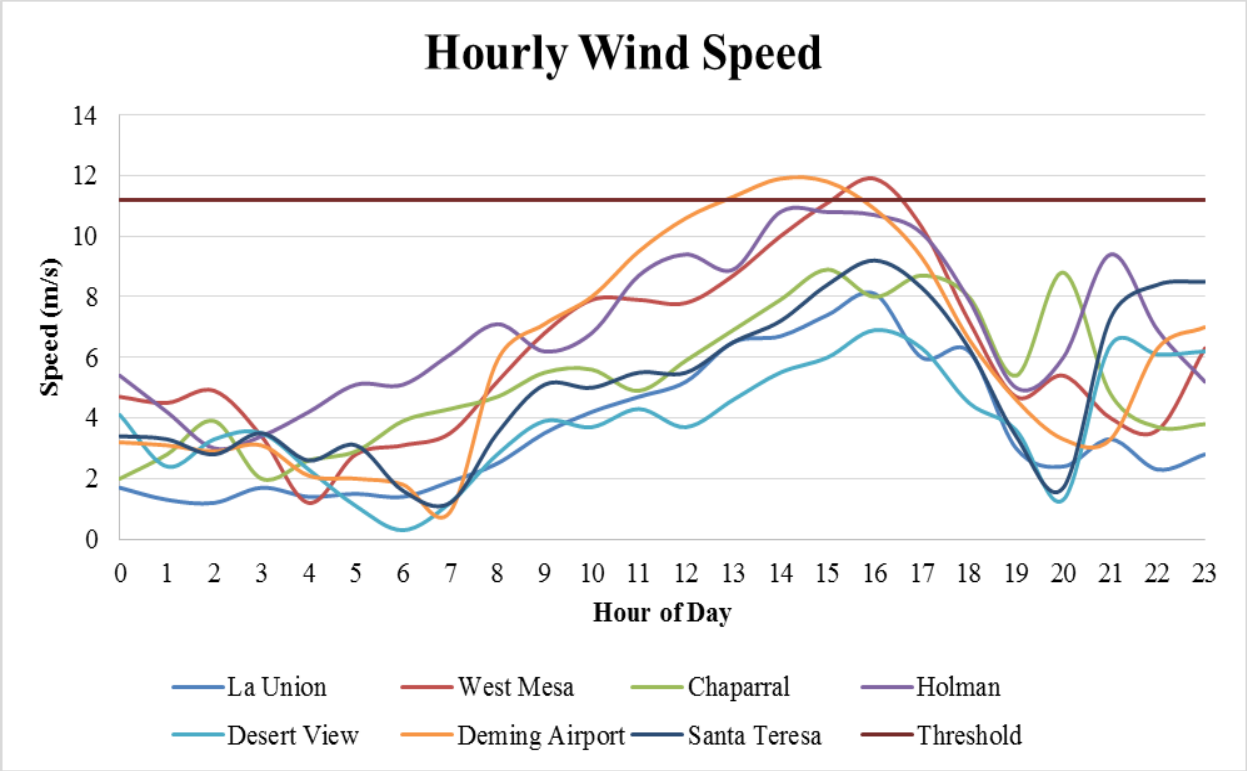


Figure 7-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

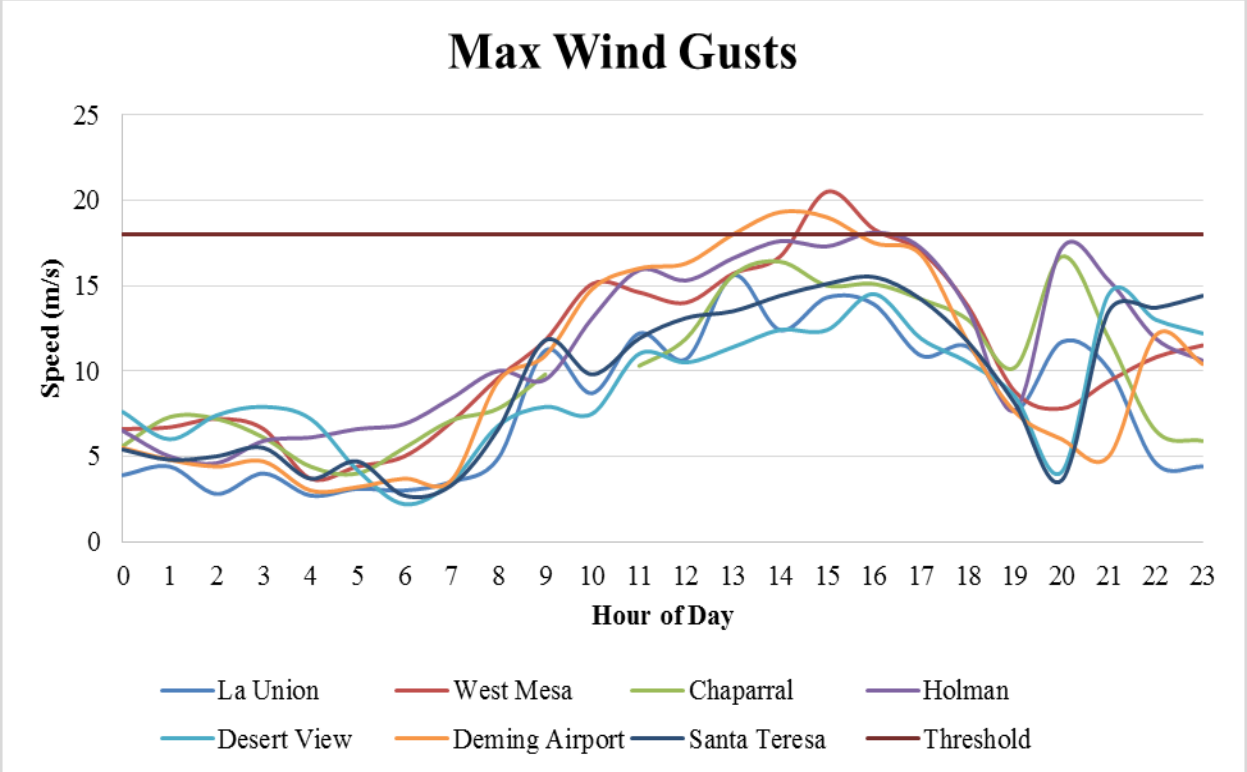


Figure 7-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 7-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical

analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded except at Deming, which was approached this level. The Anthony, Chaparral, and Deming sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances at Anthony and Chaparral would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	243	164	147	109	67	91

Table 7-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 7-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. Spring is considered the windy season with the highest blowing dust activity, as reflected in the increased 99th and 95th percentiles compared to the annual values. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded at the Anthony and West Mesa sites. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances at Anthony and Chaparral would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	505	527	467	411	774	263
95th Percentile	176	200	172	144	176	86
Event Day	243	164	147	109	67	91

Table 7-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

The Pacific cold front that moved into the region turned into a backdoor cold front that moved into the region from the east, extending from the central Tularosa Basin down to far eastern El Paso County during the evening hours. The cold front moved west across the border land throughout the night creating a strong pressure gradient in southeastern New Mexico and west Texas with northeast to east winds following behind (Figure 7-3).

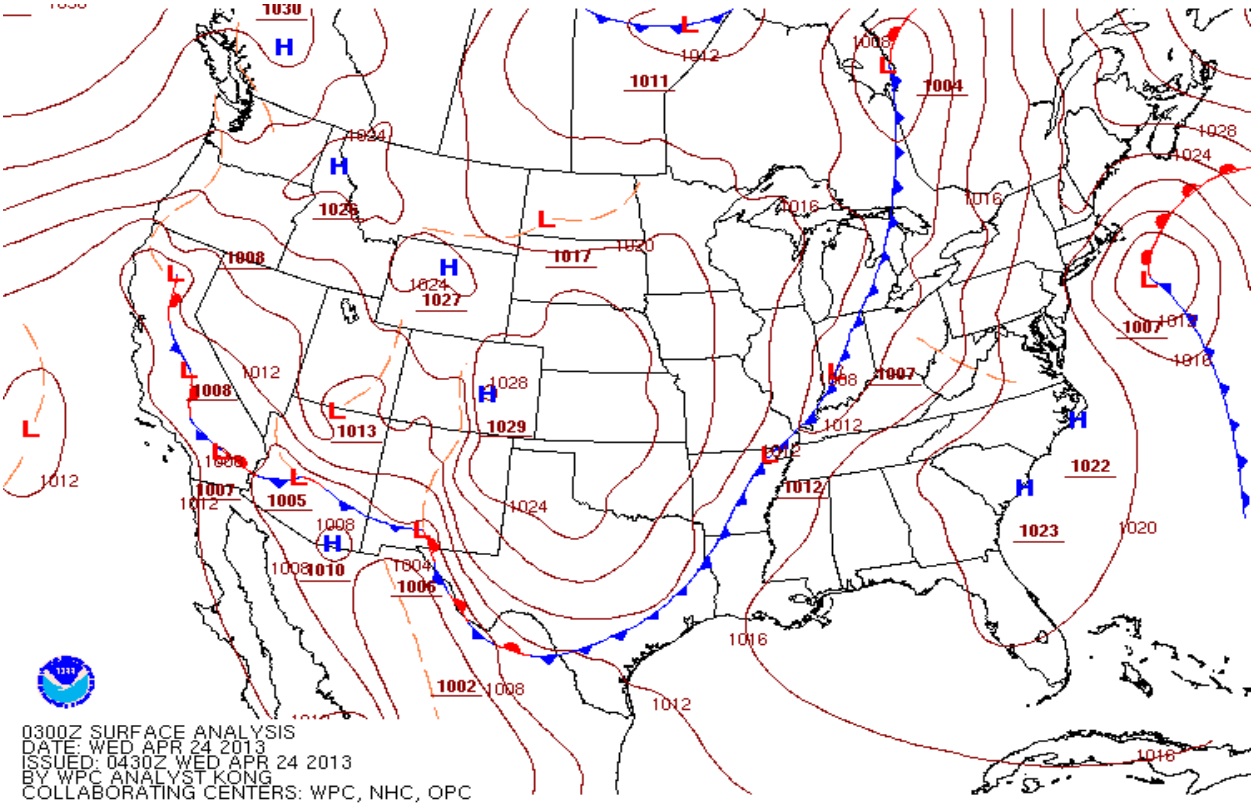
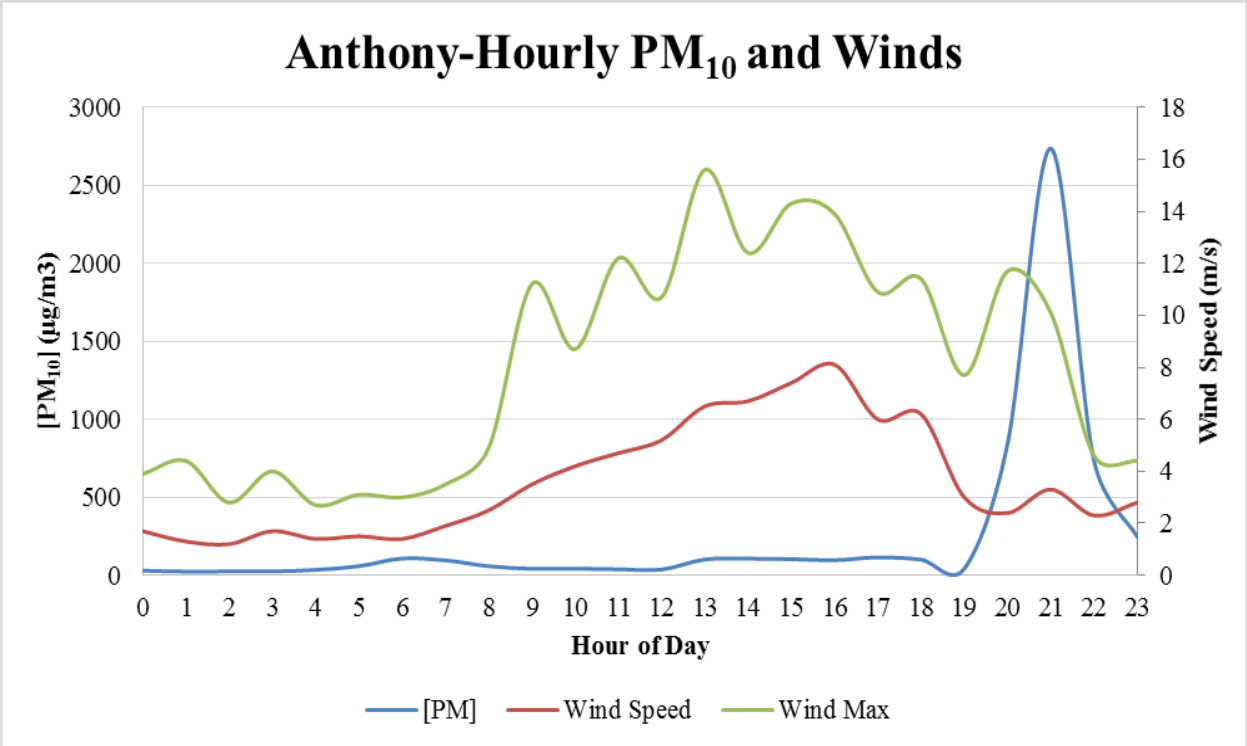
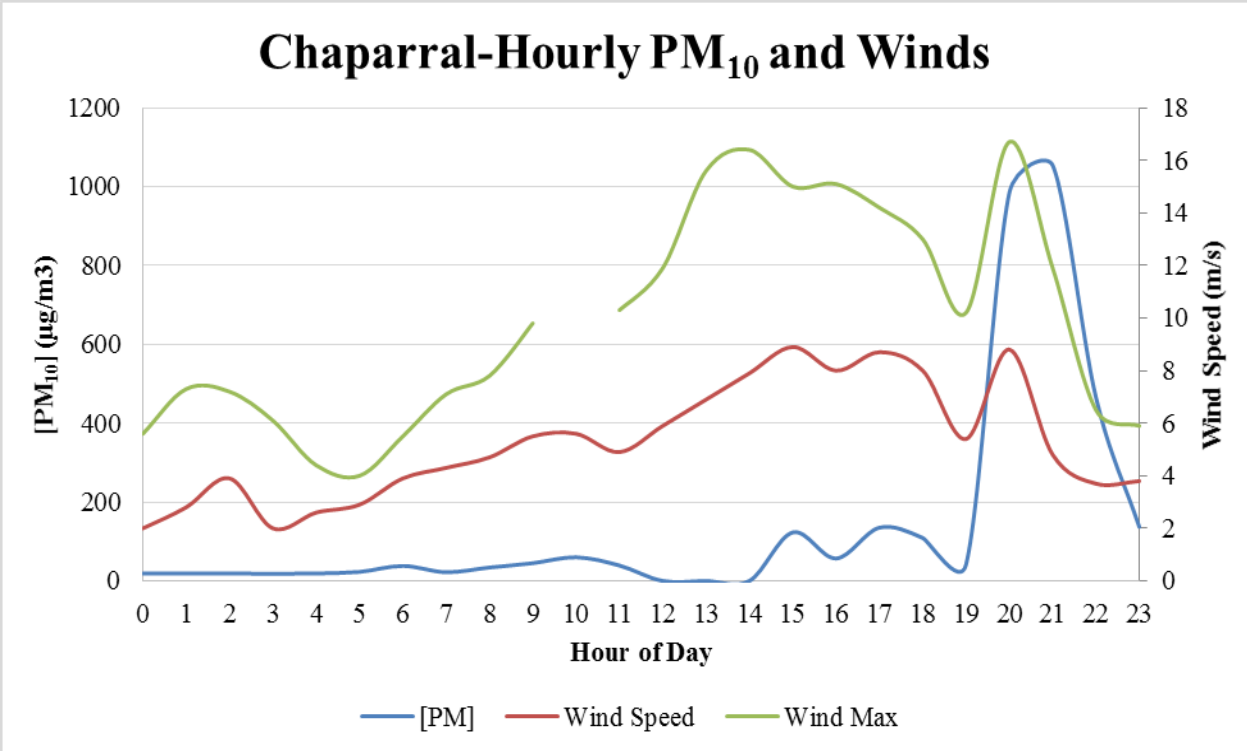


Figure 7-3. Surface weather map showing cold front and isobars of constant pressure (red lines).

The weather pattern described above generated strong winds beginning after noon and lasted through the evening hours. Beginning at the 1300 hour, wind speeds exceeded 11.2 m/s at Deming as shown in Figure 7-1. Peak wind speeds ranged from 6.9 m/s at Desert View to 11.9 m/s at the Deming Airport (Figure 7-1). Peak wind gusts ranged from 14.5 m/s at Desert View to 20.5 m/s at West Mesa (Figure 7-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 7-4 a-b. Although there were small peaks during the afternoon, the major peaks occurred once the winds shifted to the northeast to east. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 7-5).





Figures 7-4 a-b. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

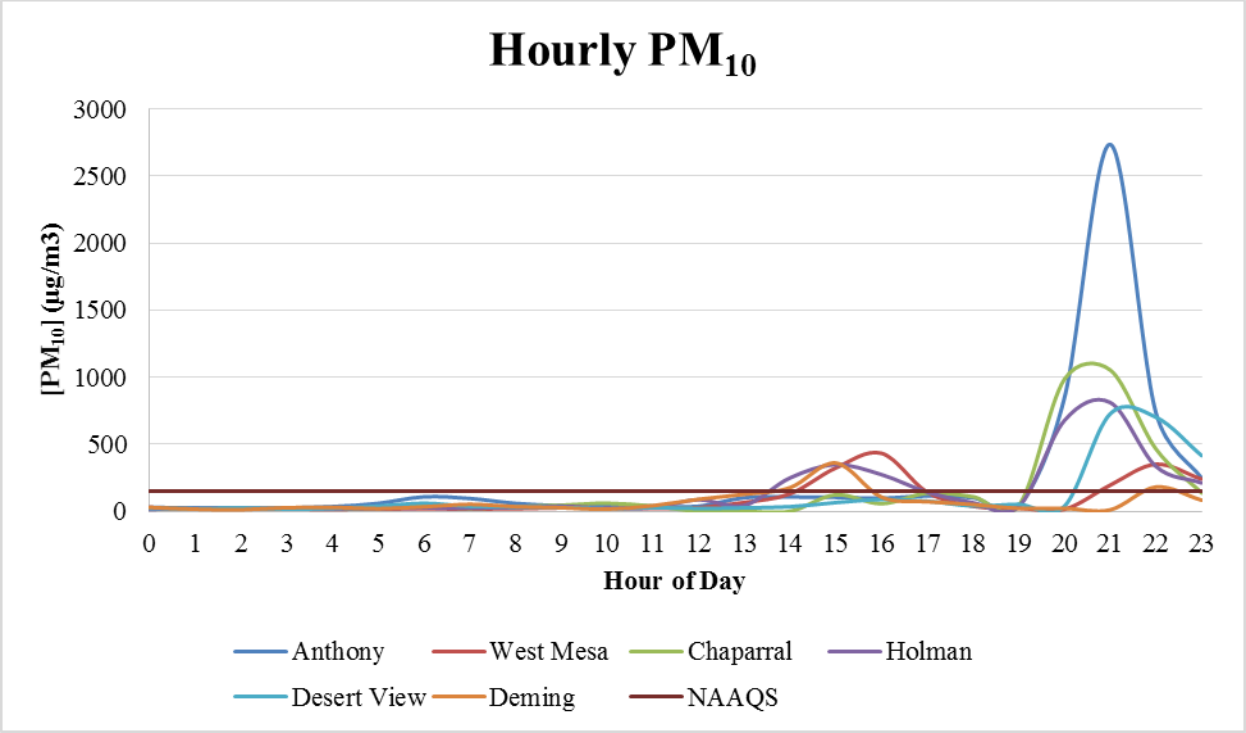


Figure 7-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background

concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred

8 Exceptional Event: May 2, 2013

Summary of the Event

The passing of a backdoor cold front caused high winds and blowing dust in eastern New Mexico and west Texas resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Chaparral, Holman, Desert View, Deming and West Mesa monitoring sites on this date (Table 1-1).

As the event unfolded, the wind blew from the east to northeast throughout the border region. These high velocity winds passed over large areas of desert within Texas and New Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, Tularosa Basin, White Sands National Monument, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert in eastern New Mexico and west Texas.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On the night before the event, sustained wind speeds exceeded EPA's default threshold at the Hobbs Jefferson site and wind gusts exceeded the NEAPs agreed upon threshold at the same site (Figures 8-1a and 8-2a). On the day of the event, sustained wind speeds exceeded EPA's default threshold at the Deming Airport site and wind gusts exceeded the NEAPs agreed upon threshold at this site as well (Figures 8-1b and 8-2b).

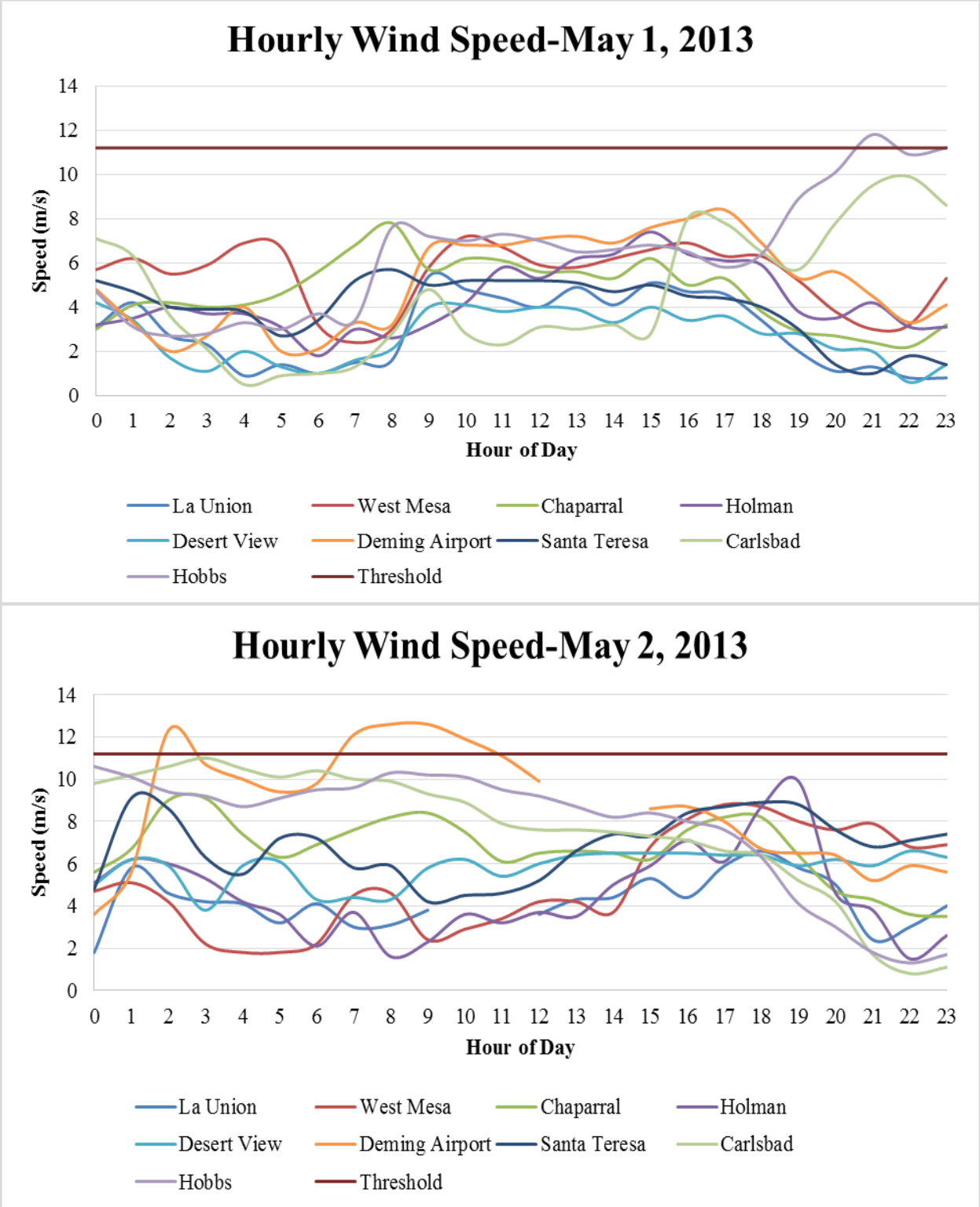


Figure 8-1 a-b. Sustained wind speeds at monitoring sites in Doña Ana, Eddy, Lea and Luna Counties.

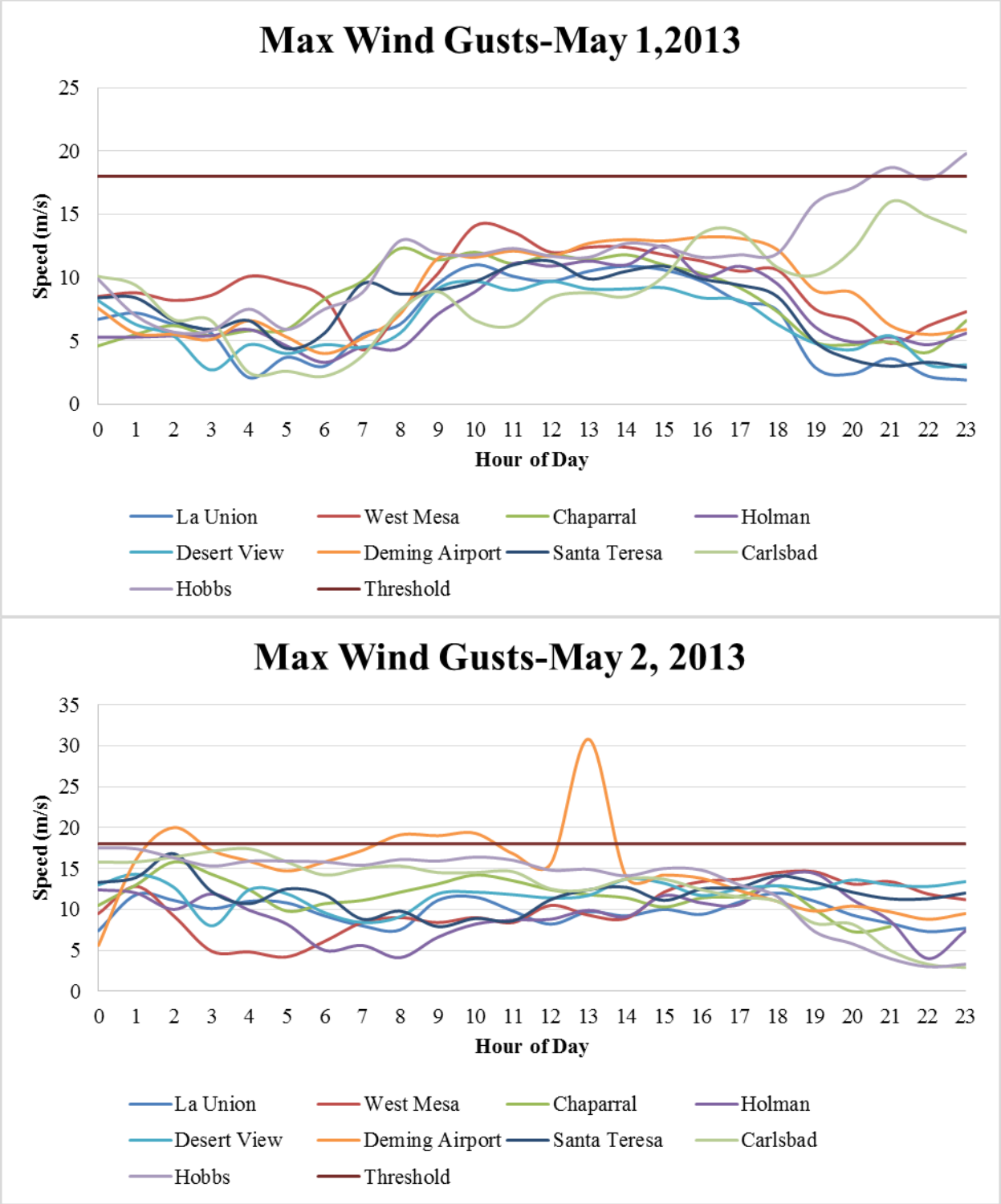


Figure 8-2. Maximum wind gusts at monitoring sites in Doña Ana, Eddy, Lea and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease

and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. Further the attainment status and lack of historical exceedances in the counties of eastern New Mexico, would not warrant control measures. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 8-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95^{th} percentile of all 24-hour averages recorded. The Anthony, Desert View, Deming and West Mesa sites recorded values above the

99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	393	204	206	246	430	321

Table 8-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 8-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis spring season was defined as the three month period from March through May. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. Spring is considered the windy season with the highest blowing dust activity, as reflected in the increased 99th and 95th percentiles compared to the annual values. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	505	527	467	411	774	263
95th Percentile	176	200	172	144	176	86
Event Day	393	204	206	246	430	321

Table 8-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong late season cold front passed through New Mexico in the early morning hours on this date. As the system moved south high winds developed from southcentral New Mexico to west Texas. (Figure 8-3).

The weather pattern described above generated strong and gusty winds beginning at the 2100 hour on the night before the event in eastern New Mexico. At the 2100 hour, wind speeds exceeded 11.2 m/s at Hobbs as shown in Figure 8-1a. The peak wind speed at this site reached from 11.8 m/s with wind speeds staying elevated throughout the morning hours (Figure 8-1a). The peak wind gust at Hobbs on this night reached 19.8 m/s (Figure 8-2a). Blowing dust from eastern New Mexico and west Texas was transported to the monitoring sites in Doña Ana and Luna Counties causing elevated levels of PM_{10} despite the relatively low wind speeds at these

sites Figure 8-4 a-f. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 8-5).

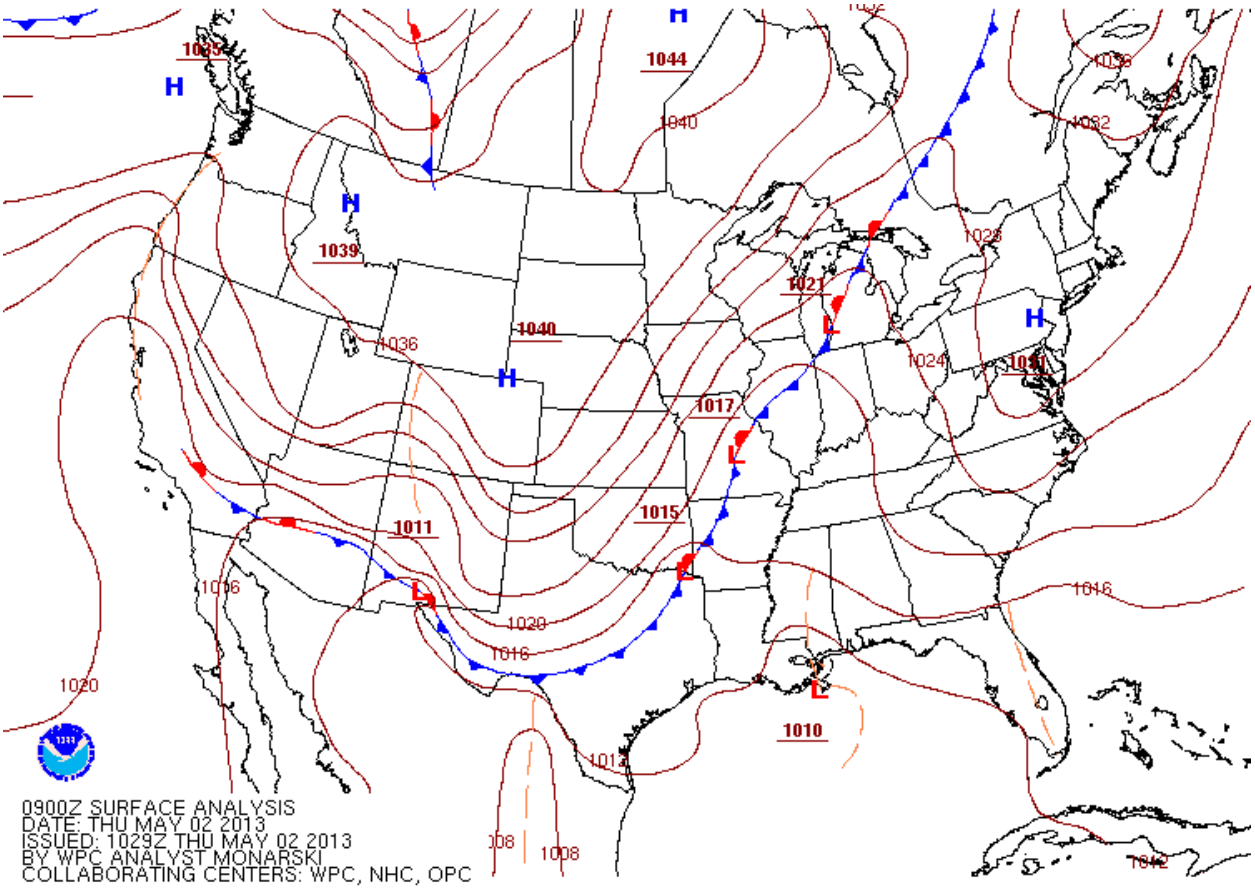
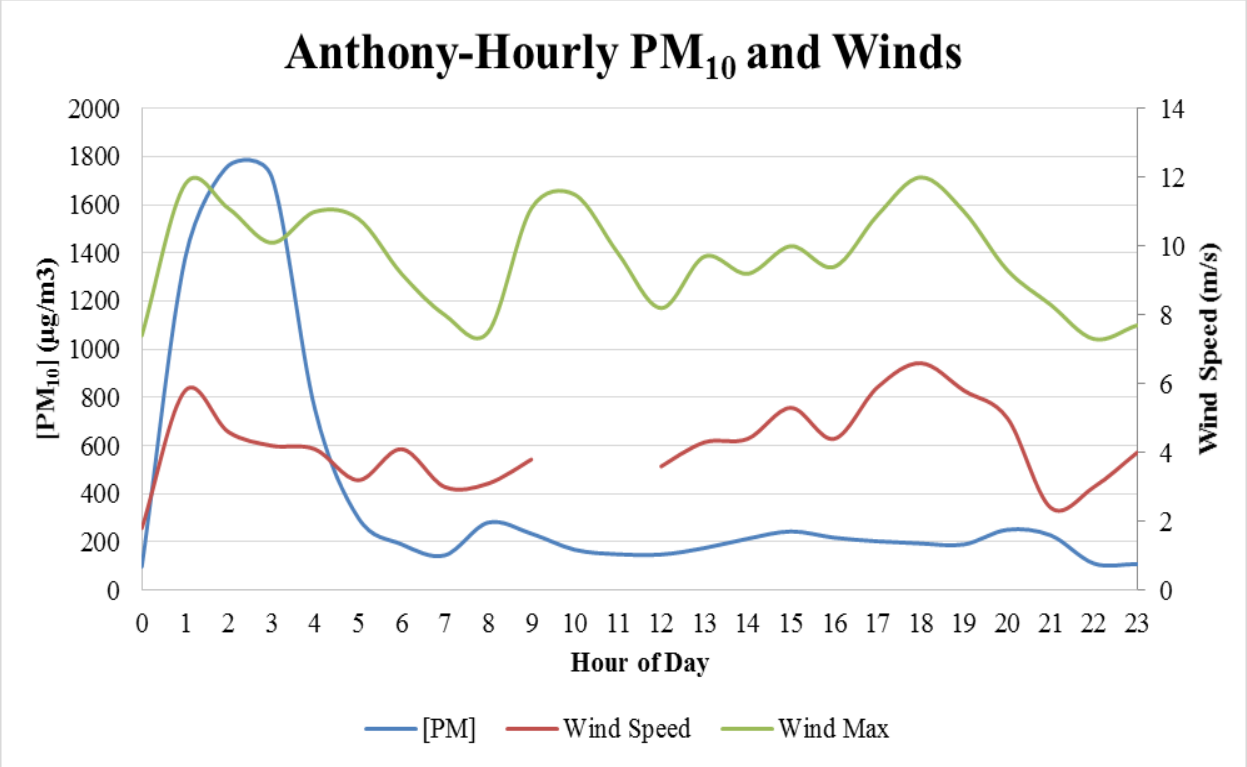
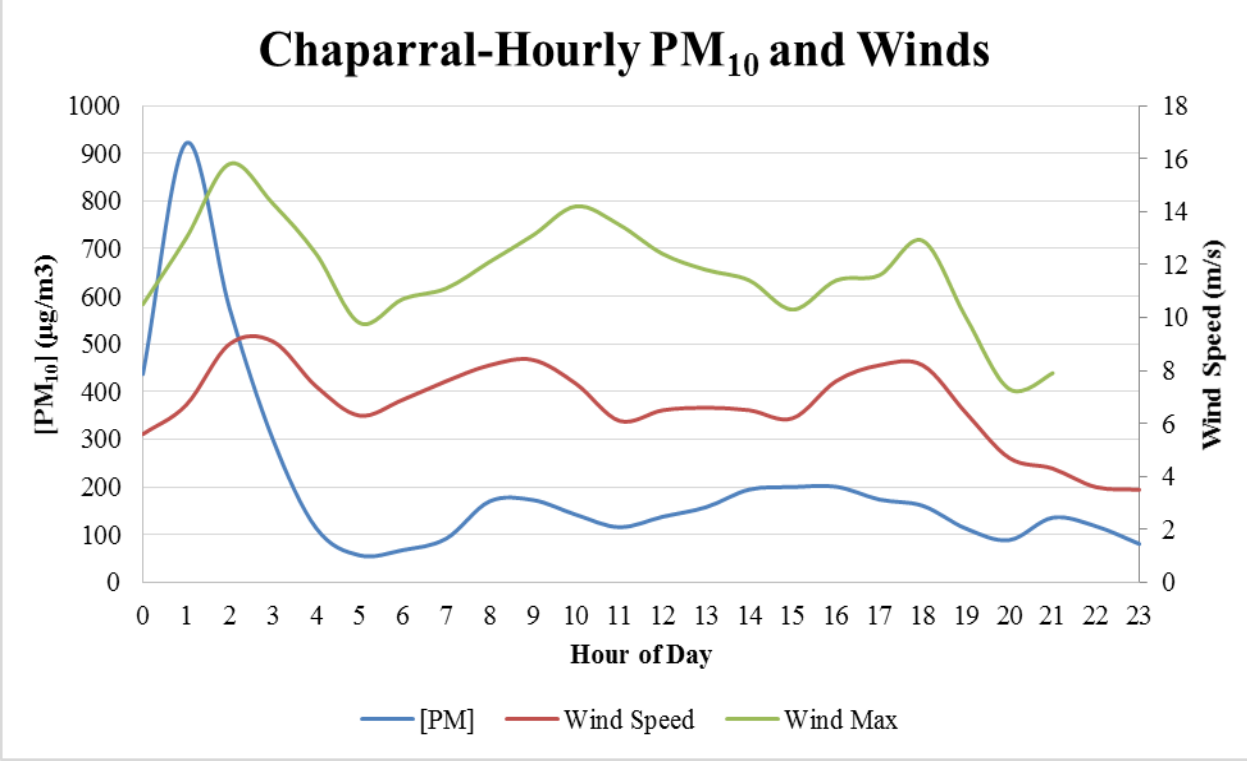
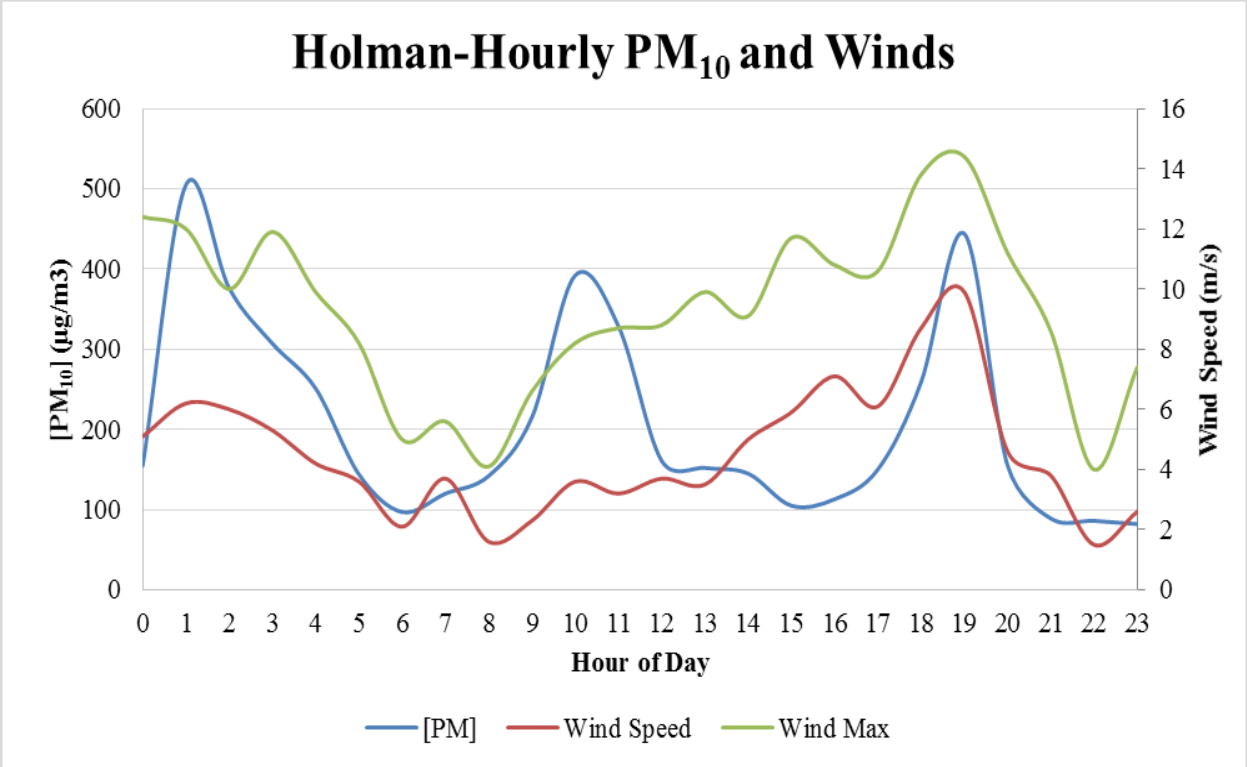
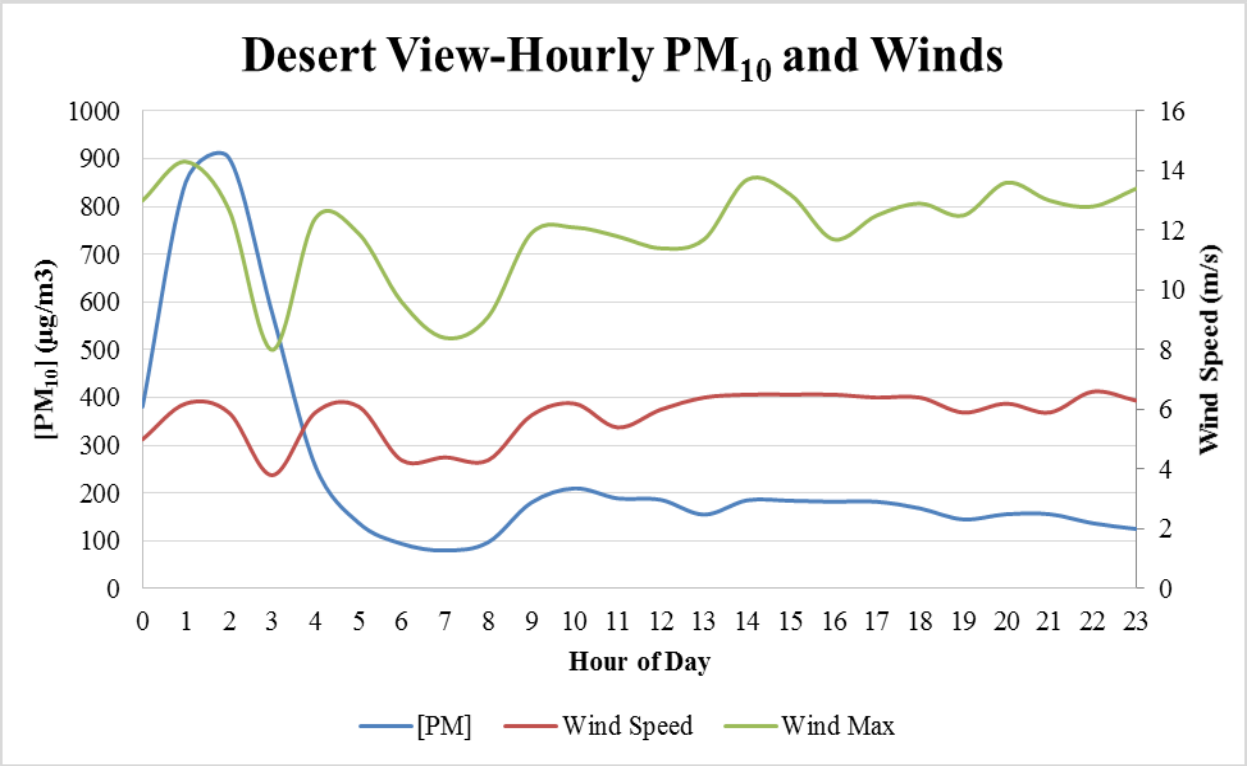


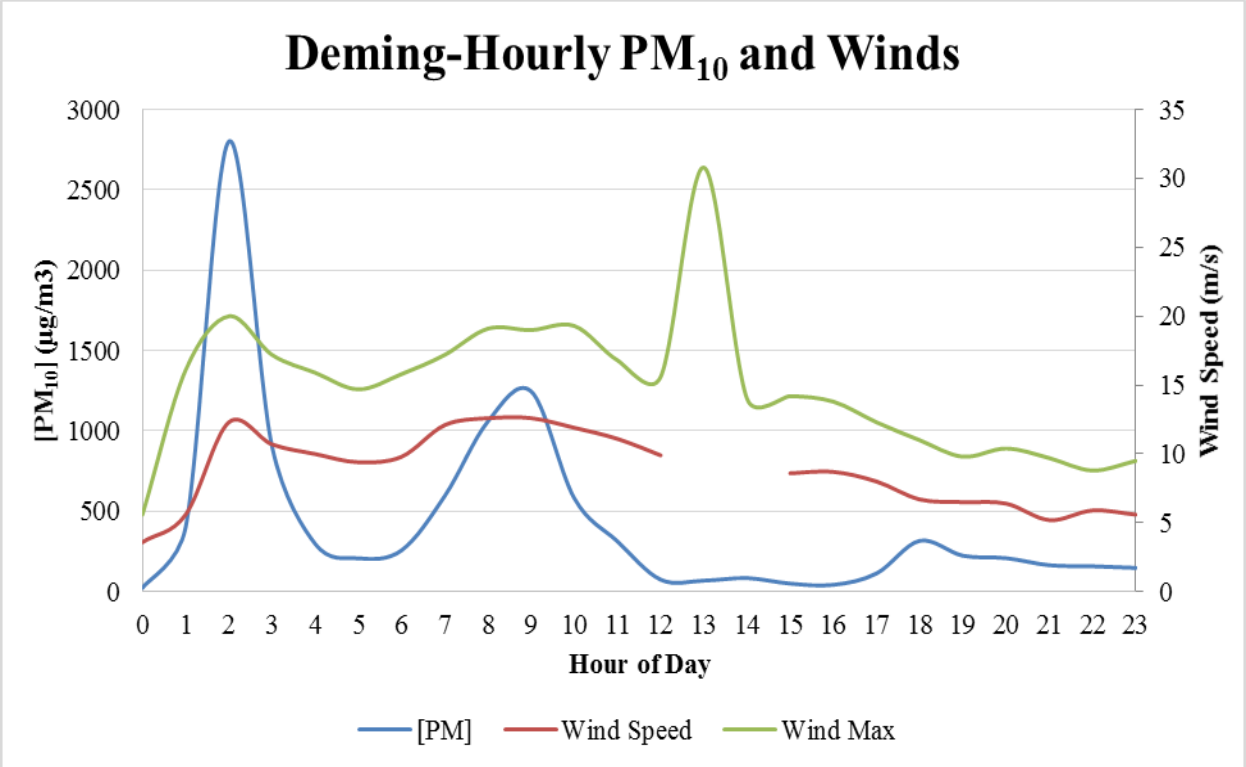
Figure 8-3. Surface weather map showing cold front, areas of low pressure and isobars of constant pressure (red lines).

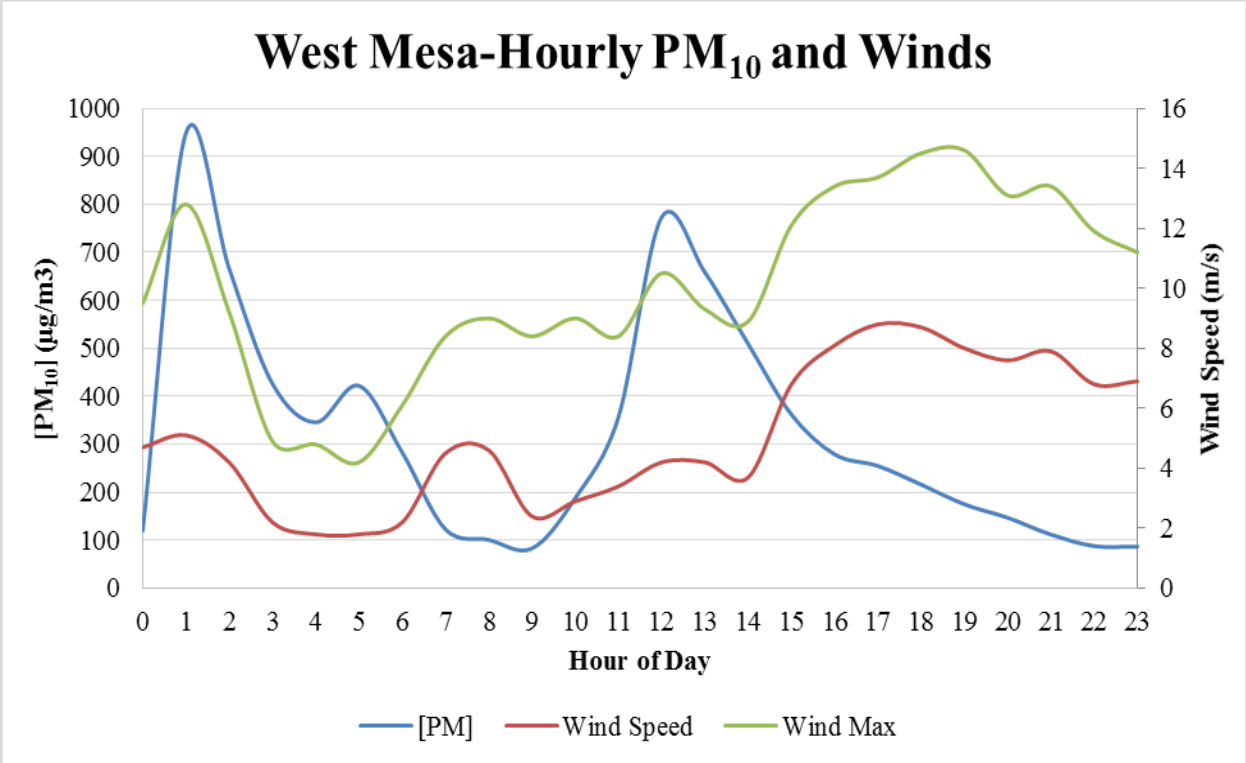

Anthony-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Chaparral-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Holman-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Desert View-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max





Figures 8-4 a-f. Time series plot of hourly observations showing increased PM_{10} concentrations despite low wind speeds.

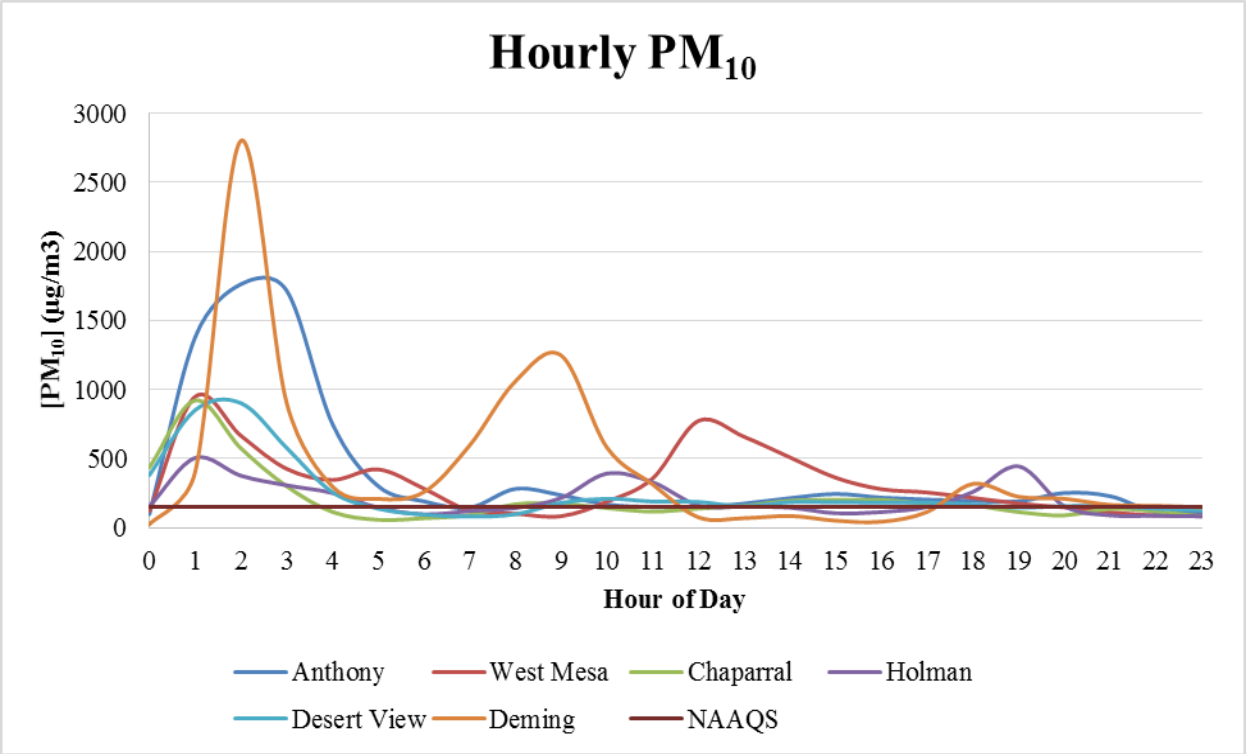


Figure 8-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The National Weather Service (NWS) issued a Wind Advisory for this date (Figure 8-6). A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer. These were in place for southwestern New Mexico and west Texas to warn the public of the high wind event. An excerpt from the NWS text product can be found below.

> WINDS OVER THE LARGE AREA WILL INCREASE TO NORTHEAST TO 20 TO 30 MPH. BUT WINDS ALONG THE WEST SLOPES OF THE FRANKLINS WILL BE STRONGER...UP TO 45 MPH. WINDS WILL BEGIN DIMINISHING AROUND MID DAY.

The event was also captured on satellite imagery showing dust plumes originating in the Tularosa Basin near the eastern slopes of the Sacramento Mountains and near White Sands National Monument in the late morning hours (Figure 8-7).

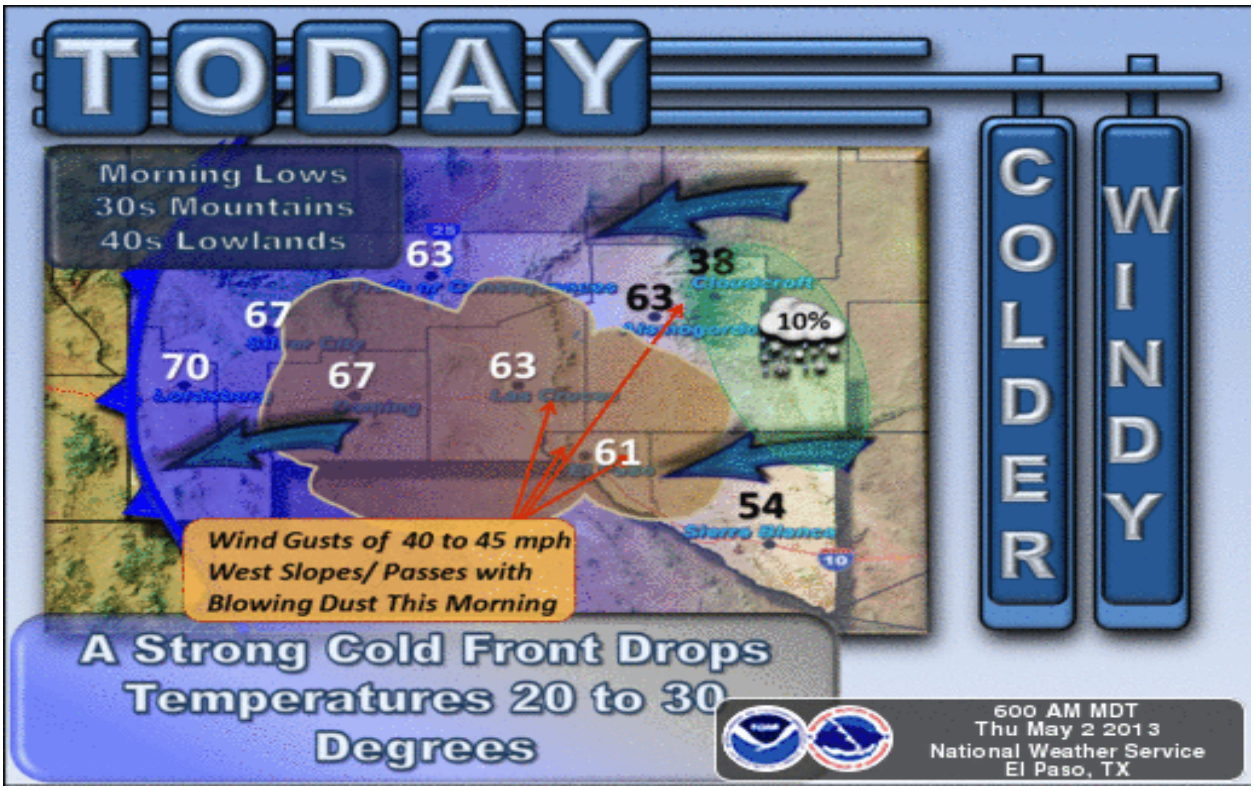


Figure 8-6. NWS graphicast showing the weather forecast with advisory and warning areas.

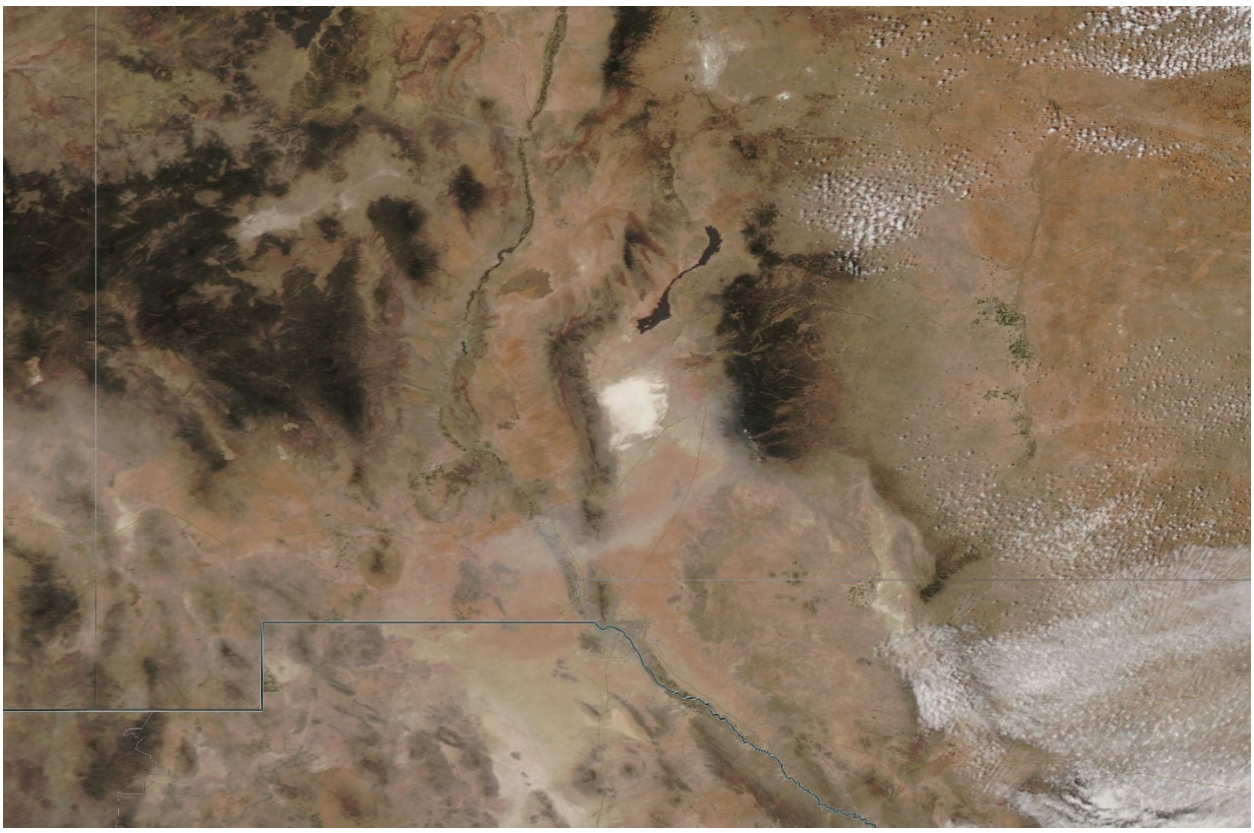


Figure 8-7. NASA satellite imagery of the border area.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

9 Exceptional Event: June 1, 2013

Summary of the Event

A late season backdoor cold front caused high wind and blowing dust in Doña Ana County resulting in an exceedance of the PM_{10} 24-hour NAAQS at the Holman monitoring site on this date (Table 1-1). Although the other monitoring sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the east to southeast throughout the border region. These high velocity winds passed over large areas of desert within Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support

the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at the Holman monitoring site and wind gusts exceeded the NEAPs agreed upon threshold at this site as well (Figures 9-1 and 9-2).

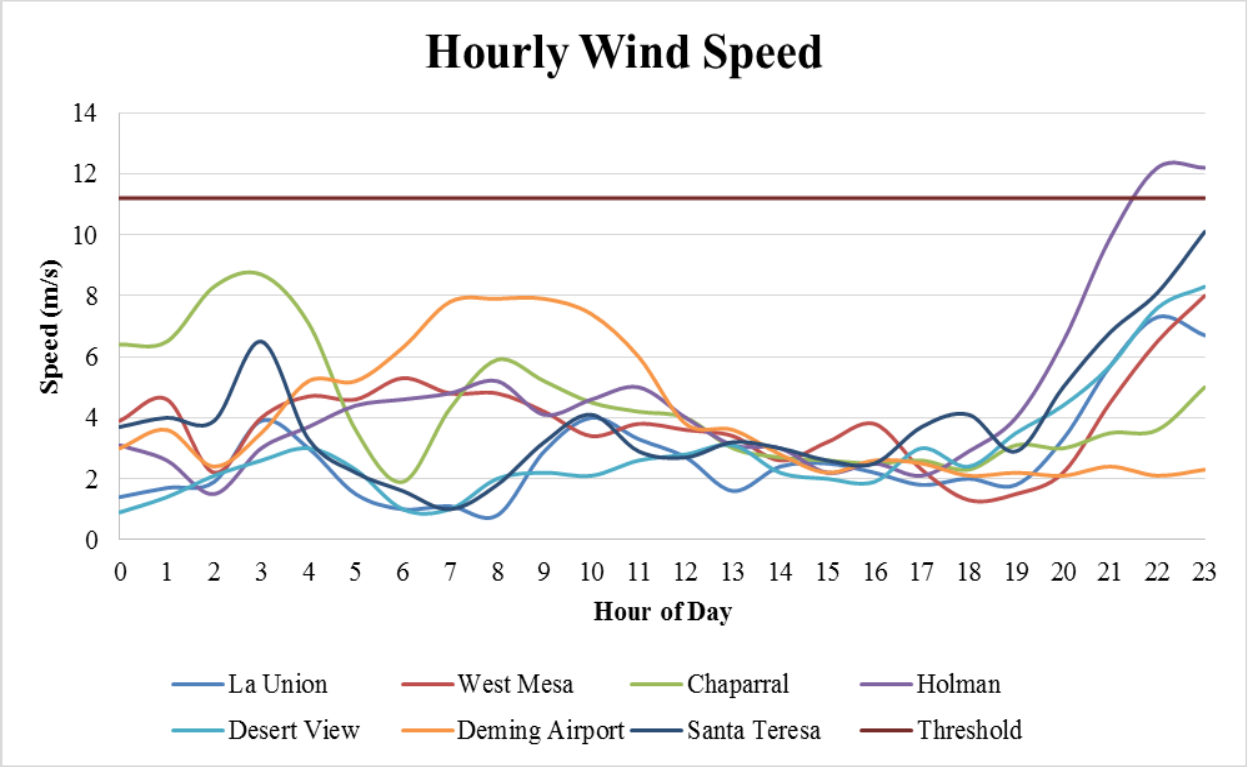


Figure 9-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

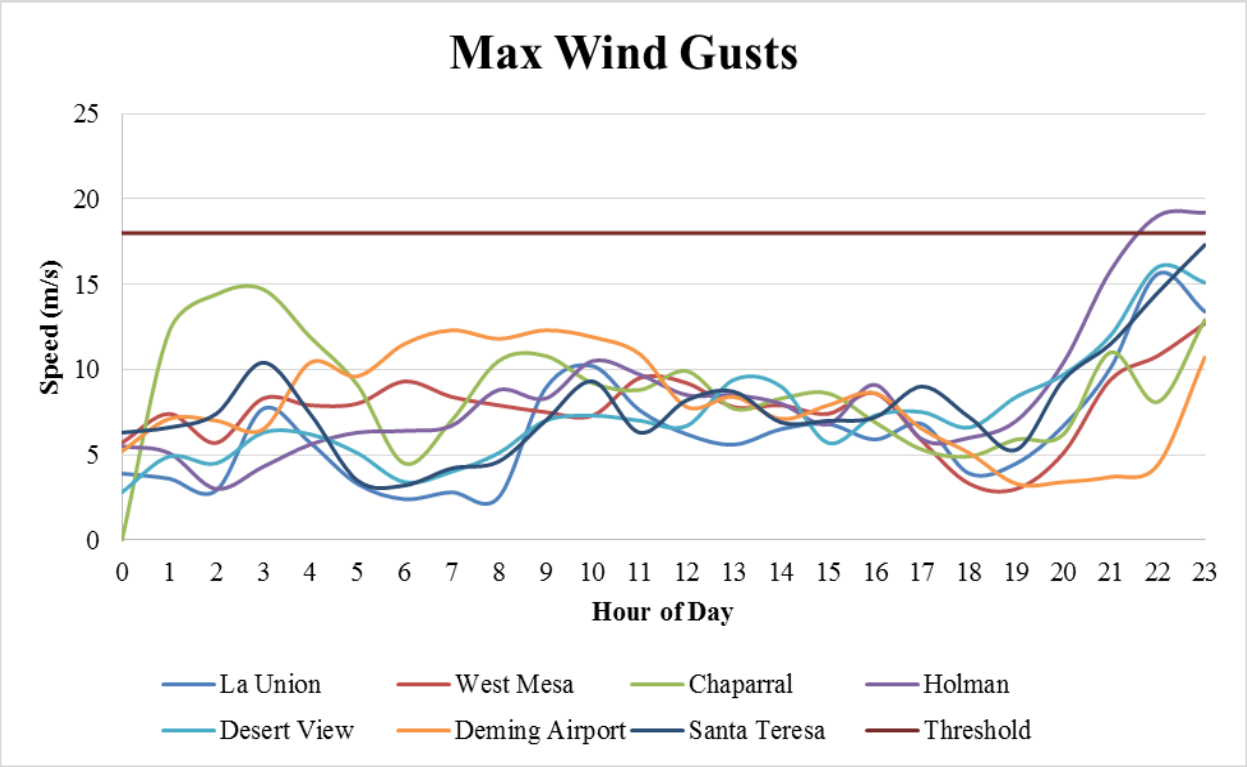


Figure 9-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 9-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded value at Holman for this day is above the 95th percentile of all 24-hour averages recorded at the site. The Anthony, Chaparral, and Deming sites recorded values near the 95th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	106	90	173	79	42	47

Table 9-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 9-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded except the Deming site. The Holman site recorded a value above the 99th percentile of data. Because NMED believes all

previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	106	90	173	79	42	47

Table 9-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A late season backdoor cold front passed through New Mexico on June 1. As the cold front moved through New Mexico, a weak surface pressure gradient formed with localized strong winds (Figure 9-3). The Holman monitoring site is located near the western slopes of the Organ Mountains resulting in the higher wind speeds at this site only as the cold front approached.

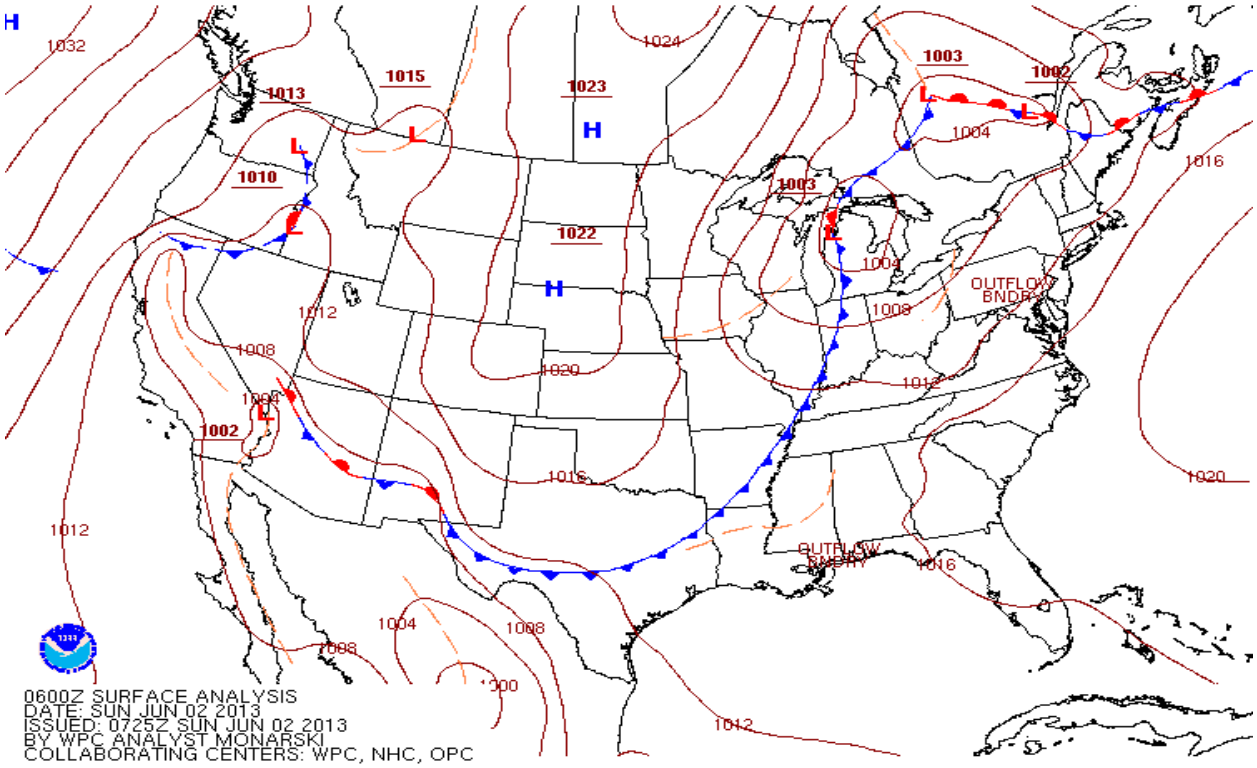


Figure 9-3. Surface weather map with radar showing thunderstorm activity.

The weather pattern described above generated strong winds beginning at the 2200 hour and lasted through the 2300 hour. Beginning at the 2200 hour, wind speeds exceeded 11.2 m/s at Holman as shown in Figure 9-1. Peak wind speeds ranged from 7.3 m/s at La Union to 12.2 m/s at Holman (Figure 9-1). Peak wind gusts ranged from 12.3 m/s at Deming to 19.2 m/s at

Holman (Figure 9-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 9-4. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in Doña Ana County (Figure 9-5).

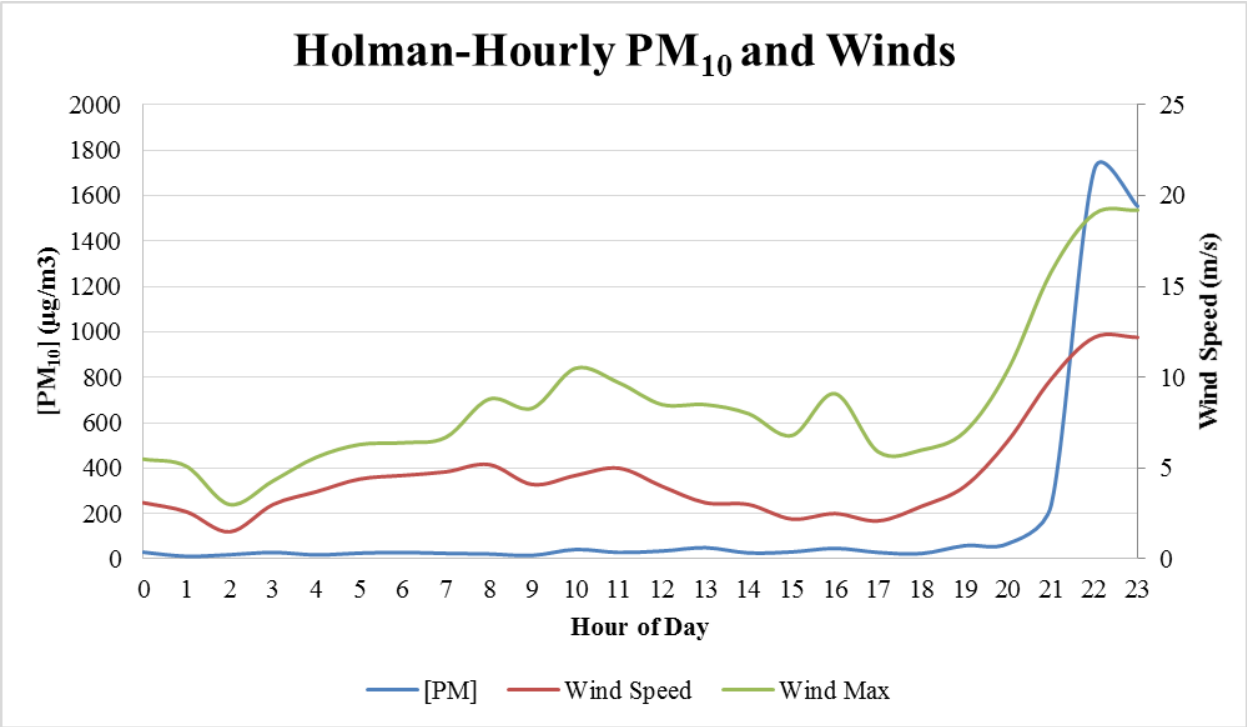


Figure 9-4. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

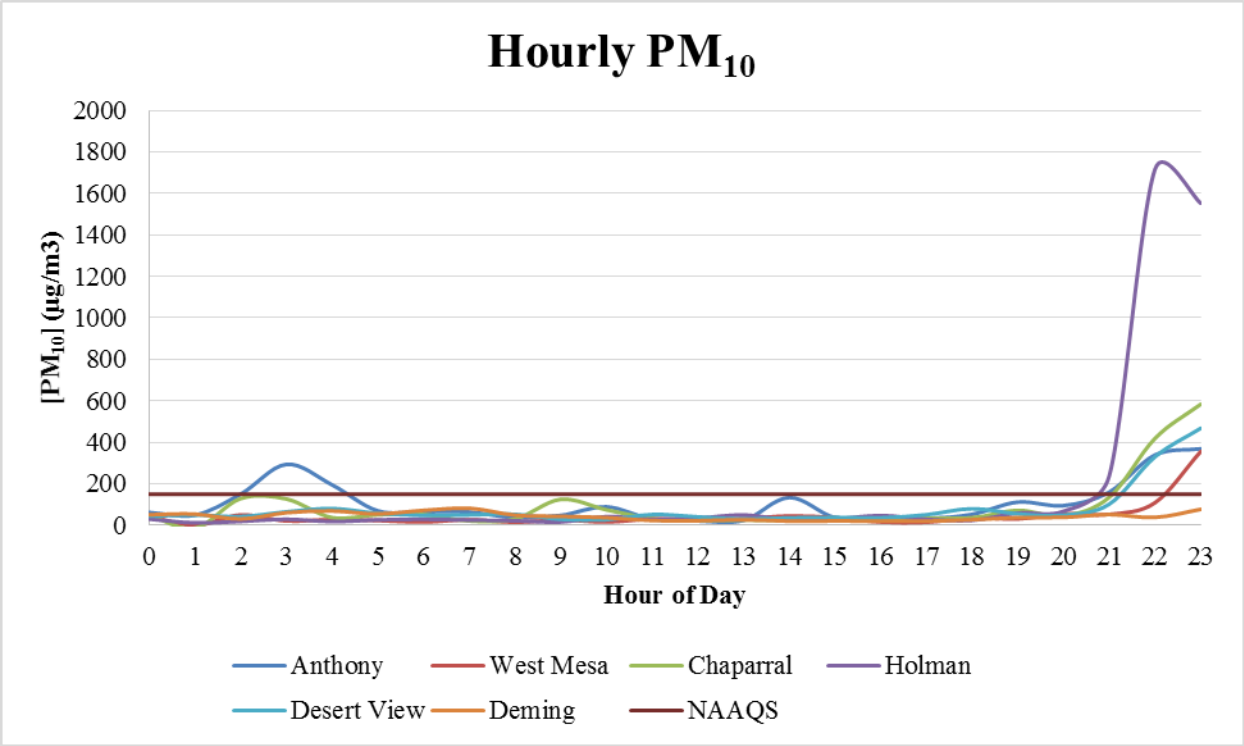


Figure 9-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

10 Exceptional Event: June 2, 2013

Summary of the Event

A passing cold front in the early morning (see section 9) and thunderstorm activity in the afternoon caused high winds and blowing dust in Doña Ana and Luna Counties resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Chaparral, Holman, and Deming monitoring sites on this date (Table 1-1). Although the Desert View and West Mesa sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the south to southeast throughout the border region. These high velocity winds passed over large areas of desert within Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at one of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at five of these sites (Figures 10-1 and

10-2). Due to the brief and localized nature of thunderstorm outflow winds, most sites would not record sustained winds greater than the threshold. However, these outflow bursts would produce powerful winds at the outflow boundary to the surface, entraining dust and transporting it to the monitoring sites. These type of dust storms are typical during the monsoon season in Arizona and are often referred to as haboobs.

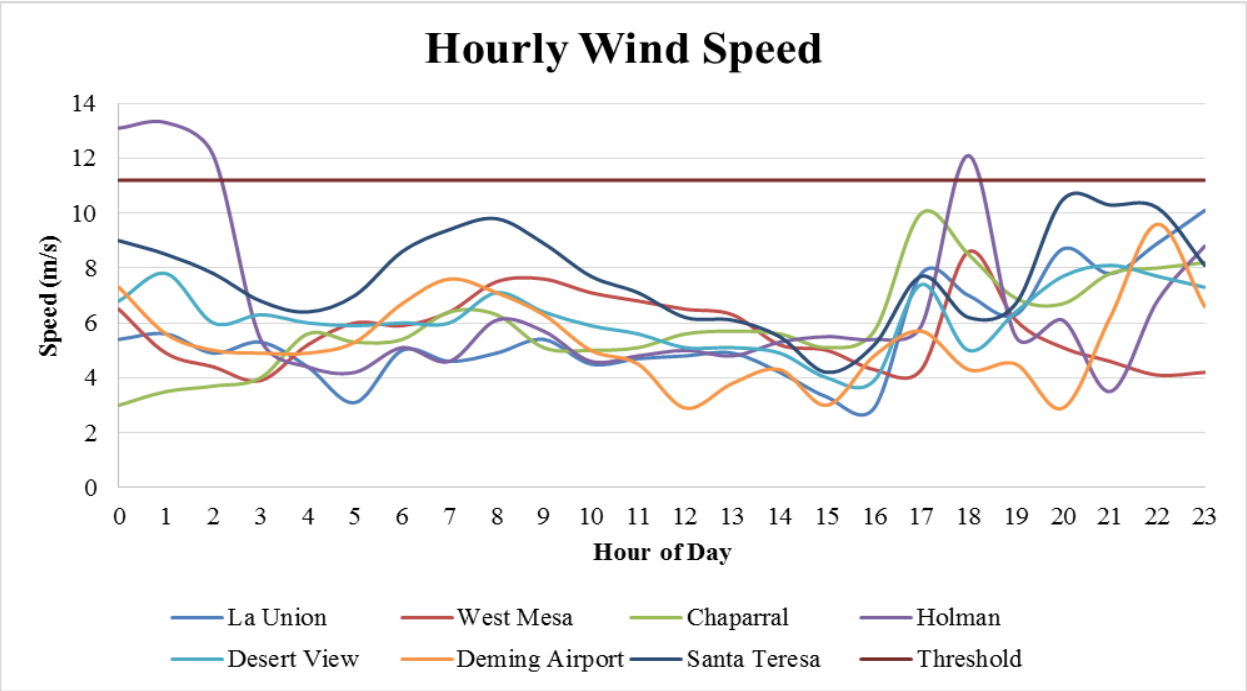


Figure 10-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

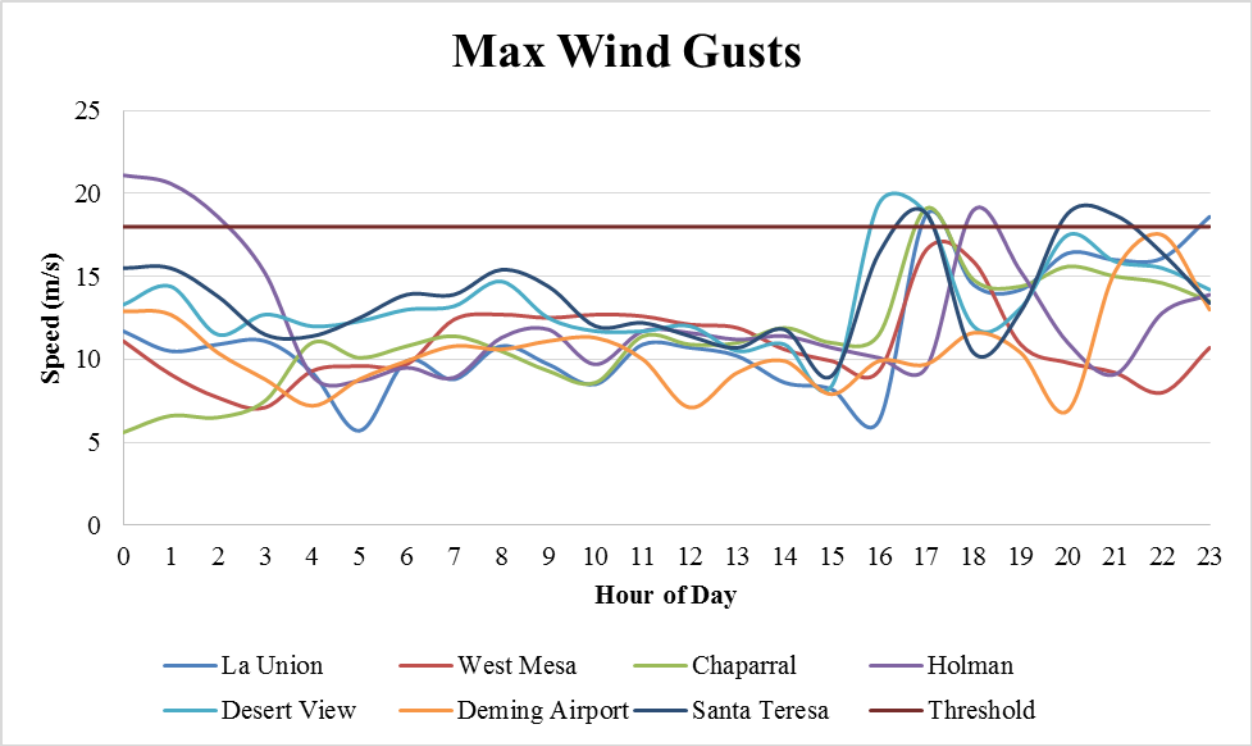


Figure 10-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 10-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded. The Anthony, Holman, and Deming sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	304	217	293	144	312	132

Table 10-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 10-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony, Chaparral, Holman, Deming and West Mesa sites recorded values above the 99th percentile of data. The Anthony and Holman site recorded values above the seasonal maximum compared to the previous five years. Because NMED believes all previous exceedances were due to high wind dust events, the

exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	304	217	293	144	312	132

Table 10-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

The Holman monitoring site continued to be impacted in the early morning hours by the storm system described in section 9. In the afternoon and evening hours, thunderstorms developed in northern Mexico, west Texas and southern New Mexico causing strong and gusty winds. (Figure 10-3).

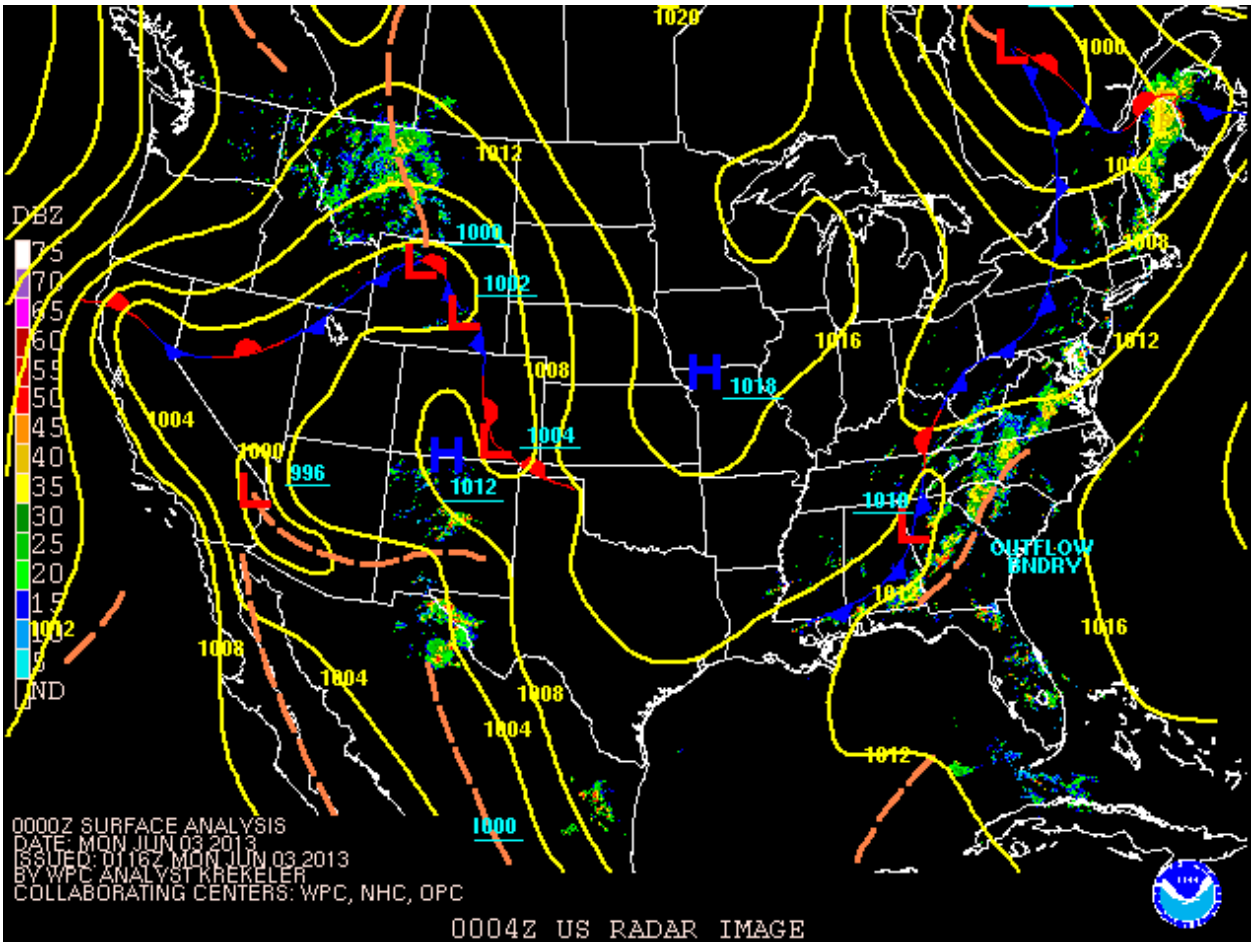
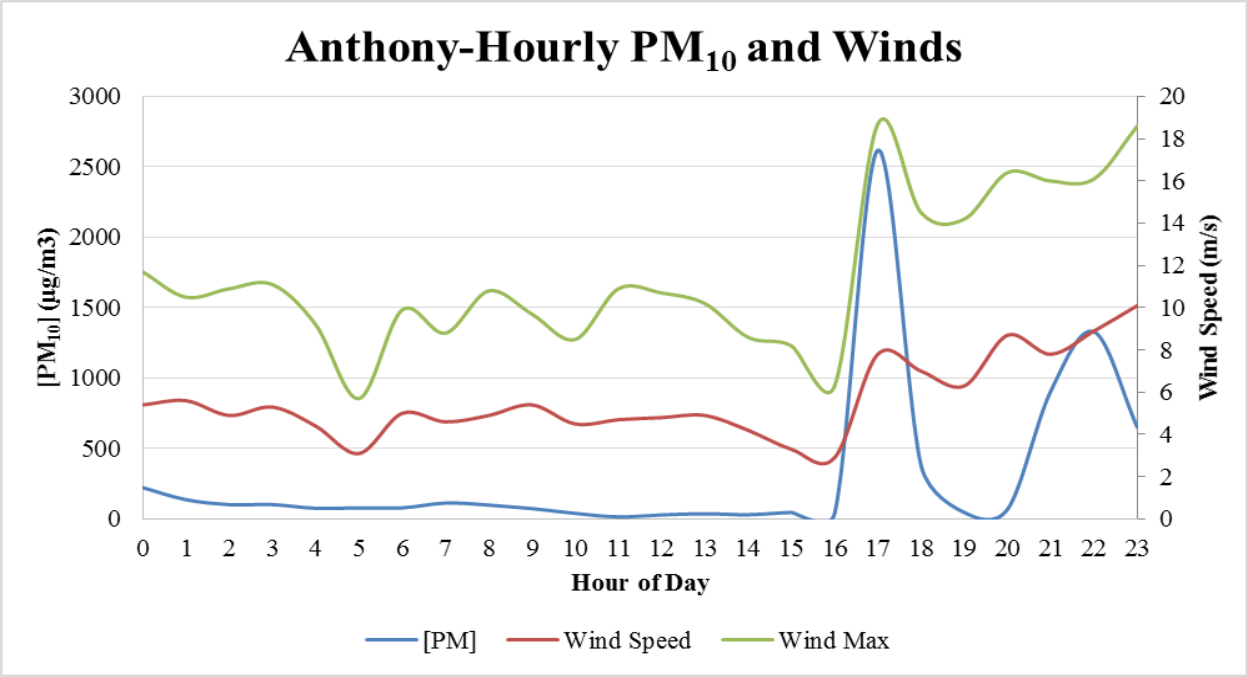
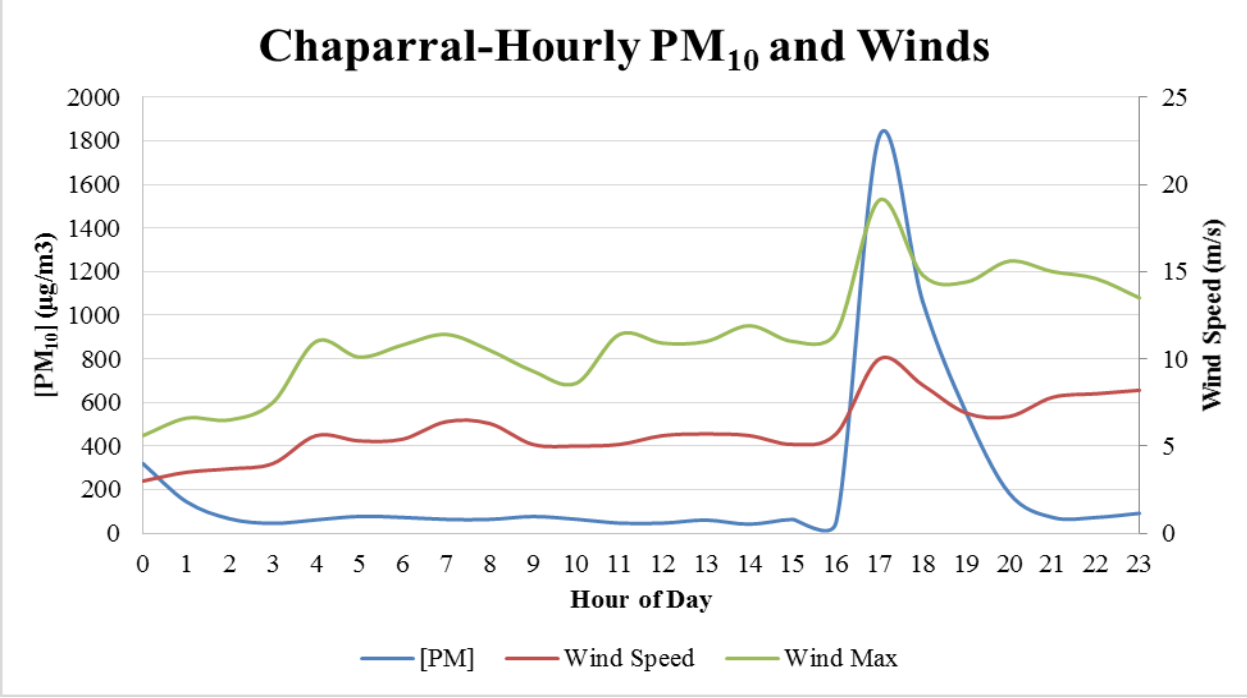
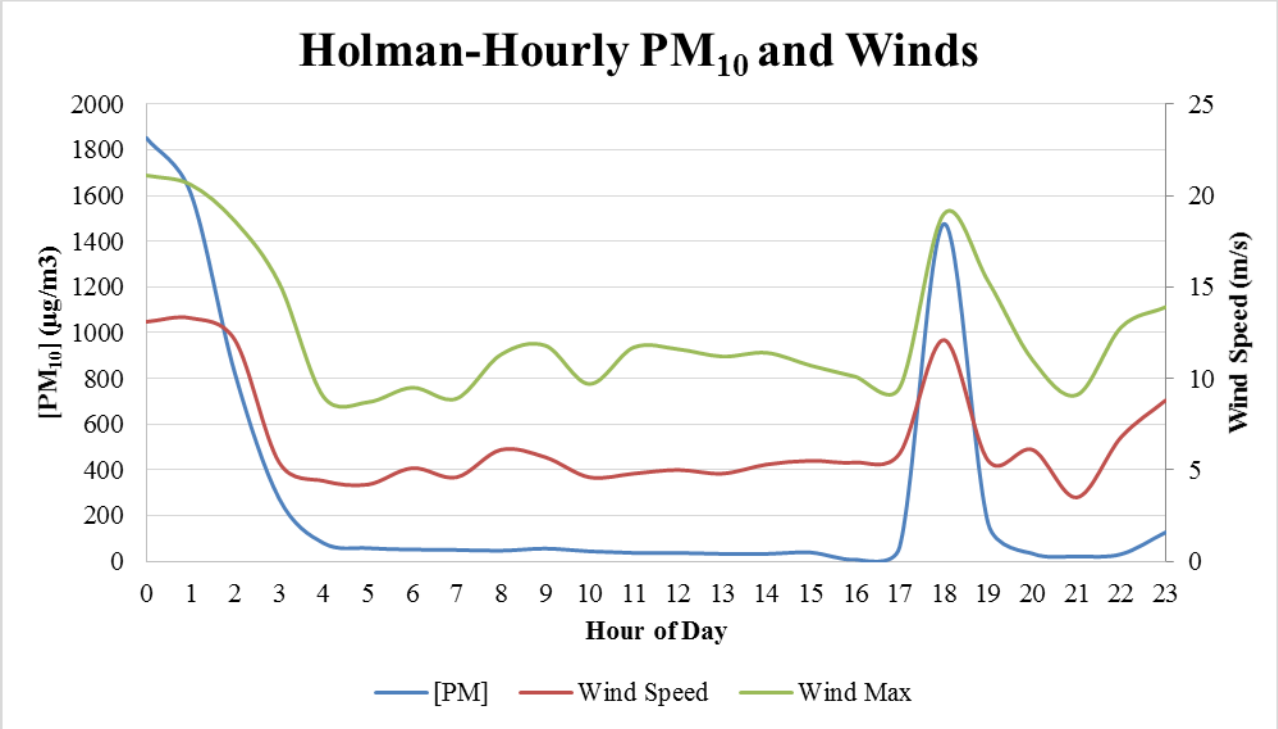


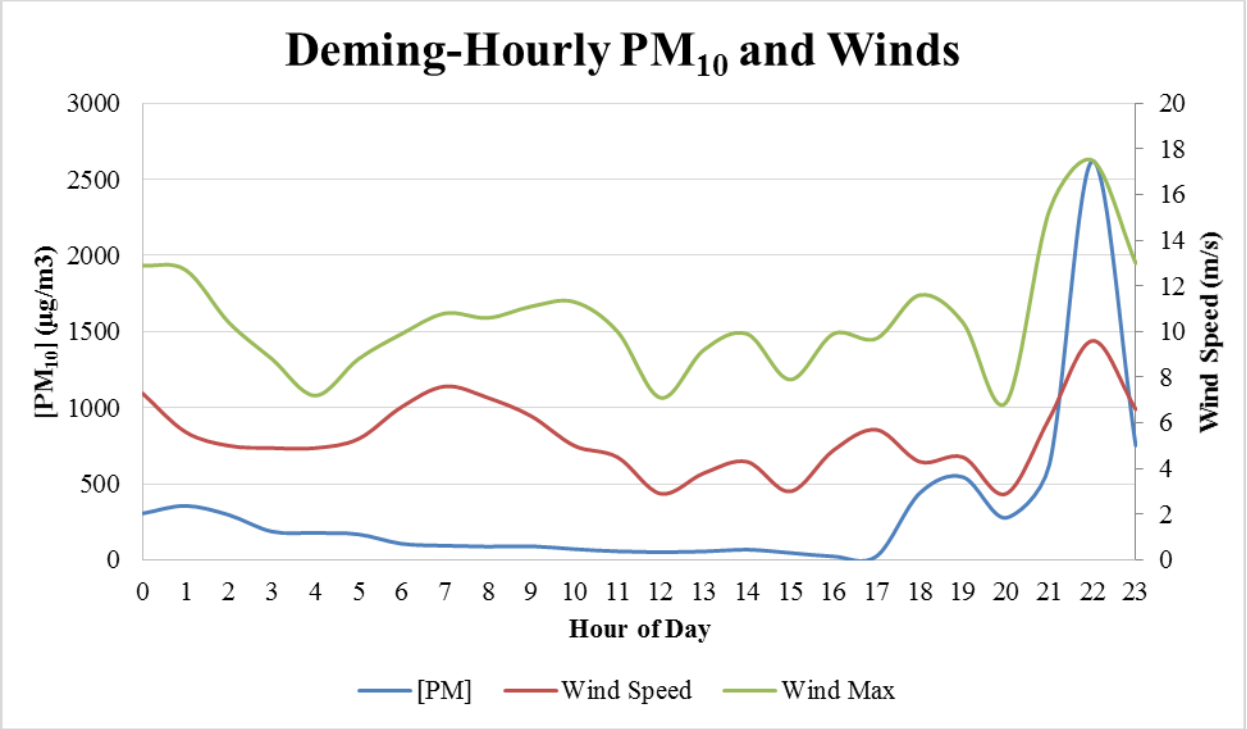
Figure 10-3. Surface weather map with radar imagery showing thunderstorm activity.

The weather pattern described above generated strong winds beginning at the 1800 hour with gusty winds lasting through the 2200 hour. Beginning at the 1800 hour, wind speeds exceeded 11.2 m/s at Holman as shown in Figure 10-1. Peak wind speeds ranged from 8.1 m/s at Desert View to 12.1 m/s at Holman (Figure 10-1). Peak wind gusts ranged from 16.6 m/s at West Mesa to 19.4 m/s at Desert View (Figure 10-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 10-4 a-d. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 10-5).









Figures 10-4 a-d. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

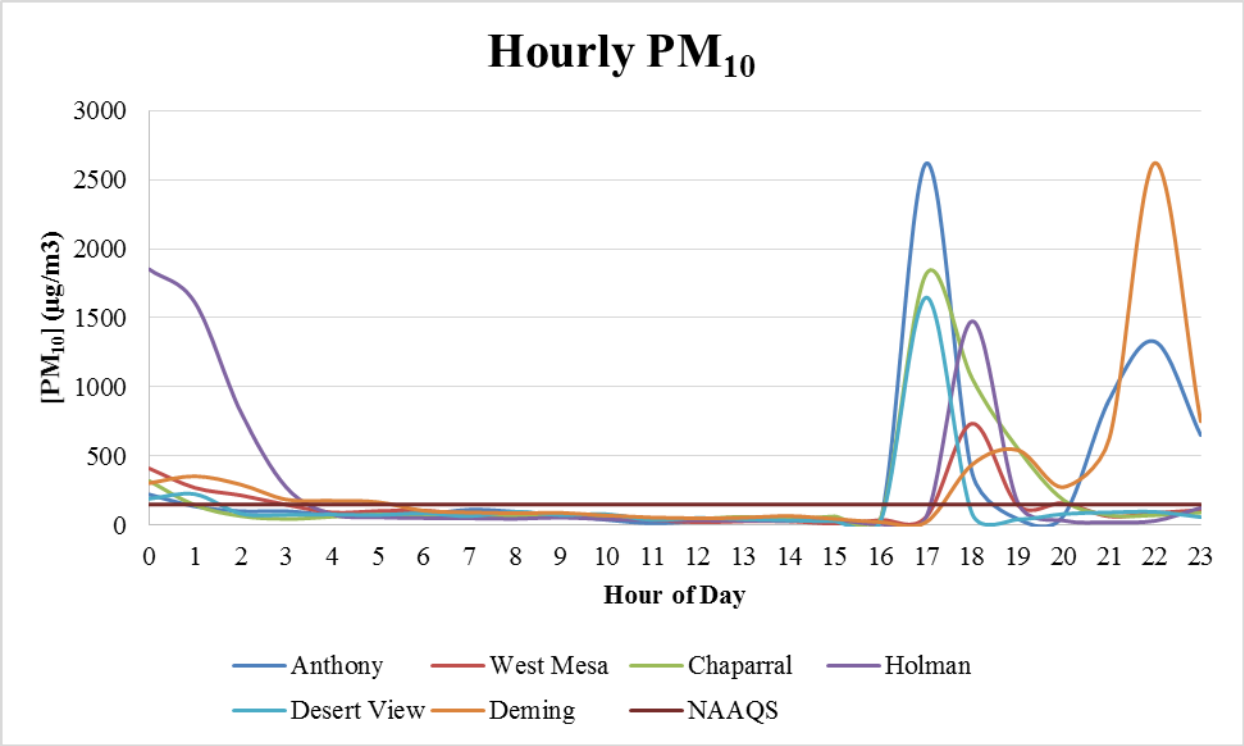


Figure 10-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

The event was blogged about by the New Mexico State Climatologist, Dr. David DuBois. He was able to capture the image below showing a distinct wall of dust (haboob) moving towards Las Cruces from the south. This dust obscured the mountains reaching a level of approximately 700 meters (www.nmborderaq.blogspot.com).

Figure 10-6. Southern view from Las Cruces at approximately 7:00 pm. Photo courtesy David DuBois.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

11 Exceptional Event: June 6, 2013

Summary of the Event

Transported dust and thunderstorm activity caused high winds and blowing dust in Doña Ana County resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Chaparral, Holman, Desert View, and West Mesa monitoring sites on this date (Table 1-1). Although the Deming site did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the northeast to east throughout the border region. These high velocity winds passed over large areas of desert within Texas and New Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the

assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and Texas.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds exceeded EPA's default threshold at one of the seven meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at two of these sites (Figures 11-1 and 11-2).

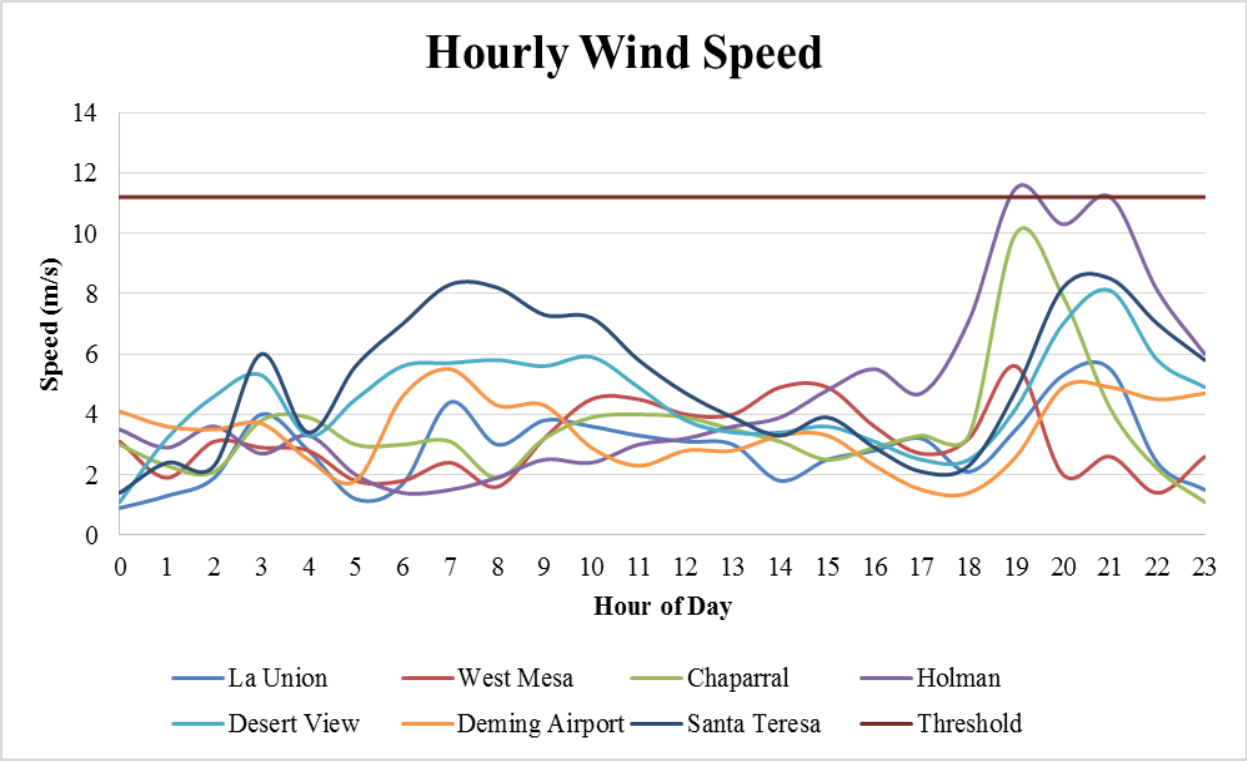


Figure 11-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

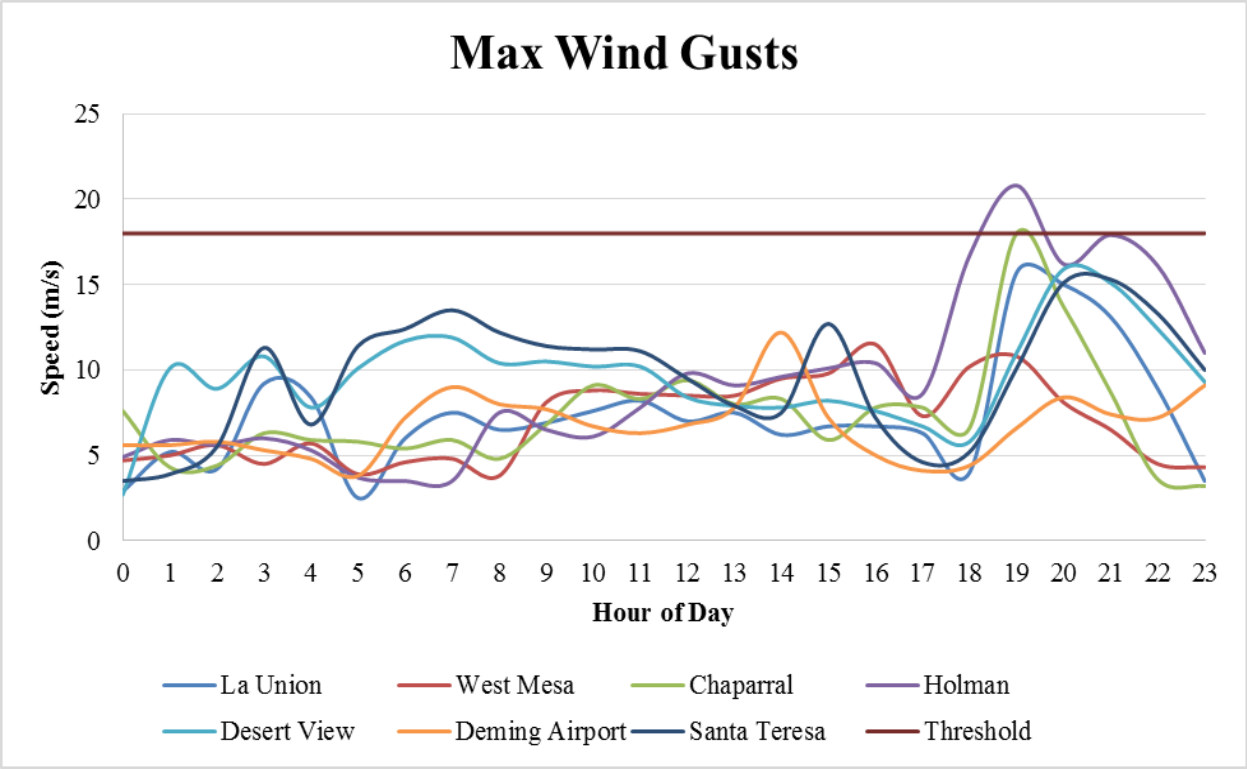


Figure 11-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 11-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded. The Anthony, Chaparral, Desert View and West Mesa sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	314	404	183	246	119	169

Table 11-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 11-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony, Chaparral, Holman, Desert View and West Mesa sites recorded values above the 99th percentile of data. Because

NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	314	404	183	246	119	169

Table 11-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

A strong storm passed through eastern New Mexico and west Texas during the early morning hours on this date. The outflow from this storm caused high winds and blowing dust over large portions of eastern New Mexico (Figure 11-3). This dust was then transported to the borderland during the night as supported by HYSPLIT backward trajectories showing wind masses originating in west Texas and Oklahoma moving westward (Figure 11-4) In the afternoon scattered thunderstorm activity produced outflow boundary winds that caused strong and gusty winds. The NWS short term forecast product summarized this weather pattern below.

```
SCATTERED SHOWERS AND THUNDERSTORMS WILL MOVE SOUTHEASTWARD ACROSS
SOUTHERN NEW MEXICO EARLY THIS EVENING...MAINLY EAST OF INTERSTATE 25.
GUSTY WINDS PEAKING AT 50 MPH WILL CAUSE BLOWING DUST IN THE LOWER
ELEVATIONS...WITH VISIBILITIES DROPPING BELOW 1 MILE AT TIMES.
```

The weather pattern described above generated gusty winds beginning at the 1900 hour and lasted through the 2100 hour. Beginning at the 1900 hour, wind speeds exceeded 11.2 m/s at Holman as shown in Figure 11-1. Peak wind speeds ranged from 5.5 m/s at La Union to 11.5 m/s at Holman (Figure 11-1). Peak wind gusts ranged from 11.5 m/s at La Union to 20.8 m/s at Holman (Figure 11-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 11-5 a-e. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 11-6).

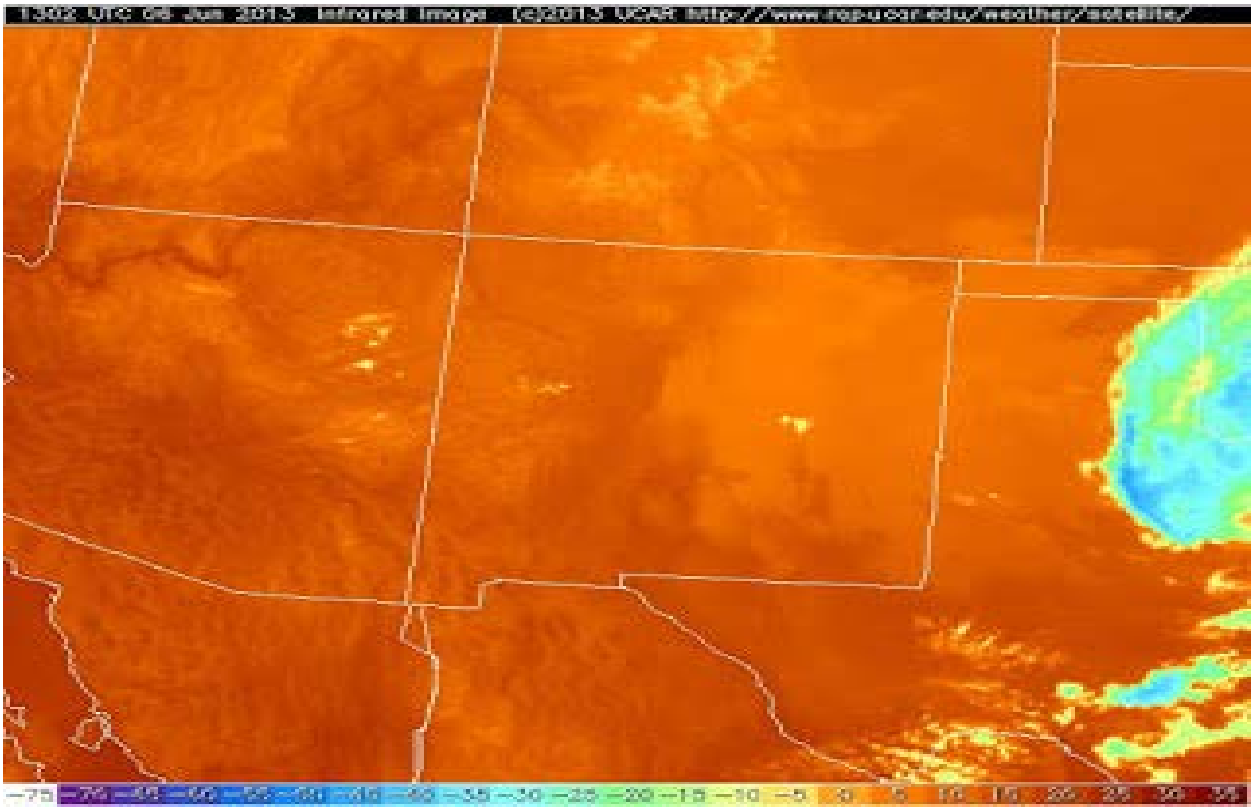


Figure 11-3. Surface weather map showing cold front, areas of low pressure and isobars of constant pressure (red lines).

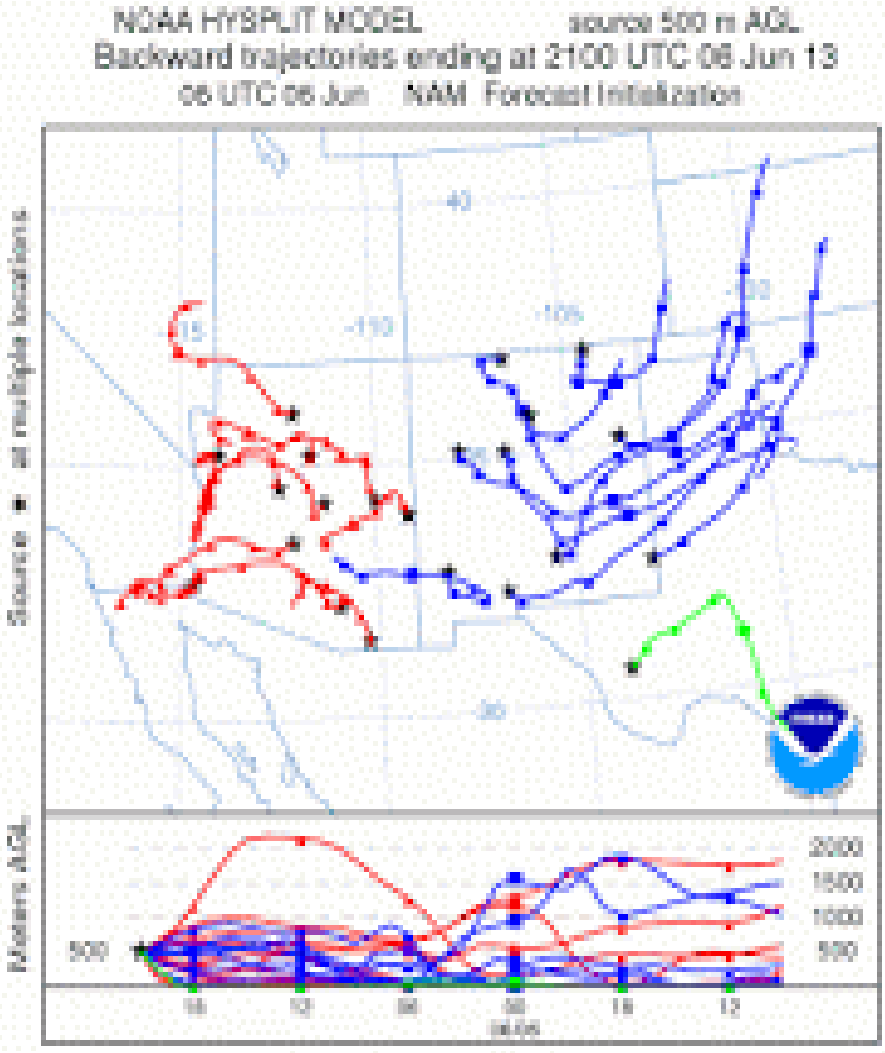
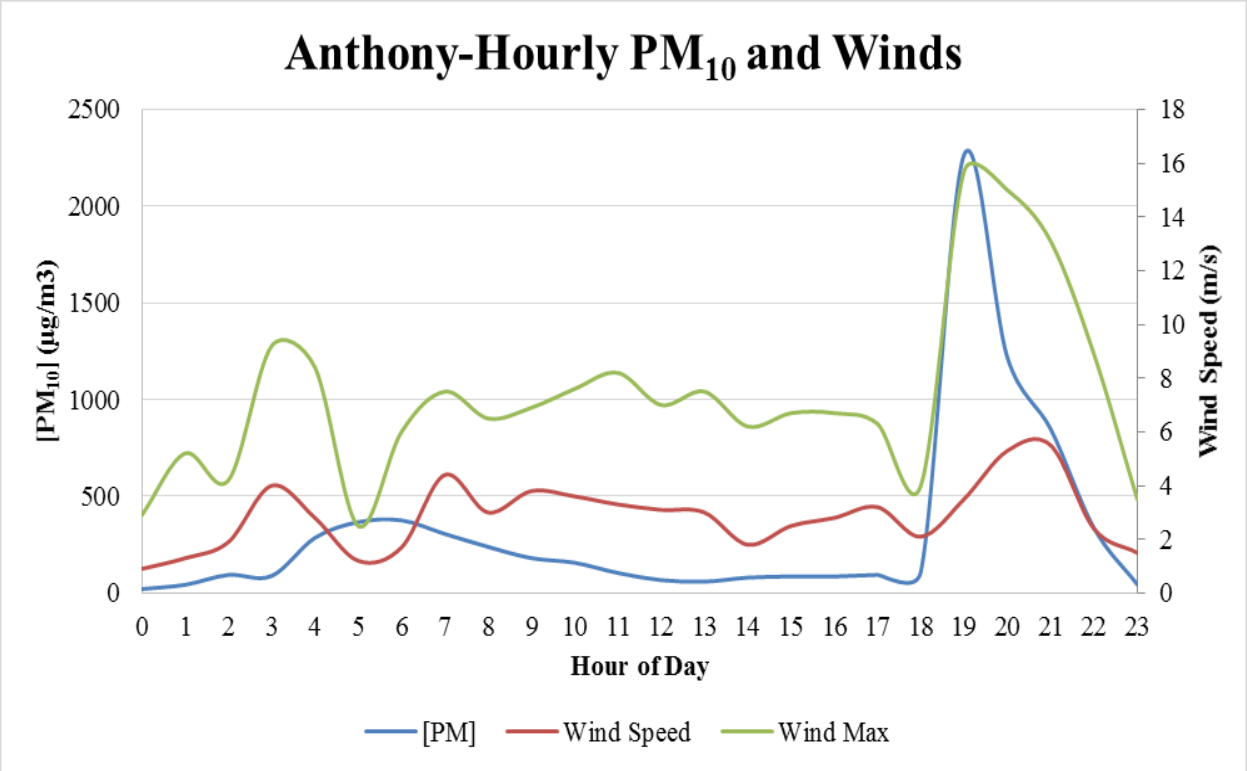
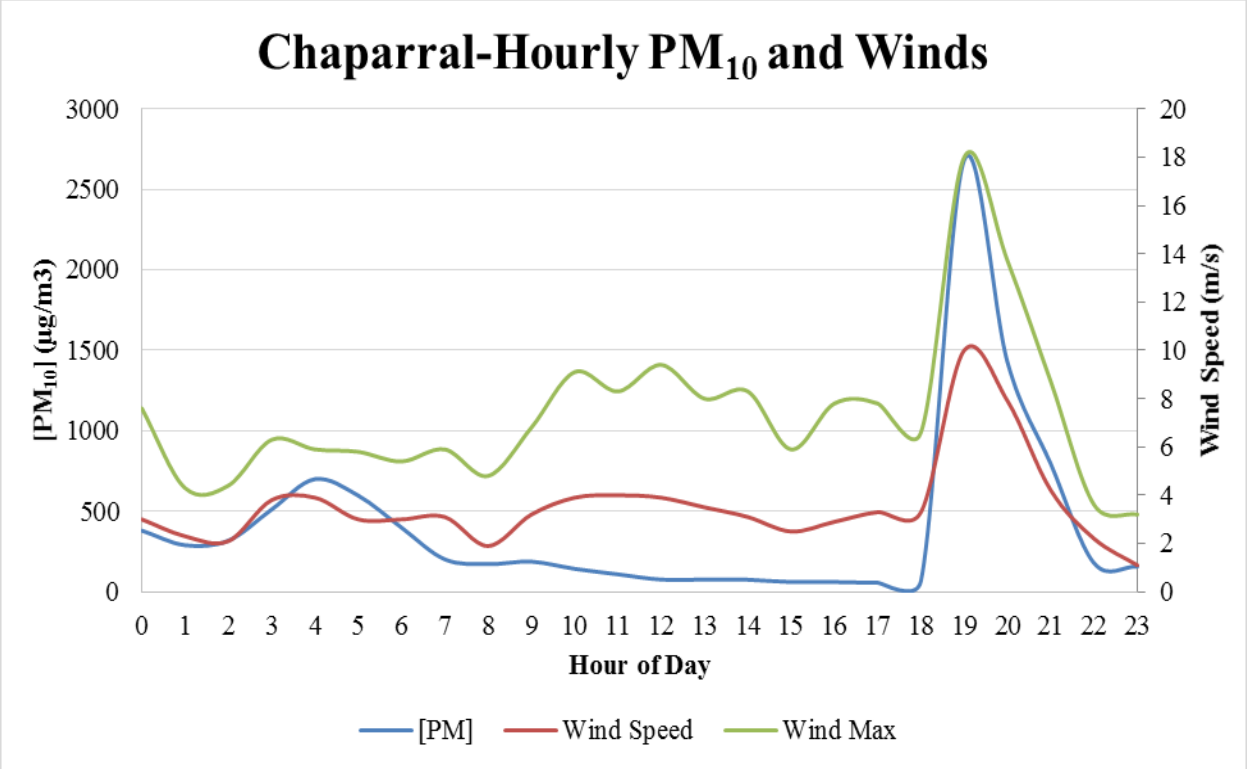
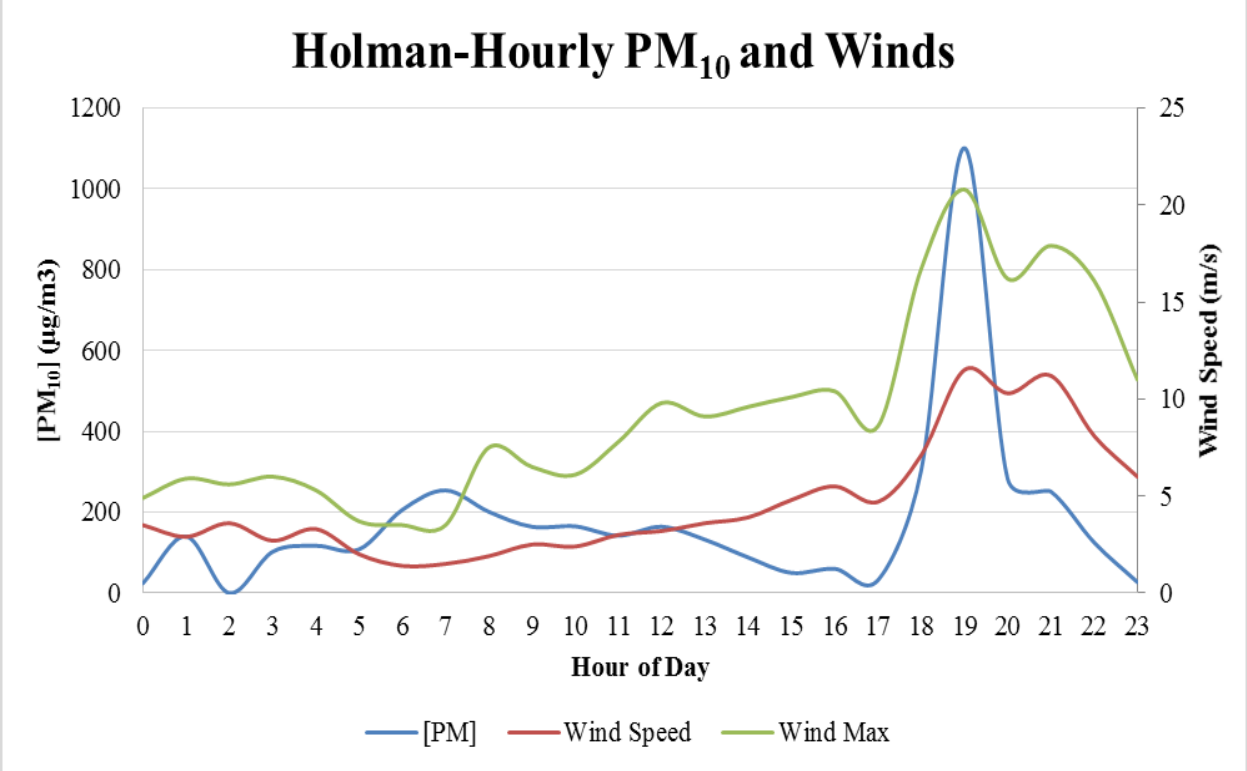
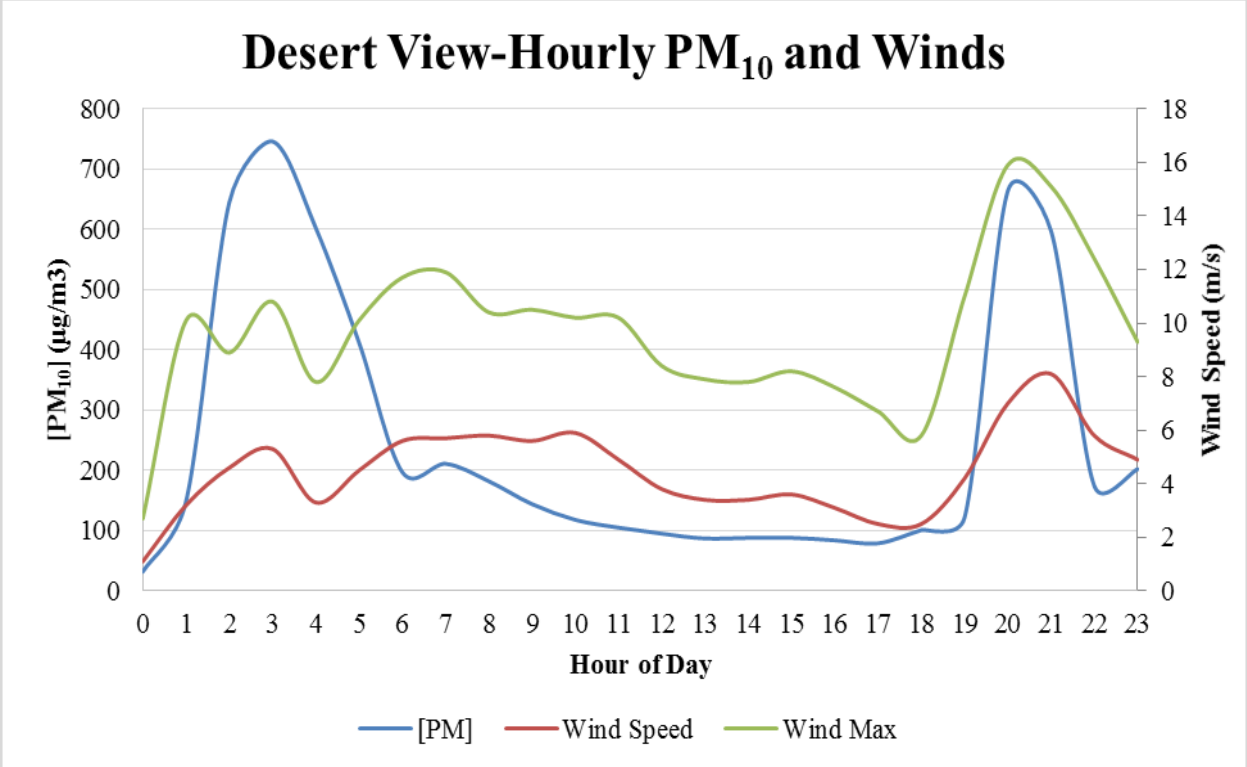


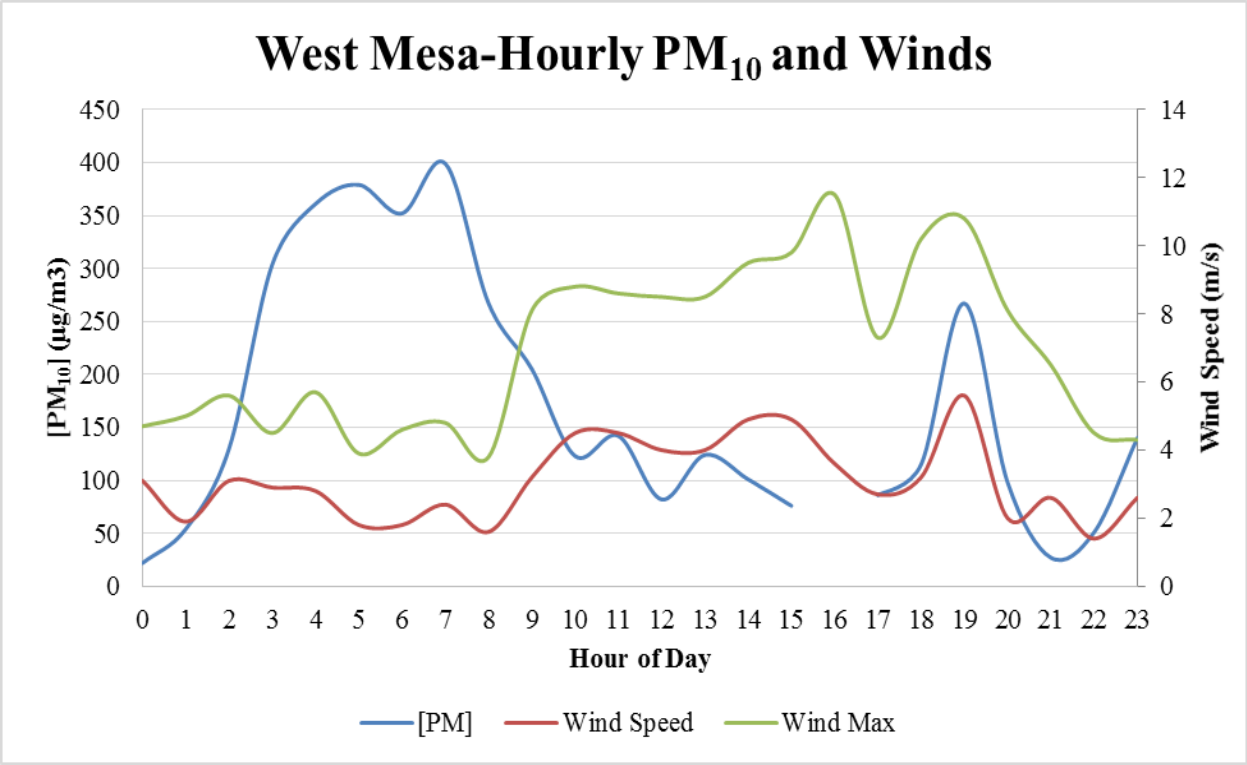
Figure 11-4. NOAA HYSPLIT backward trajectories.


Anthony-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Chaparral-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Holman-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max


Desert View-Hourly PM10 and Winds
[PM10] (µg/m3)
Wind Speed (m/s)
Hour of Day
[PM]
Wind Speed
Wind Max



Figures 11-5 a-e. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

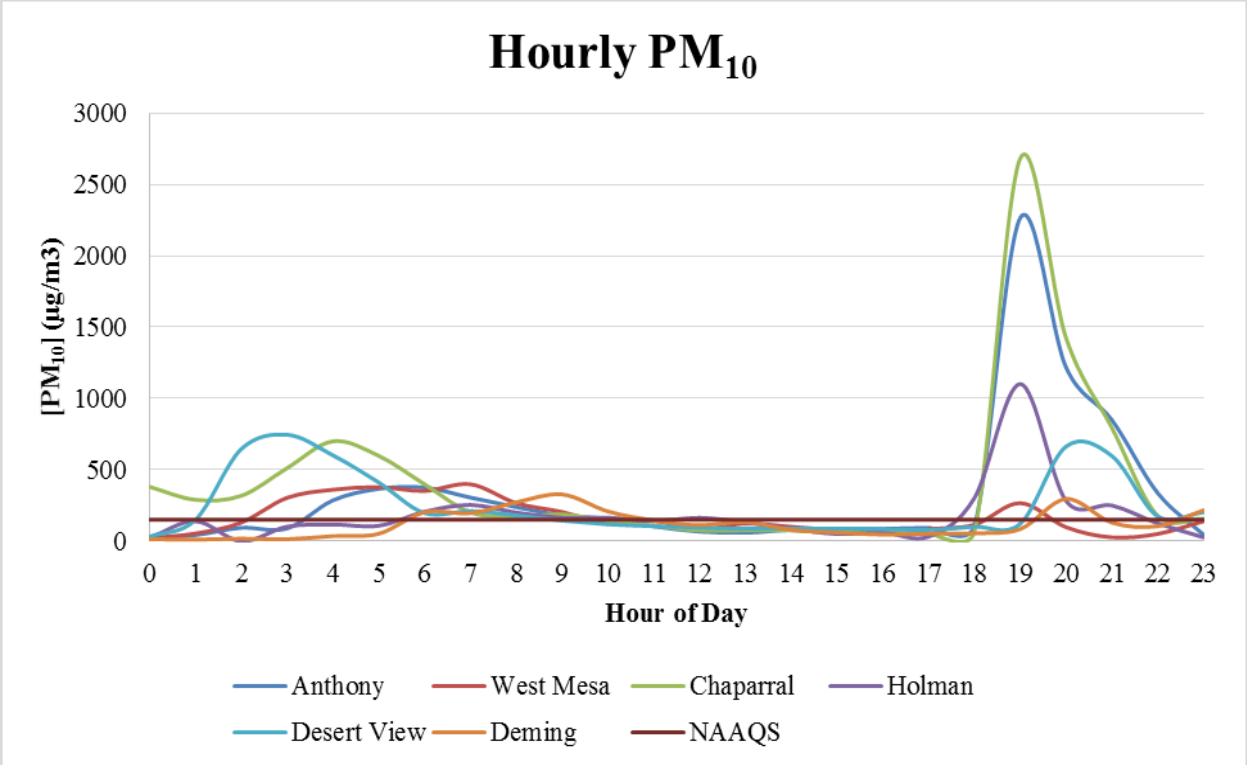


Figure 11-6. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

12 Exceptional Event: June 8, 2013

Summary of the Event

Smoke from the Silver Fire in the Gila Mountains of New Mexico caused an exceedance of the PM_{10} 24-hour NAAQS at the Deming Airport monitoring site on this date (Table 1-1). The monitoring sites in Doña Ana County also were impacted on this day as indicated by their elevated PM_{10} 24-hour averages. As the event unfolded, the wind blew from the north to northwest throughout the border region. NMED measured low sustained hourly wind speeds during the time that elevated PM_{10} concentrations were measured. The presence of wildfire, little to no point sources in the area, and the high PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by wildfire smoke.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of smoke contributing to this exceedance include the Silver Fire (see satellite imagery and HYSPLIT information below) and fires in northern Mexico (see section 14). On June 7, 2013, lightning started the wildfire in the vicinity of Kingston, NM. The fire continued for over a month and burned 138,705 acres. Figure 12-1 shows satellite imagery of the smoke plumes produced by the fires as well as its location as indicated by the red dots.

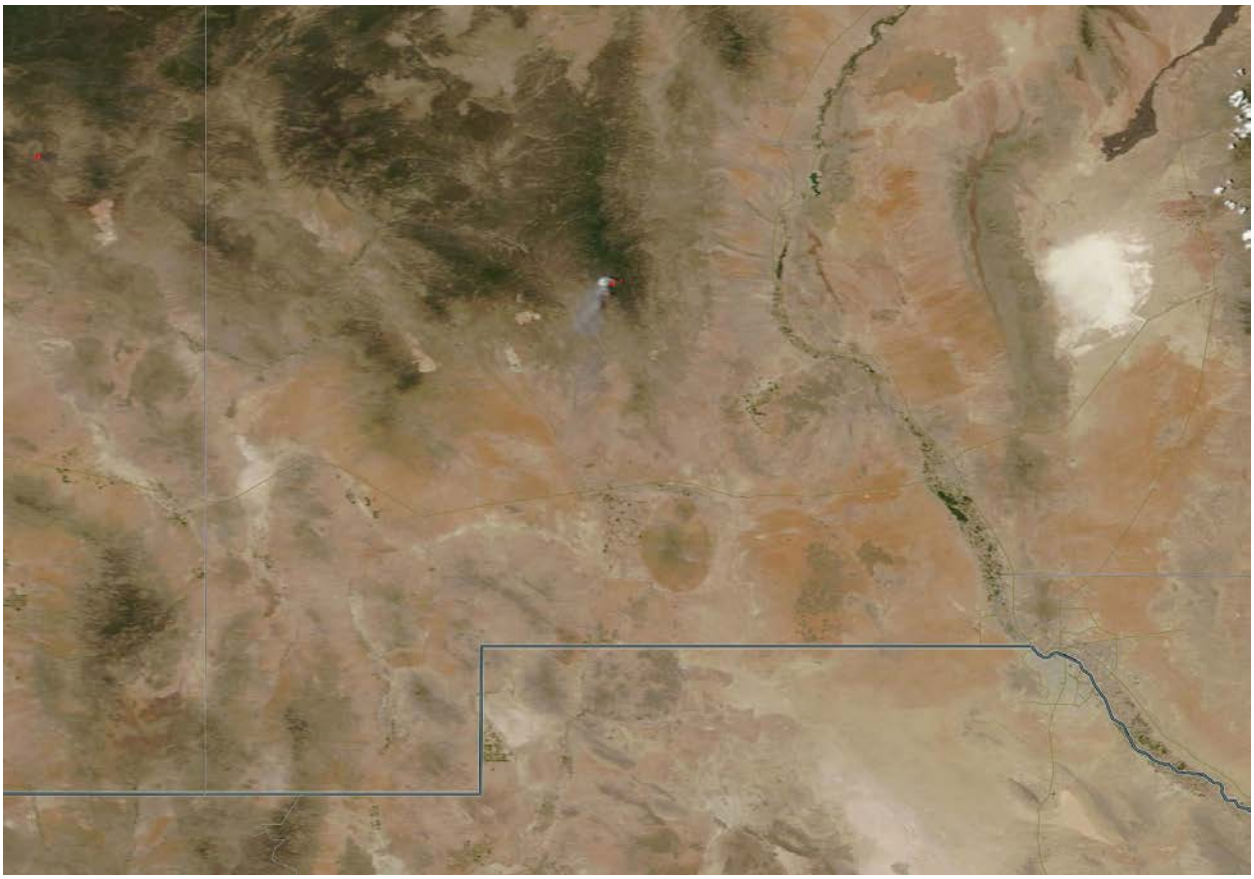


Figure 12-1. NASA satellite imagery of the Silver Fire.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds have caused these exceedances in the past and they occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 12-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded except for the Chaparral monitor. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	131	90	94	126	197	99

Table 12-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table12-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	131	90	94	126	197	99

Table 12-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Smoke caused elevated levels of PM_{10} throughout the day during periods of relatively low winds as demonstrated by the time series plots in Figure 12-2. During the hours of elevated concentrations, hourly PM_{10} concentrations spiked at all of the monitoring sites (Figure 12-3).

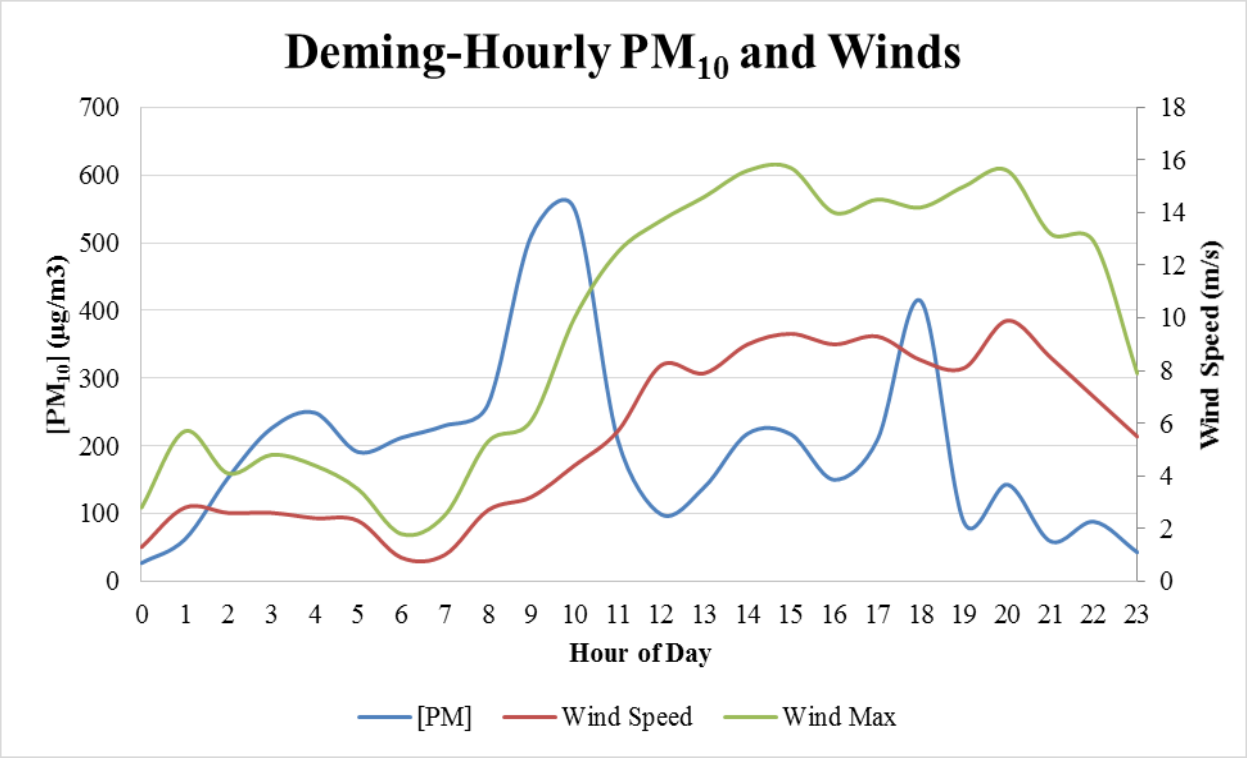


Figure 12-2. Time series plot of hourly observations showing increased PM_{10} concentrations before wind speeds and gusts increase.

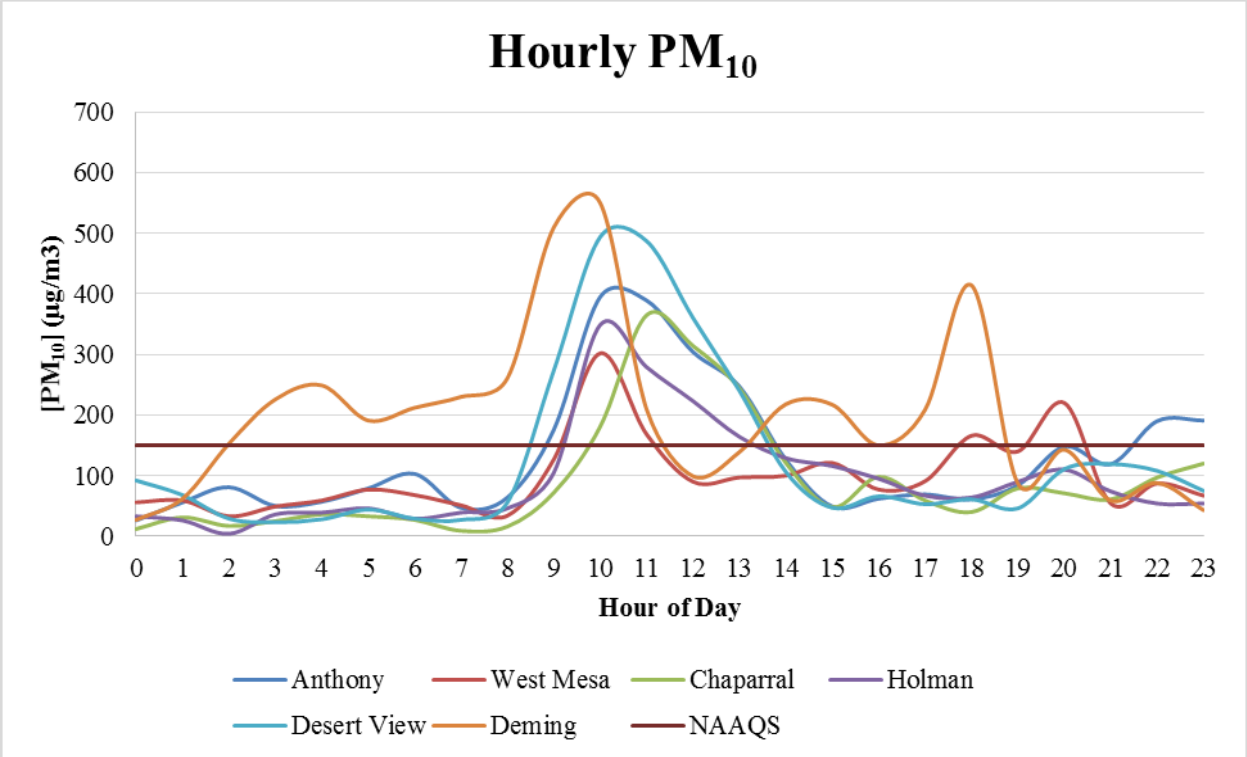


Figure 12-3. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Air parcel trajectories were modeled using the NOAA HYSPLIT model. This model helps describe causal connections between the suspected source area (e.g. wildfire locations) and the monitoring site. HYSPLIT back trajectories from the Deming site were run using the ensemble mode beginning at the 900 hour on June 8 for the previous 24-hour period. All of the trajectory lines indicate transport from the fire locations to the monitoring site. The smoke traveled from the northwest before reaching the Deming site (Figure 12-4).

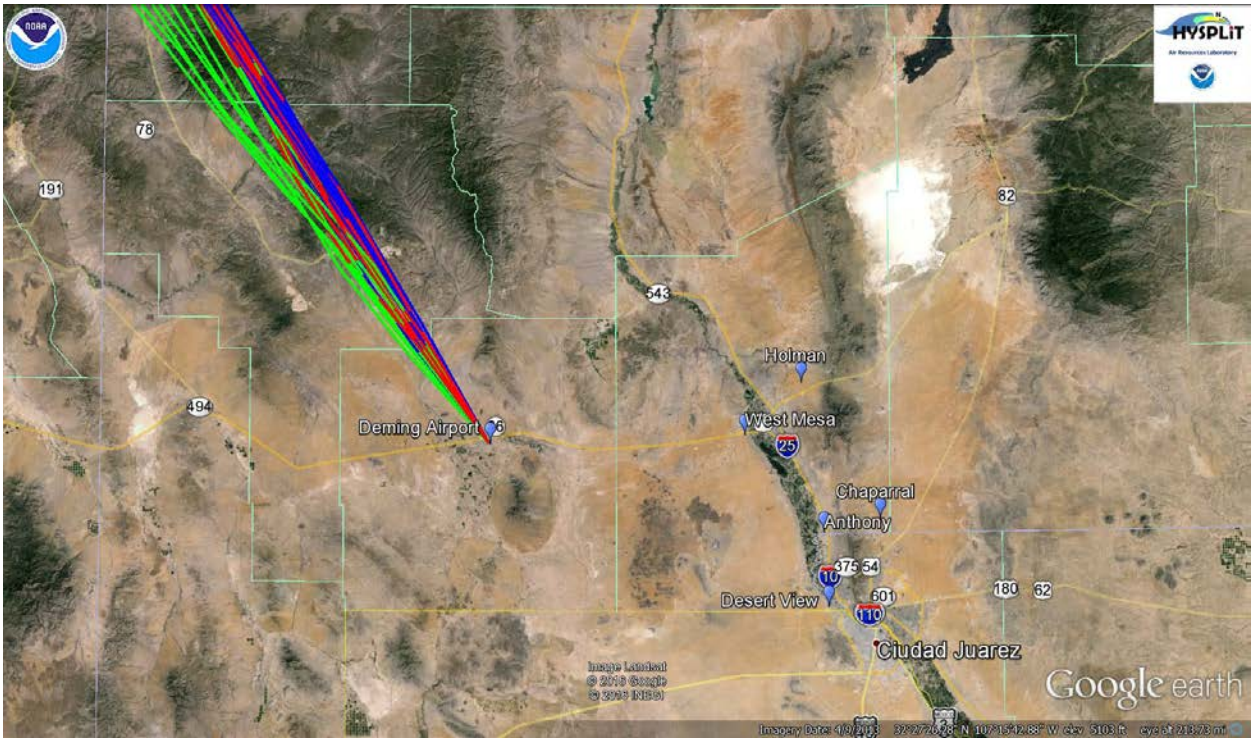


Figure 12-4. HYSPLIT back trajectories for the 24-Hour period before the highest concentrations were monitored.

The NAAPS Aerosol forecast from the Naval Research Laboratory also shows that most of the southwestern US was covered in smoke on this date (Figure 12-5). Windblown dust was mostly contained to southeastern Colorado and eastern Montana.

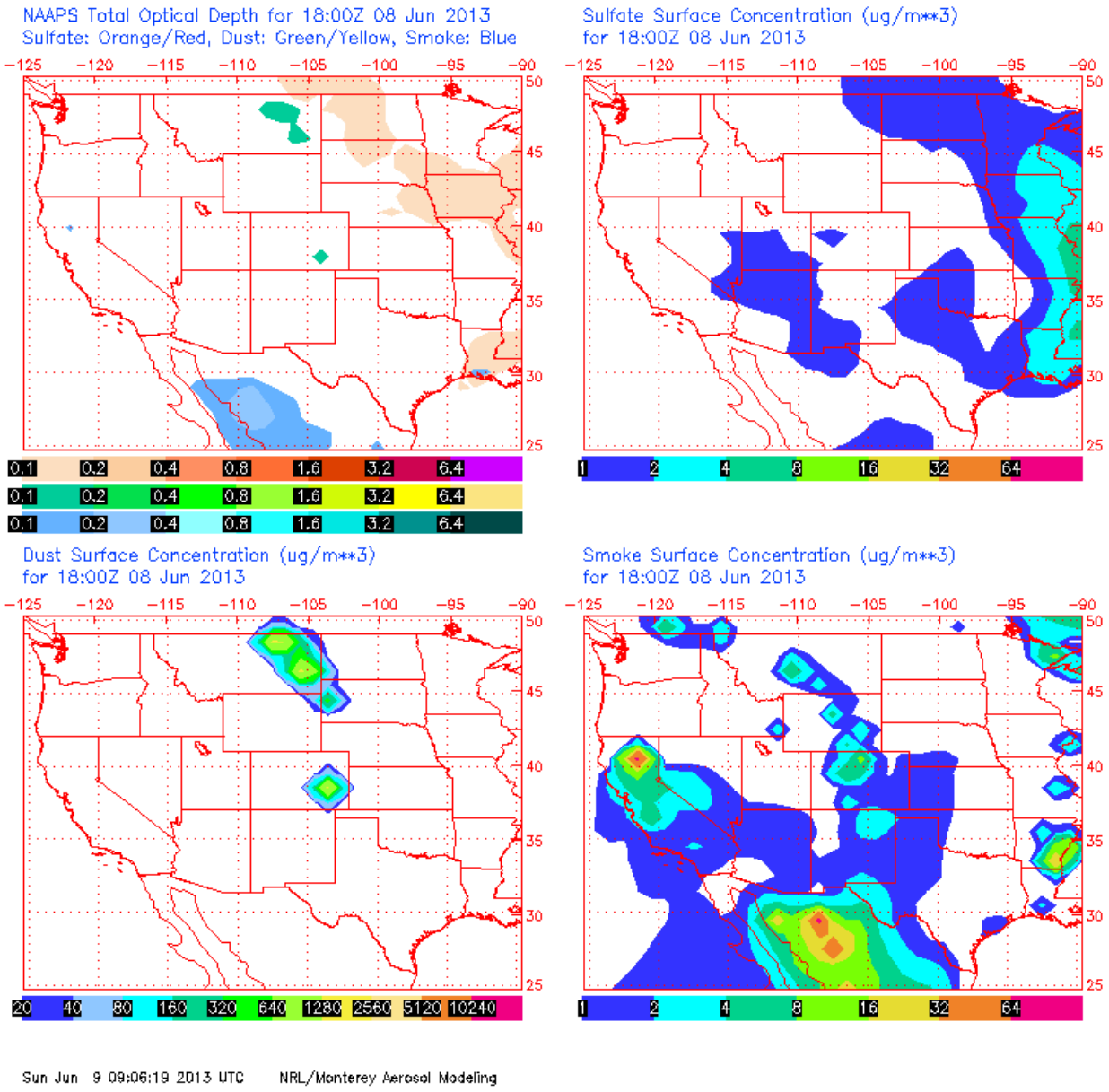


Figure 12-5. NAAPS Aerosol Forecast for June 8 at 1200 Mountain Standard Time.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by smoke from wildfires.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties.

Based on the evidence provided above, NMED concludes that without the smoke impacts from wildfire, an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the smoke event clearly caused these exceedances. The causal connection of the measured PM_{10} and the smoke plume indicate that but for the smoke impacts this exceedance would not have occurred.

13 Exceptional Event: June 20, 2013

Summary of the Event

Thunderstorm activity caused high winds and blowing dust in Doña Ana County resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony, Holman, and West Mesa monitoring sites on this date (Table 1-1). Although the Desert View and Chaparral sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

Two separate events affected the monitoring sites on this date. As the events unfolded, the wind blew from the south to southeast throughout the border region. These high velocity winds passed over large areas of desert within Texas, New Mexico and Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert and the playas in New Mexico and northern Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds did not exceed EPA's default threshold at the meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at two of the seven sites (Figures 13-1 and 13-2). Although the monitoring sites did not record sustained wind speeds above the 11.2 m/s threshold, the Holman monitoring site recorded winds approaching this level at 10.6 m/s or within 0.6 m/s (1.3 mph) of the threshold.

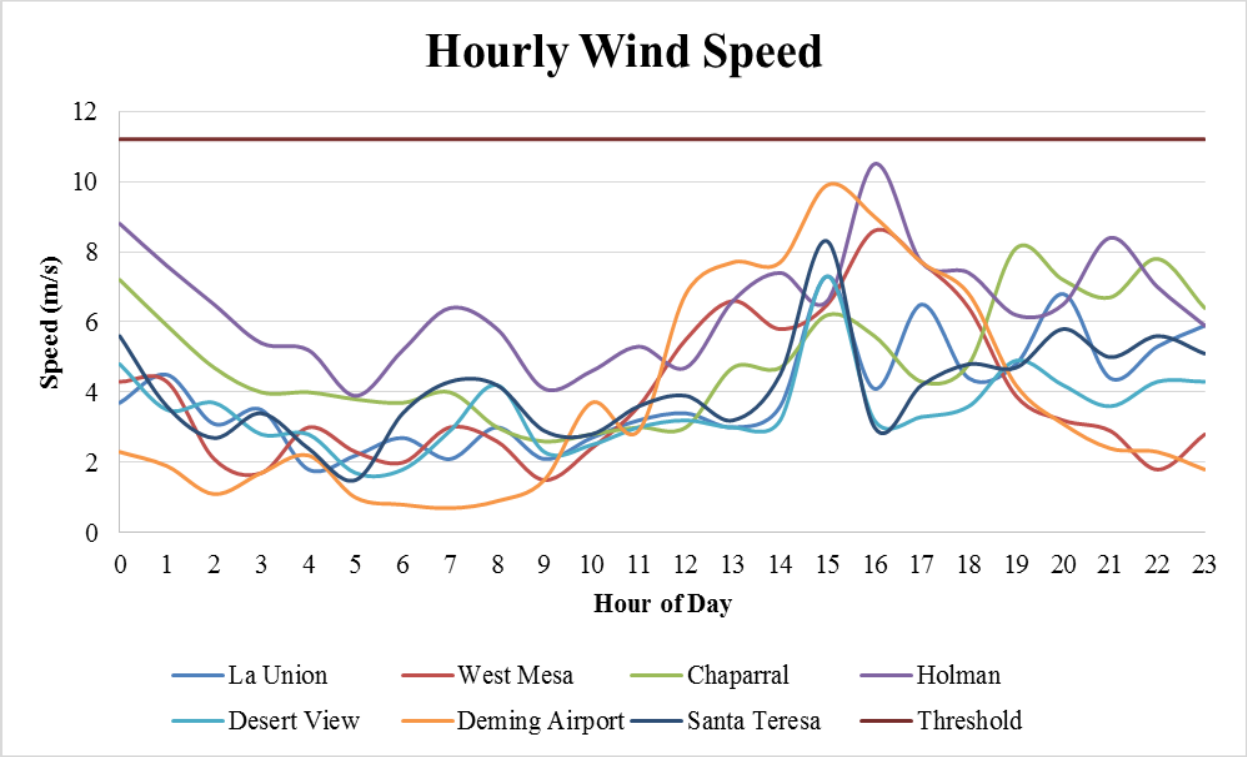


Figure 13-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

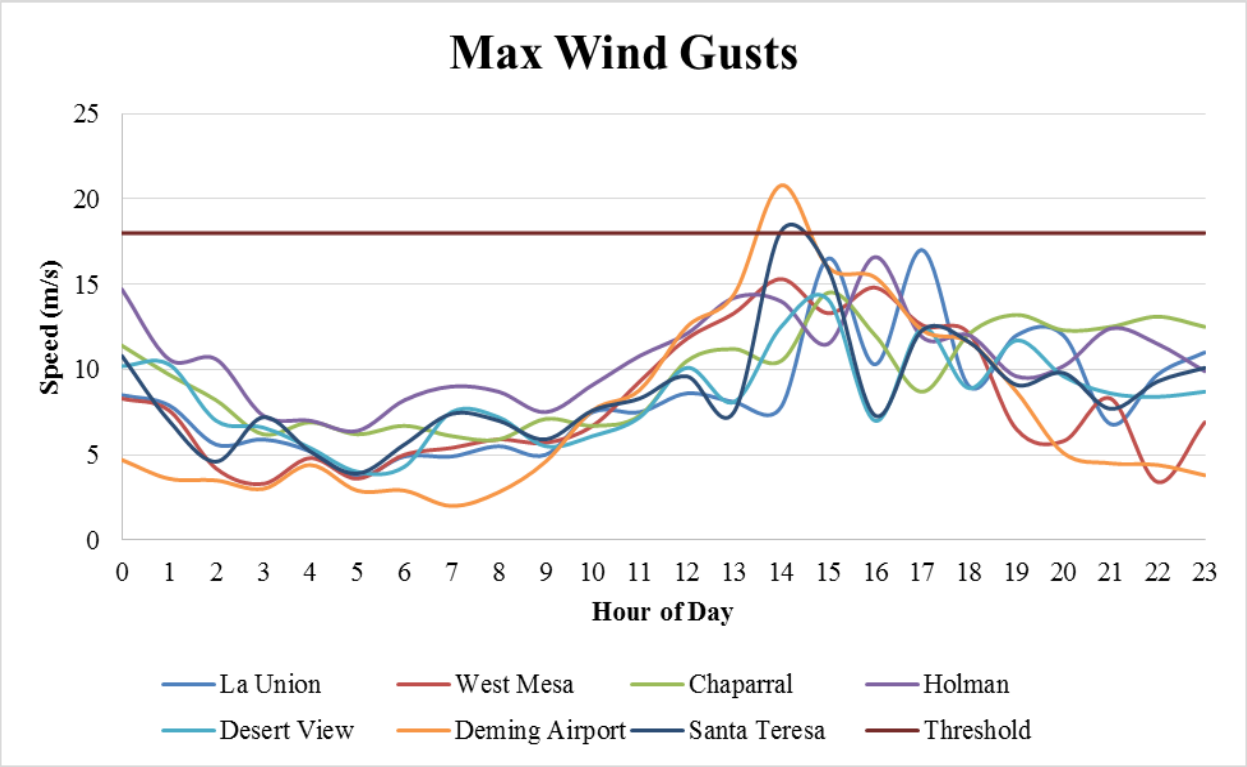


Figure 13-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 13-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of all 24-hour averages recorded at the Anthony, Holman, Desert View, and West Mesa sites. The West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	186	84	164	118	57	182

Table 13-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 13-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the spring season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The Anthony, Holman, Desert View and West Mesa sites recorded values for this day above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony, Holman, and West Mesa sites recorded values above the 99th

percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	186	84	164	118	57	182

Table 13-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Thunderstorm activity in the early morning and afternoon hours produced outflow boundary winds that caused strong and gusty winds on this day. The outflow from these storms caused high winds and blowing dust over large portions of southern New Mexico, west Texas, and northern Mexico (Figure 13-3 a-b). This dust produced by these weather systems was then transported to the monitoring sites by lower level winds. The NWS hazardous weather product summarized this weather pattern and possible impacts below.

> A FEW STORMS WILL PRODUCE WIND GUSTS TO 60 MPH CAUSING DAMAGE ALONG WITH BLOWING DUST AND REDUCED VISIBILITIES. PEA SIZED HAIL IS ALSO POSSIBLE WITH A FEW STORMS.

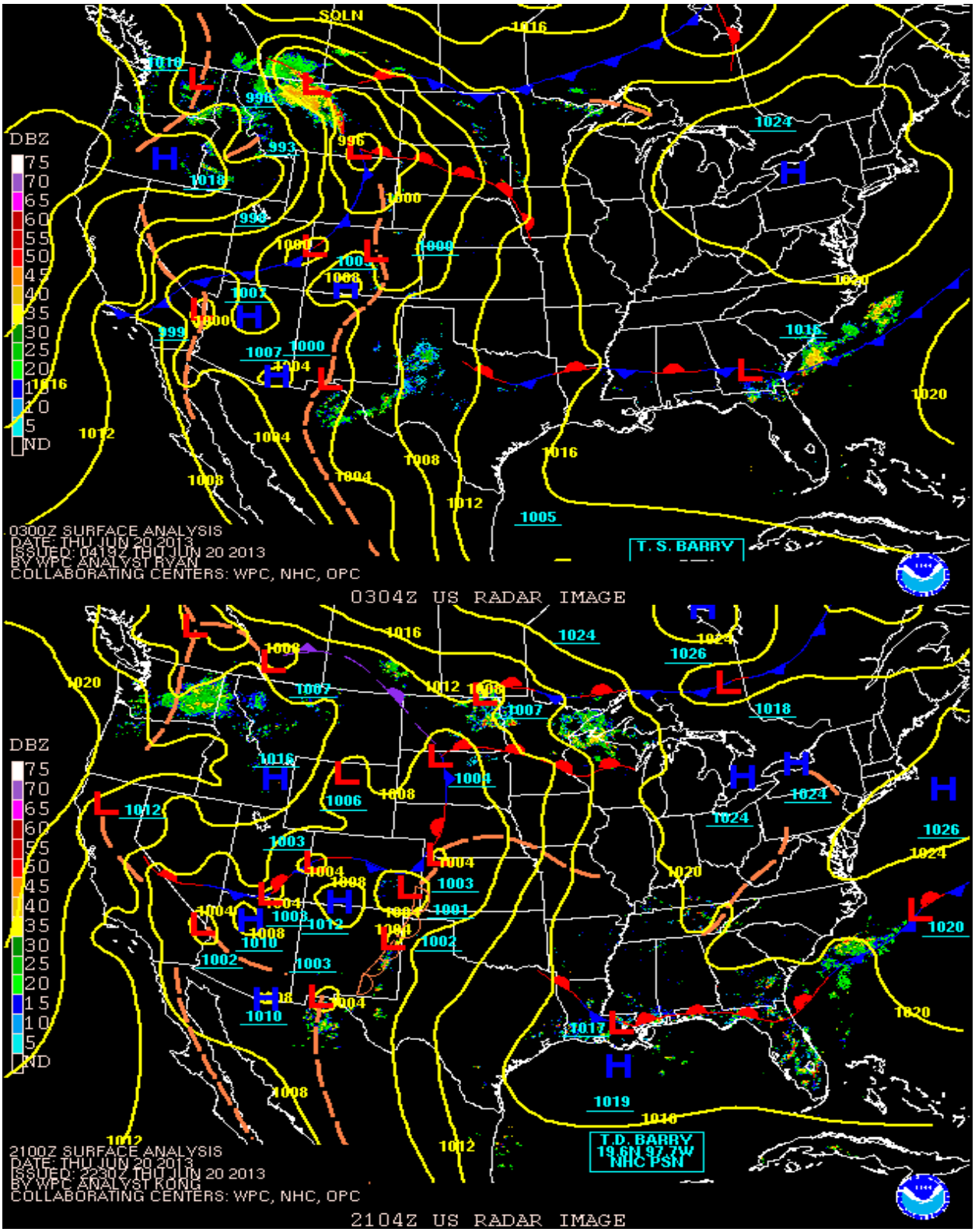
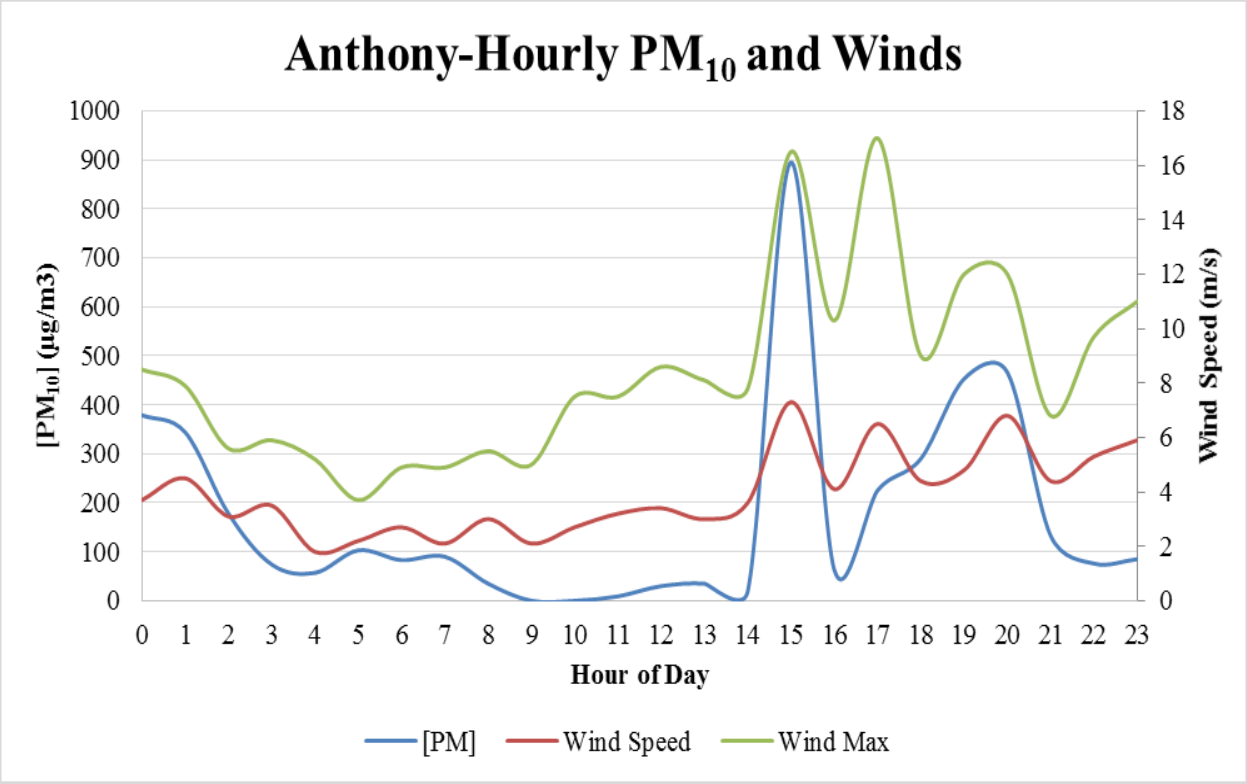
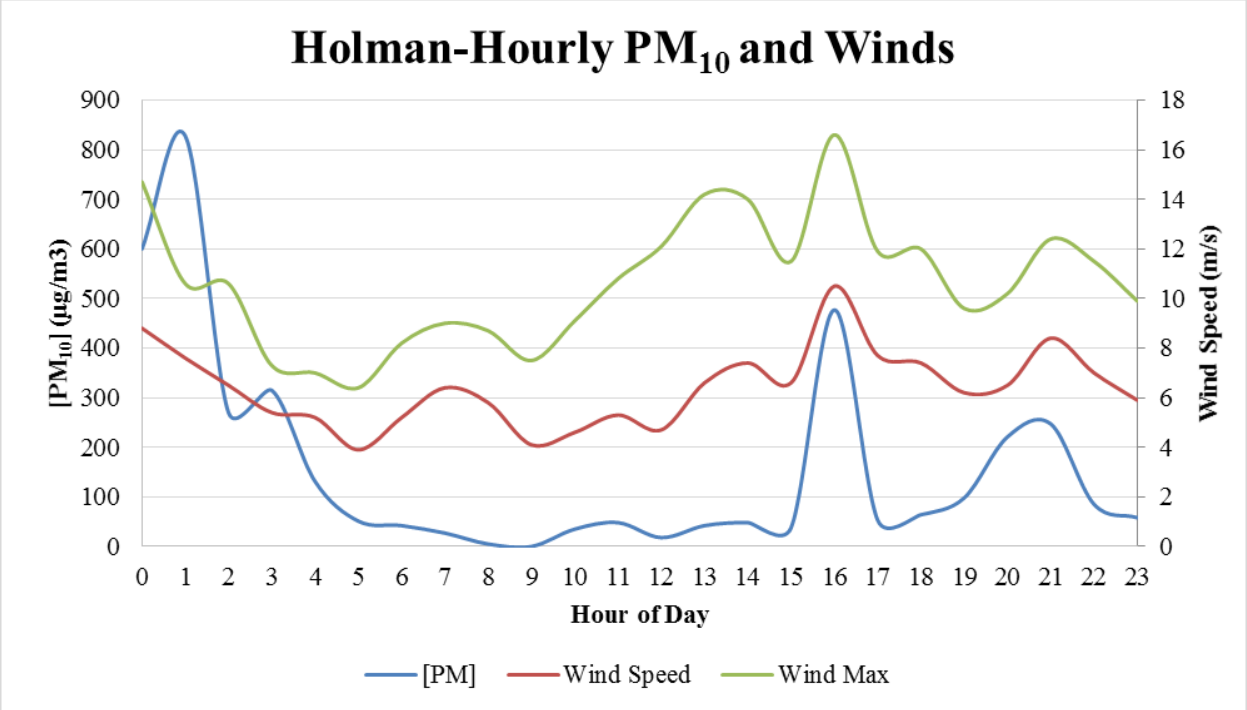
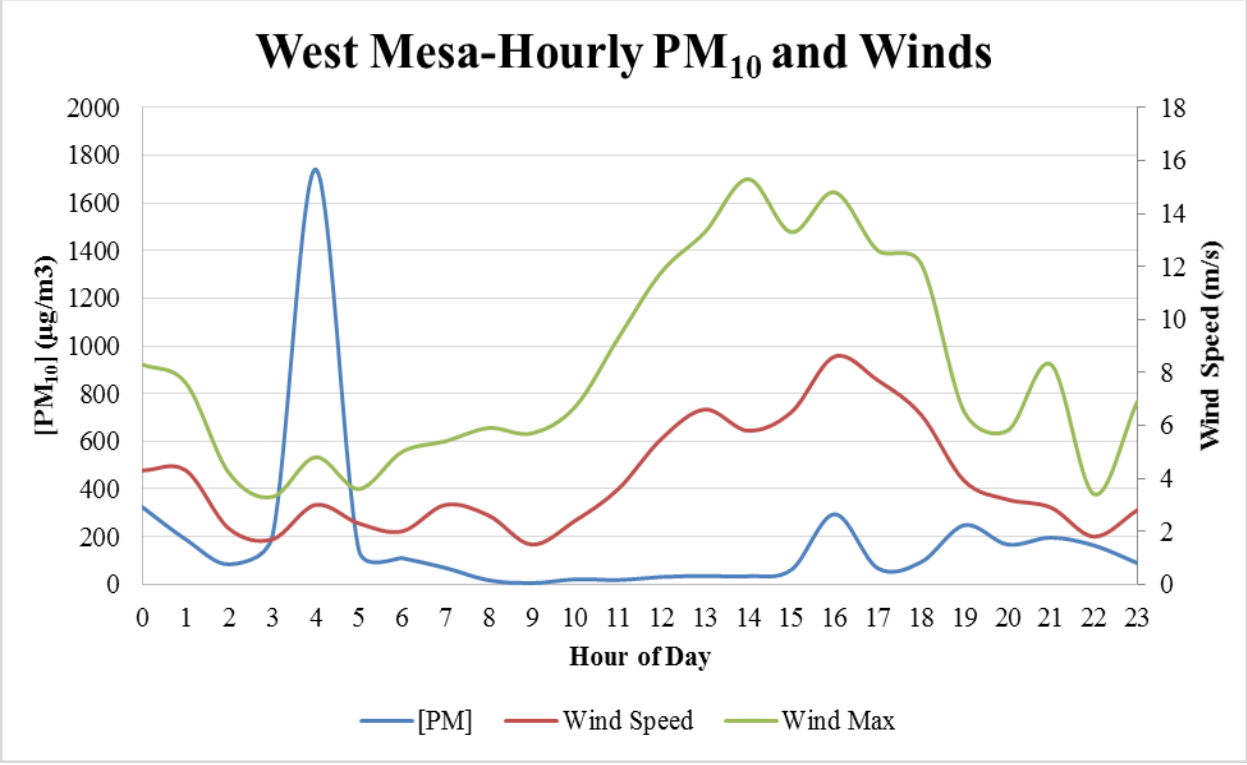


Figure 13-3 a-b. Surface weather map with radar composite showing thunderstorm activity in Northern Mexico.

The weather pattern described above generated strong winds beginning at the 1500 hour with lower wind speeds carrying dust through the 2200 hour. Beginning at the 1500 and 1600 hour, wind speeds approached 11.2 m/s at Deming and Holman respectively as shown in Figure 13-1. Peak wind speeds ranged from 7.3 m/s at Desert View to 10.5 m/s at Holman (Figure 13-1). Peak wind gusts ranged from 14.1 m/s at Desert View to 20.8 m/s at the Deming Airport (Figure 13-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 13-4 a-c. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 13-5). The monitoring sites, especially the West Mesa and Holman sites, were impacted by transported dust in the early morning hours.







Figures 13-4 a-c. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

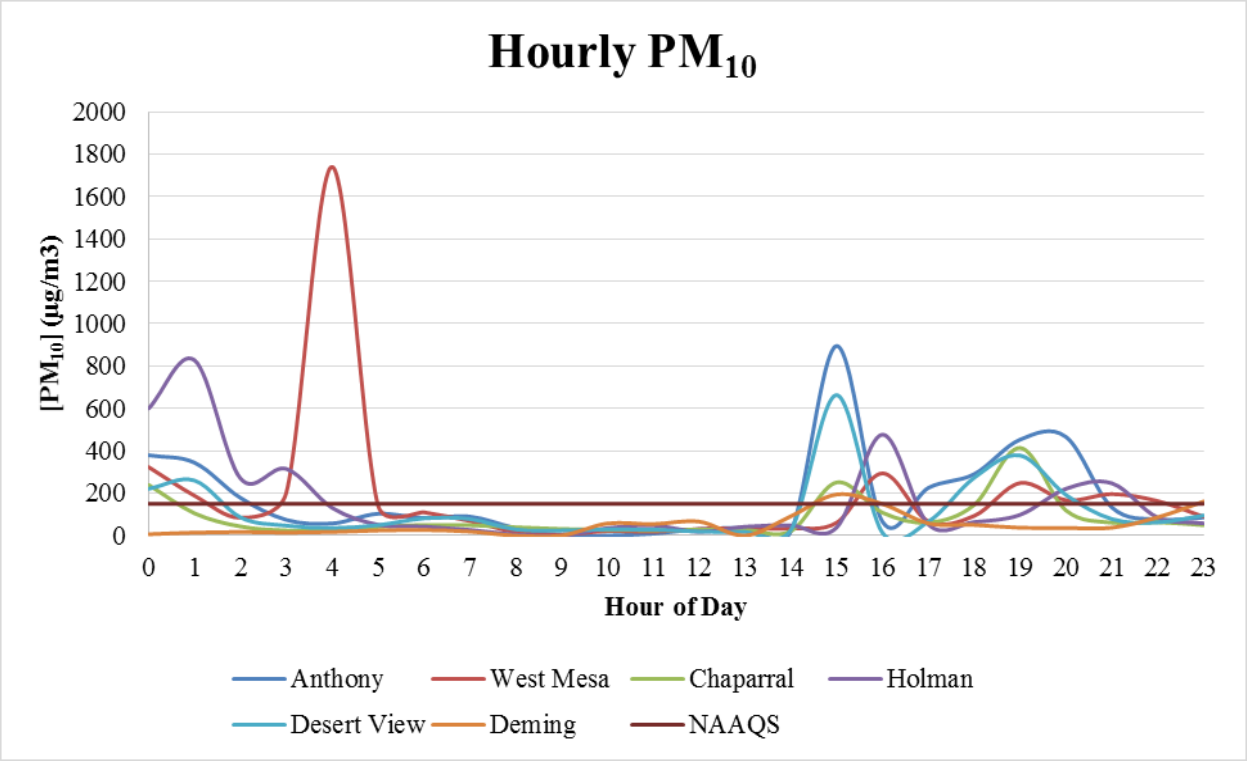


Figure 13-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration

for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

14 Exceptional Event: June 22, 2013

Summary of the Event

Smoke from fires in northern Mexico caused an exceedance of the PM_{10} 24-hour NAAQS at the West Mesa monitoring site on this date (Table 1-1). As the event unfolded, the wind blew from the southwest throughout the border region. NMED measured low sustained hourly wind speeds during the time that elevated PM_{10} concentrations were measured. The presence of wildfires, little to no point sources in the area, and the high PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by wildfire smoke.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of smoke contributing to this exceedance include fires in northern Mexico. The largest and most likely source of smoke are the fires burning in northern Mexico in the Sierra Madres south of Douglas, Arizona and along the Sonora-Chihuahua border (see satellite imagery below and HYSPLIT information below). Due to the lack of information regarding these fires, it is unknown how they started and what measures were taken to contain the fire. However, given the amount of time the fires burned and the location of the fires, it is assumed that these were wildfires. Figure 14-1 shows satellite imagery of the smoke plumes produced by these fires as well as their locations as indicated by the red dots.

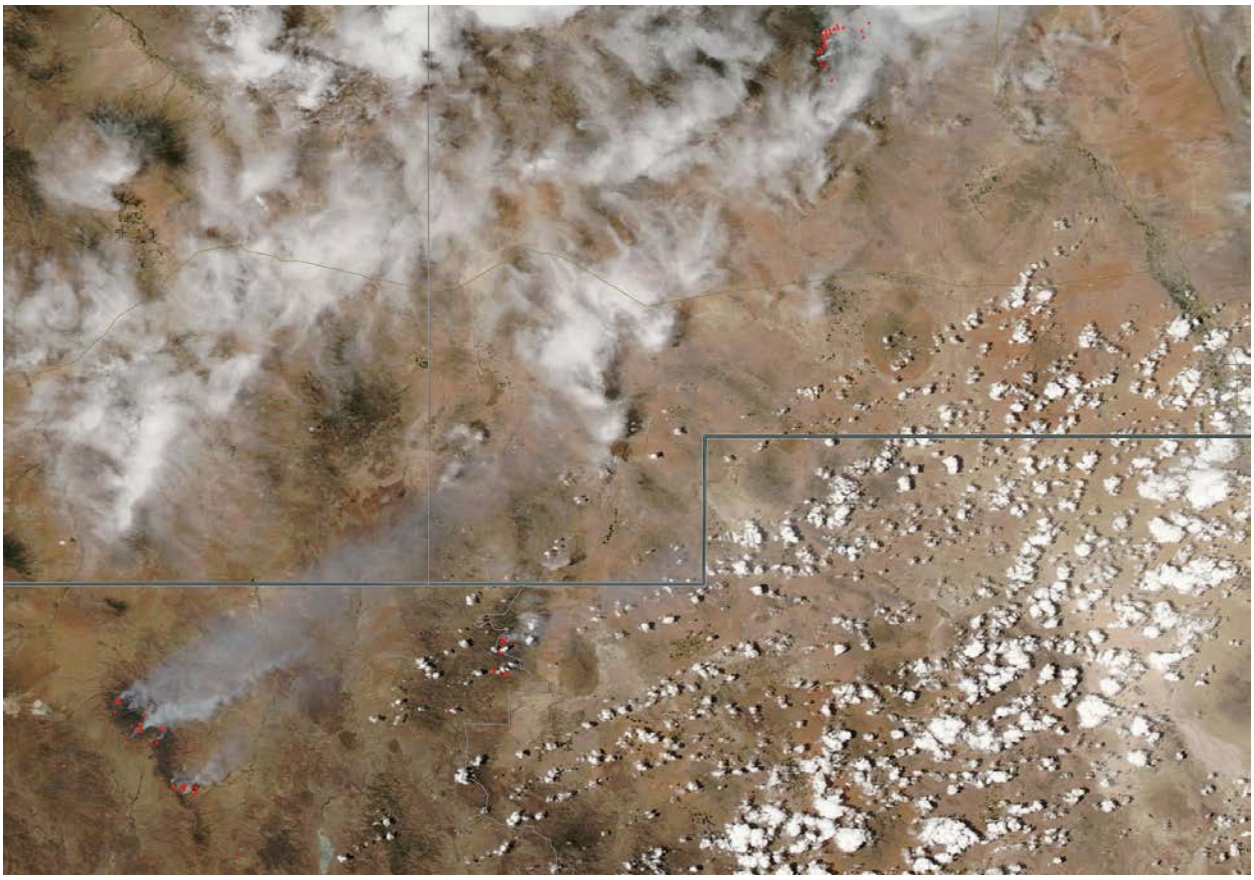


Figure 14-1. NASA satellite imagery of the fires in northern Mexico.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds have caused these exceedances in the past and they occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 14-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values at the other monitoring sites for this day are below the 95^{th} percentile of all 24-hour averages recorded. However, the West Mesa site recorded a value above the 99^{th} percentile of data. Because NMED believes all previous exceedances were due to high

wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	72	49	59	48	48	228

Table 14-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table14-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are below the 95th percentile of the seasonal 24-hour averages recorded except for the Holman and West Mesa sites. The West Mesa site recorded a value above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	72	49	59	48	48	228

Table 14-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Smoke caused elevated levels of PM_{10} before the time period winds increased and removed the smoke from the area as demonstrated by the time series plots in Figure 14-2. During the hours of elevated concentrations, hourly PM_{10} concentrations spiked at only the West Mesa monitoring site (Figure 14-3).

Air parcel trajectories were modeled using the NOAA HYSPLIT model. This model helps describe causal connections between the suspected source area (e.g. wildfire locations) and the monitoring site. HYSPLIT back trajectories from the West Mesa site were run using the ensemble mode beginning at the 800 hour on June 22 for the previous 24-hour period. All of the trajectory lines indicate transport from the fire locations to the monitoring site. The smoke traveled along the complex terrain between the Florida, Portrillo, and the Robledo Mountains before reaching the West Mesa (Figure 14-4).

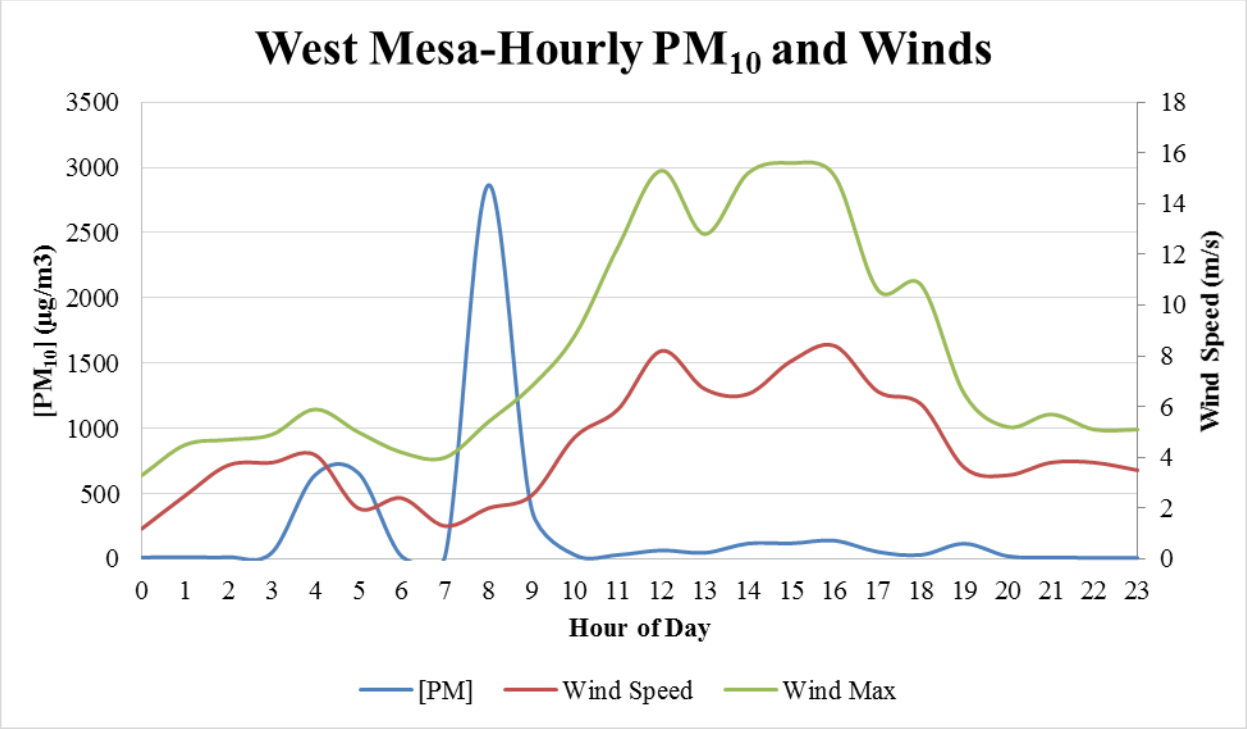


Figure 14-2. Time series plot of hourly observations showing increased PM_{10} concentrations before wind speeds and gusts increase.

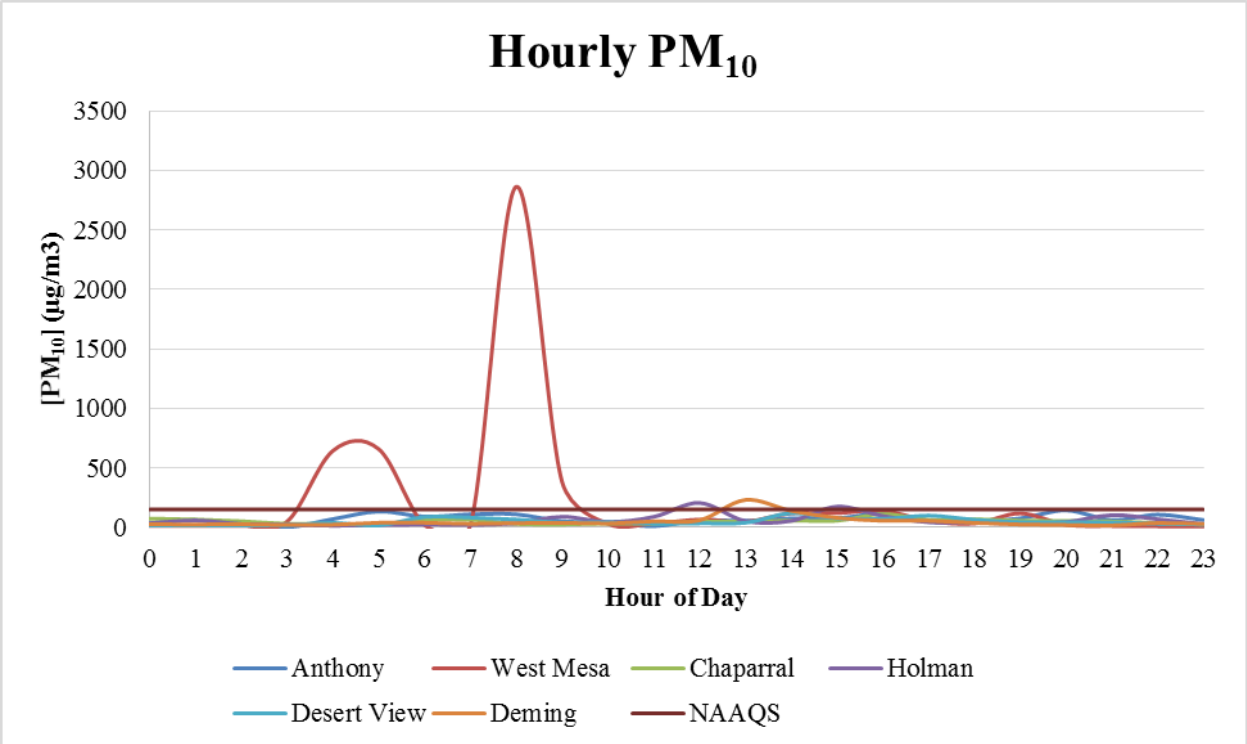


Figure 14-3. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Figure 14-4. HYSPLIT back trajectories for the 24-Hour period before the highest concentrations were monitored.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by smoke from wildfires.

No Exceedance but for the Event

Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties.

Based on the evidence provided above, NMED concludes that without the smoke impacts from wildfire, an exceedance would not have occurred. Even if the 95th percentile concentration for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background

concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the smoke event clearly caused these exceedances. The causal connection of the measured PM_{10} and the smoke plume indicate that but for the smoke impacts this exceedance would not have occurred.

15 Exceptional Event: June 30, 2013

Summary of the Event

Thunder storm activity caused high winds and blowing dust in Doña Ana County resulting in exceedances of the PM_{10} 24-hour NAAQS at the Anthony and Chaparral monitoring sites on this date (Table 1-1). Although the other sites did not record an exceedance on this date, elevated PM_{10} concentrations were measured during the same time period.

As the event unfolded, the wind blew from the northeast to east throughout the border region. These high velocity winds passed over large areas of desert within New Mexico. NMED measured strong sustained hourly wind speeds at and in areas upwind of the PM_{10} monitoring sites. The co-occurrence of high winds and elevated levels of blowing dust, little to no point sources in the area, and the high hourly and daily PM_{10} concentrations support the assertion that this was an exceptional event, specifically a natural event caused by high wind and blowing dust.

Is Not Reasonably Controllable or Preventable

Suspected Source Areas and Categories Contributing to the Event

Sources of windblown dust contributing to this exceedance include portions of the Chihuahuan Desert, residential and commercial properties, agricultural land and unpaved roads upwind of the monitors. The largest and most likely sources of windblown dust is the natural desert in New Mexico.

Sustained and Instantaneous Wind Speeds

EPA uses a default entrainment threshold of sustained wind speeds at 11.2 m/s (25 mph) for natural and well controlled anthropogenic sources contributing to natural events caused by high wind and blowing dust. Under the Doña Ana and Luna County NEAPs, EPA and NMED agreed that wind gusts exceeding 18 m/s (40 mph) would overwhelm any natural and well-controlled anthropogenic sources and cause windblown dust. On this day, sustained wind speeds did not exceed EPA's default threshold at the meteorological monitoring sites in the region and wind gusts exceeded the NEAPs agreed upon threshold at three of the seven sites (Figures 15-1 and 15-2). Although the monitoring sites did not record sustained wind speeds above the 11.2 m/s threshold, the Holman and Chaparral monitoring site recorded winds approaching this level at 10.5 m/s and 10.8 m/s respectively. These levels are within 0.7 m/s (1.5 mph) of the threshold.

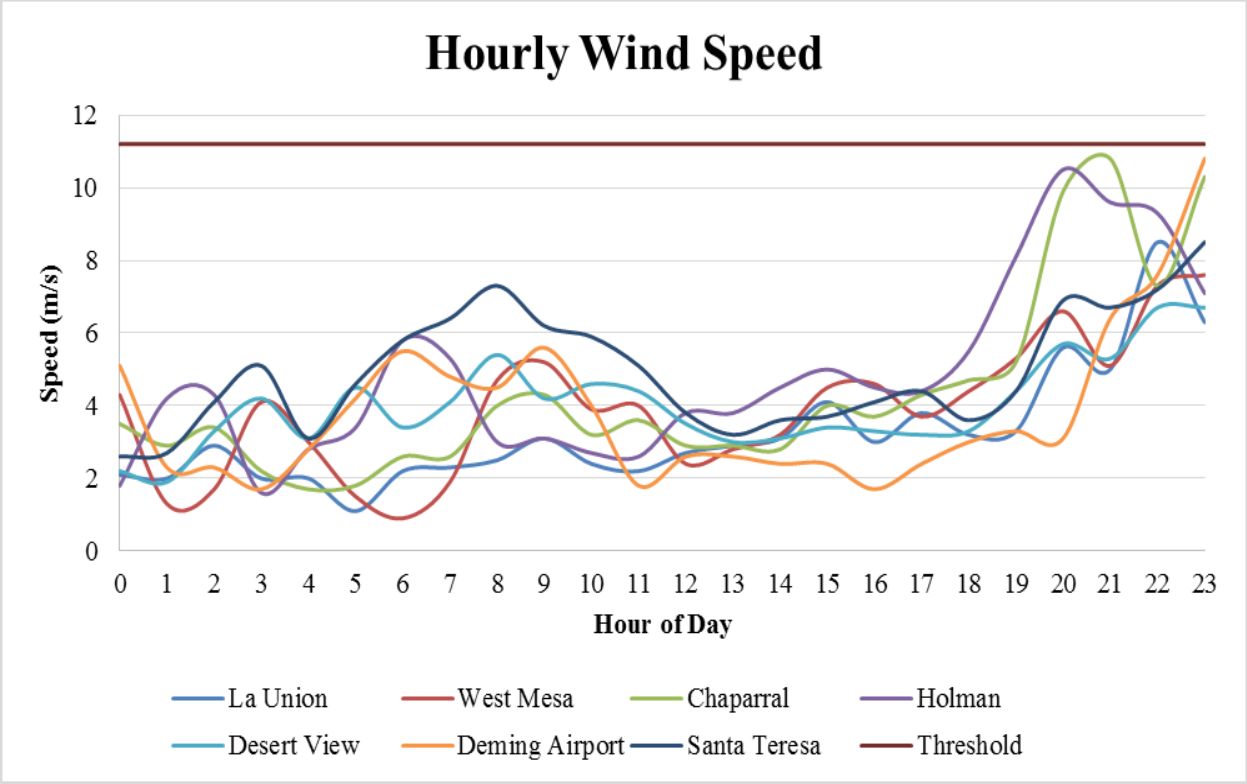


Figure 15-1. Sustained wind speeds at monitoring sites in Doña Ana and Luna Counties.

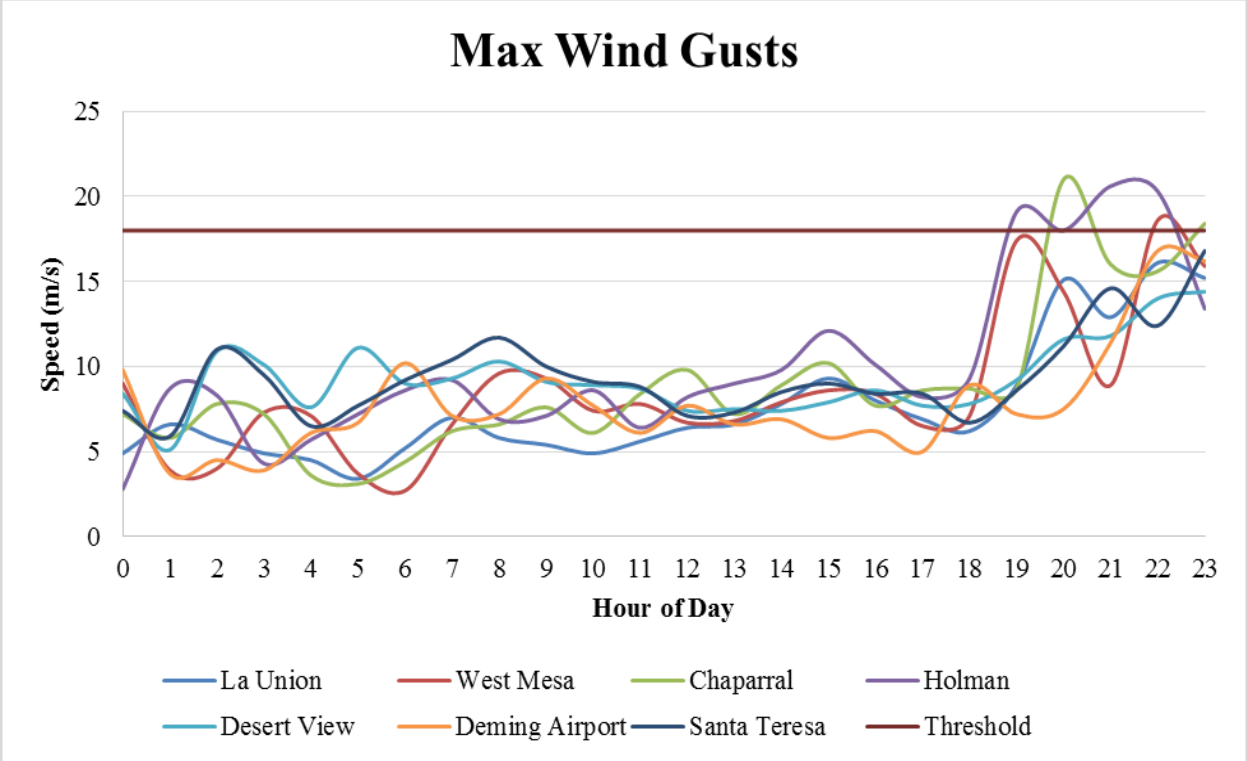


Figure 15-2. Maximum wind gusts at monitoring sites in Doña Ana and Luna Counties.

Basic Controls Analysis

Under the approved Doña Ana County and Luna County Natural Events Action Plans (NEAPs), Best Available Control Measures (BACM) are in place for anthropogenic sources based on ease and effectiveness of implementation. In addition, large land managers including New Mexico State University, Ft. Bliss Military Base, White Sands Missile Range and the New Mexico Department of Transportation, each signed a Memorandum of Understanding with NMED to control sources of windblown dust under their control. The BACM measures regulate disturbed lands, construction and demolition, vacant parking lots and materials handling and transportation. Our investigation did not identify any unusual PM_{10} producing activities on this day, and anthropogenic emissions remained constant before, during and after the event.

Soil erosion by wind or water reduces agricultural productivity and has always been a major concern for agricultural land managers. New Mexico farmers work with the local U.S. Department of Agriculture Natural Resource Conservation Service and New Mexico State Agricultural Extension Office to develop and implement soil conservation plans specifically designed for the soil types and crops of each individual farm. Most of the cropland in Doña Ana County form stable, non-erodible aggregates (clods) when tilled, protecting the surface from wind erosion even when the soil is dry and not covered with plants. In addition, most crop planting in the area would have been completed and the land irrigated by this time of year.

Wind speeds on this day were high enough to entrain dust from undisturbed desert areas upwind of the monitors. Emissions from these areas are not reasonably controllable because costs would prohibit applying controls and detrimental effects on the natural ecosystem could occur.

Based on Doña Ana and Luna Counties attainment designation, implementation of BACM, and the MOUs in place, NMED believes that the control measures to reduce windblown dust should suffice as reasonable controls. Additional controls would not be economically and technically feasible and would not provide additional public health protections. NMED concludes that the sources contributing to the event are not reasonably controllable.

Historical Fluctuations Analysis

Annual and Seasonal 24-hour Average Fluctuations

Since being established, the monitoring sites in Doña Ana and Luna Counties have recorded exceedances of the PM_{10} NAAQS. High winds cause these exceedances and they can occur at any time of year (Appendix-A). Most exceedances occur from late winter through early summer (February-June) and are associated with the passage of storm systems and associated cold fronts or thunderstorm outflow during the monsoon season. High winds caused all recorded exceedances from 2008-2012 and NMED submitted natural events demonstrations to EPA.

Table 15-1 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements including days when high wind natural events caused exceedances from 2008-2012. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical

analysis. The Anthony, Chaparral, Desert View, Deming and West Mesa sites recorded values for this day above the 95th percentile of all 24-hour averages recorded. The Anthony site recorded a value approaching the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	1740	1607	1450	1693	1099	480
99th Percentile	268	297	212	231	300	135
95th Percentile	105	101	71	91	69	47
Event Day	258	155	64	99	135	100

Table 15-1. Percentile comparison of event day 24-hour average to 24-hour averages from 2008 to 2012.

Table 15-2 shows the percentile rank of the 24-hour average PM_{10} concentration on this day relative to all measurements during the summer season including days when high wind natural events caused exceedances from 2008-2012. For purposes of this analysis summer season was defined as the three month period from June through August. Data for PM_{10} in this table includes FEM TEOM measurements only since they are continuous monitors that provide a large number of data points for a robust statistical analysis. The recorded values for this day are above the 95th percentile of the seasonal 24-hour averages recorded. The Anthony and West Mesa sites recorded values above the 99th percentile of data. Because NMED believes all previous exceedances were due to high wind dust events, the exceedances for this day would be the maximum values recorded if no high wind exceedances are included in the analysis.

	Anthony	Chaparral	Holman	Desert View	Deming	West Mesa
Max	299	357	212	265	314	133
99th Percentile	172	170	144	155	209	84
95th Percentile	79	86	58	66	63	43
Event Day	258	155	64	99	135	100

Table 15-2. Percentile comparison of event day 24-hour average to seasonal 24-hour averages from 2008 to 2012.

Clear Causal Relationship

Thunderstorm activity in the late evening and hours produced outflow boundary winds that caused strong and gusty winds on this day. The outflow from these storms caused high winds and blowing dust over large portions of southern New Mexico, west Texas, and northern Mexico

(Figure 15-3). This dust produced by these weather systems was then transported to the monitoring sites by lower level winds.

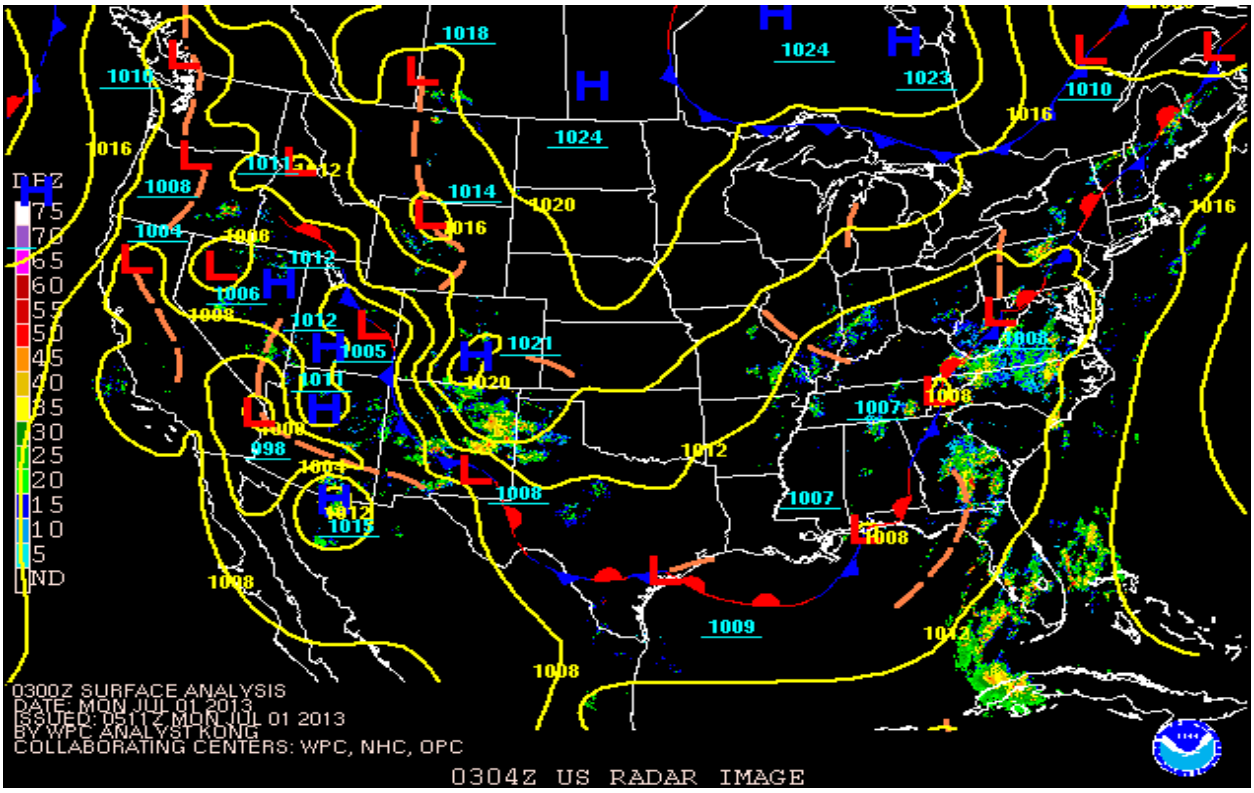
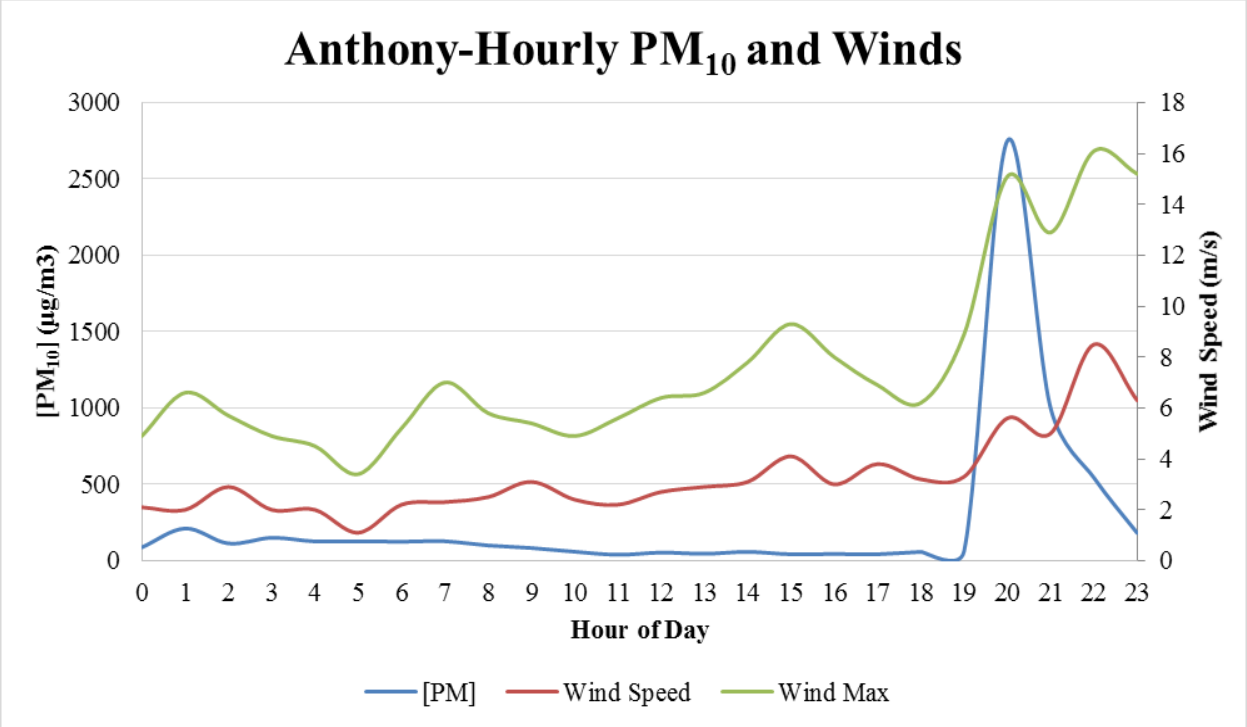
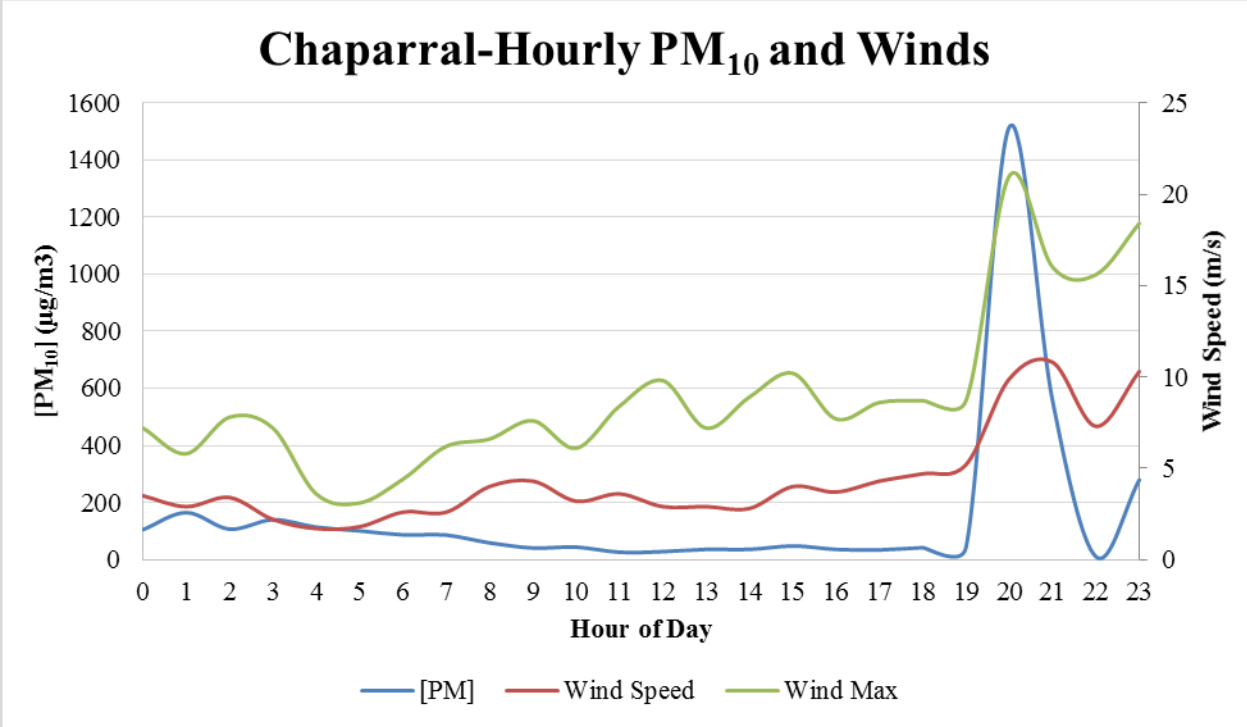


Figure 15-3. Surface weather map showing cold front, areas of low pressure and isobars of constant pressure (red lines).

The weather pattern described above generated strong and gusty winds beginning at the 2000 hour and lasted through the 2200 hour. Beginning at the 2000 hour, wind speeds approached 11.2 m/s at Holman as shown in Figure 15-1. Peak wind speeds ranged from 6.7 m/s at Desert View to 10.8 m/s at Chaparral (Figure 15-1). Peak wind gusts ranged from 14.4 m/s at Desert View to 21 m/s at Chaparral (Figure 15-2). Blowing dust caused elevated levels of PM_{10} during the same period as high winds as demonstrated by the time series plots in Figure 15-4 a-b. During these hours, hourly PM_{10} concentrations spiked at all monitoring sites in the network (Figure 15-5).





Figures 15-4 a-b. Time series plot of hourly observations showing increased PM_{10} concentrations as wind speeds and gusts increase.

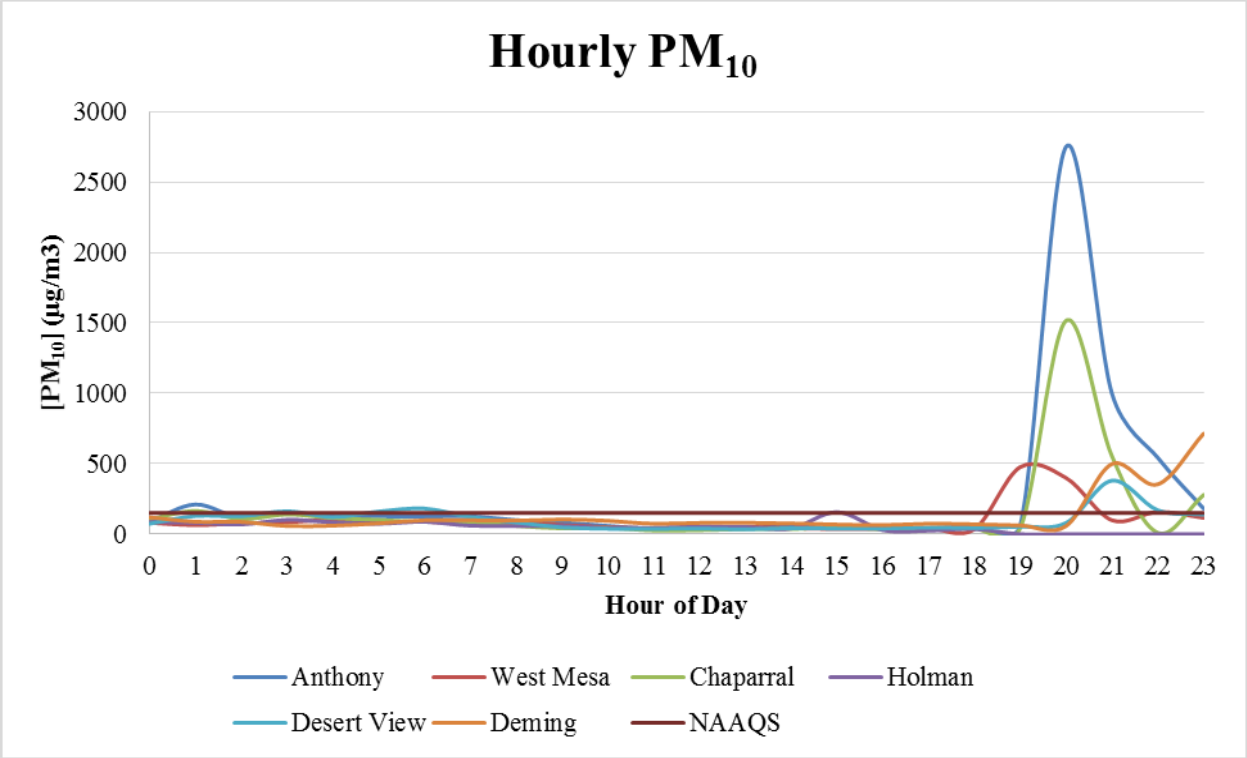


Figure 15-5. Hourly PM_{10} concentrations for Doña Ana and Luna Counties monitors.

Affects Air Quality

The historical fluctuations and clear causal relationship analyses prove that the event in question affected air quality on this date.

Natural Event

The Clear Causal Relationship and not Reasonably Controllable or Preventable analyses show that this was a natural event caused by high wind and blowing dust.

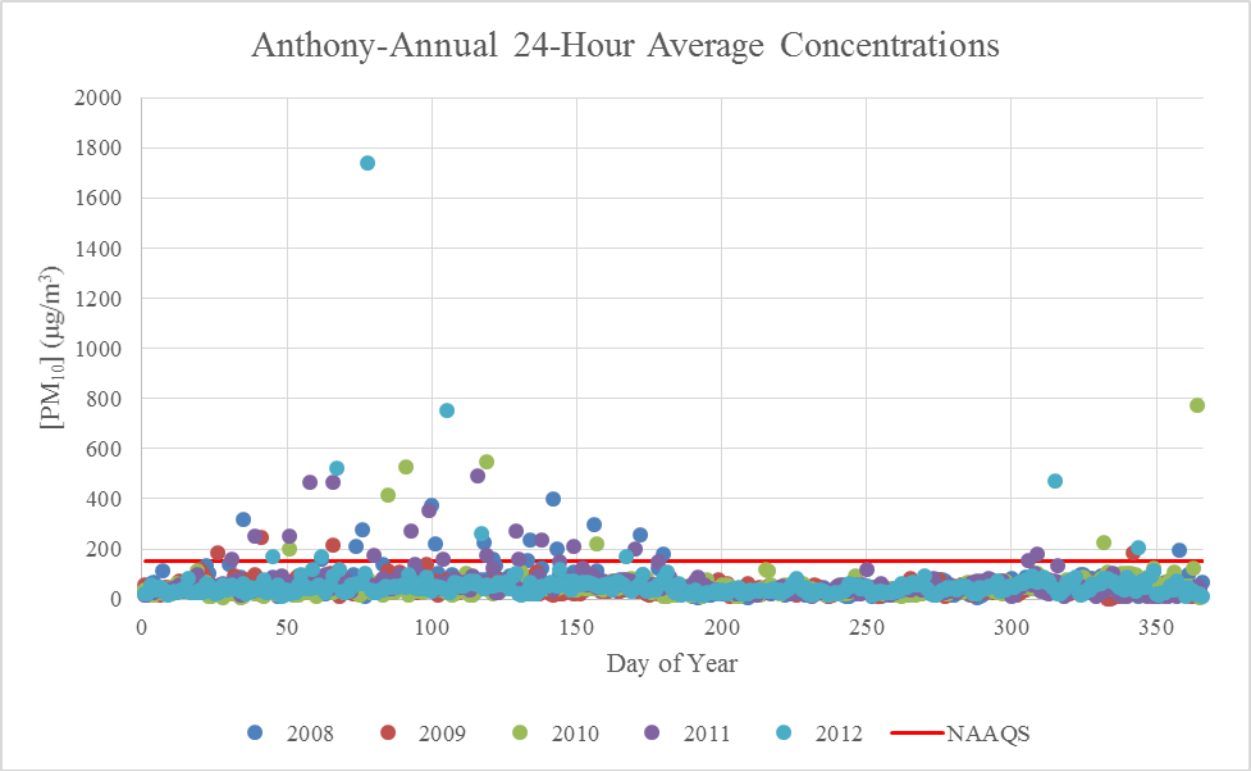
No Exceedance but for the Event

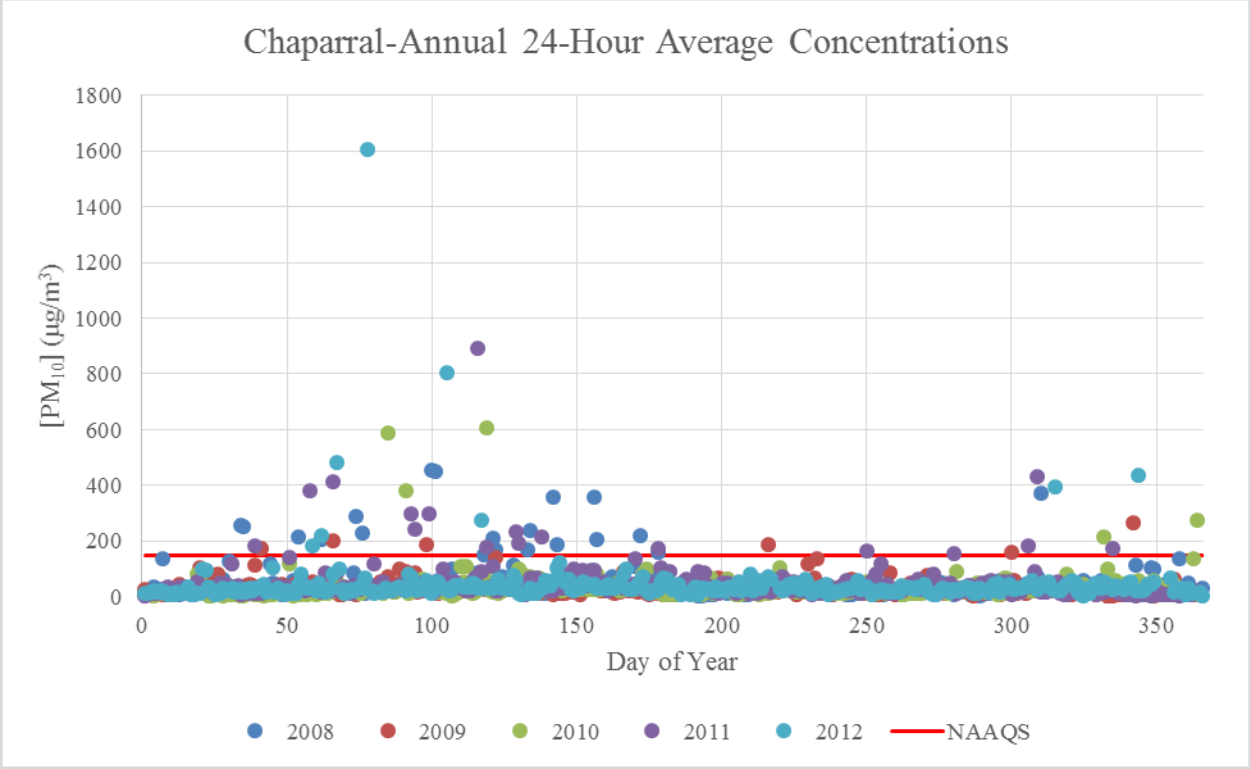
Looking at the 95th percentile of 24-hour averages contained in the historical fluctuation analyses, non-event pollution levels for the monitors are typically significantly below the NAAQS. Activities that generate anthropogenic PM_{10} were approximately constant immediately preceding, during and after the event. Activity levels were typical for the time of year and the BACM measures were being implemented. Vehicular traffic, cooking and residential and agricultural fires do not directly cause PM_{10} 24-Hour NAAQS exceedances in the counties. With the high winds on this day, these emissions would not contribute significantly to the PM_{10} measured.

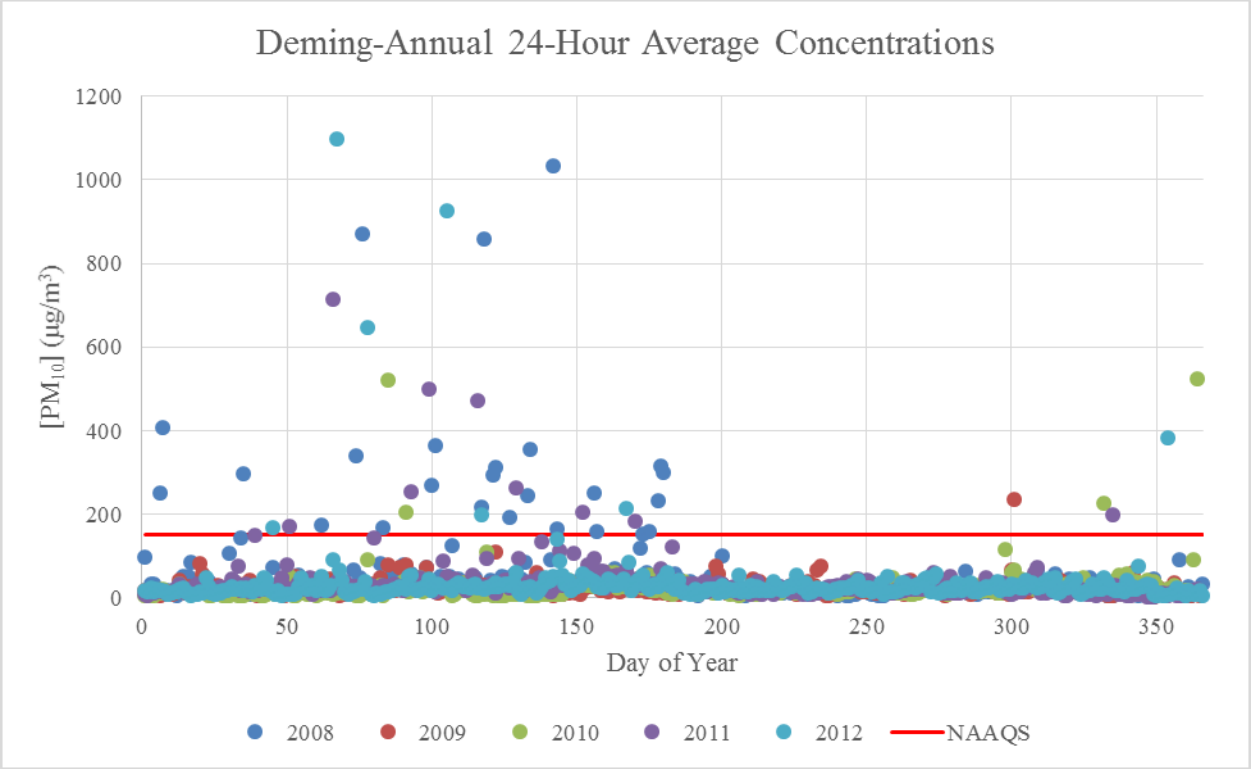
Based on the evidence provided above, NMED concludes that without the high wind and blowing dust an exceedance would not have occurred. Even if the 95th percentile concentration

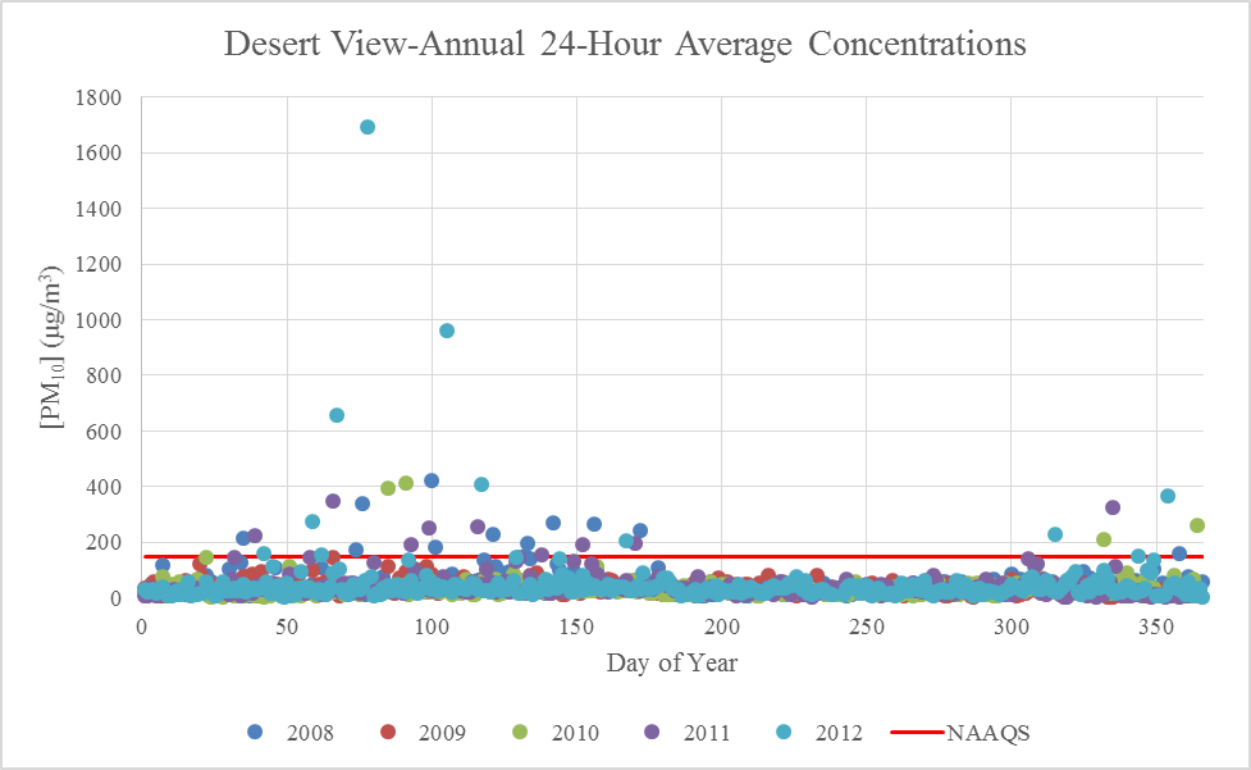
for 24-Hour averages, 105 µg/m^3 (Anthony TEOM monitor), were used as the background concentration to compare to the measured PM_{10} concentrations, the particulate contribution from the high wind event clearly caused these exceedances. The causal connection of the measured PM_{10} and the strong winds indicate that but for the high wind event these exceedances would not have occurred.

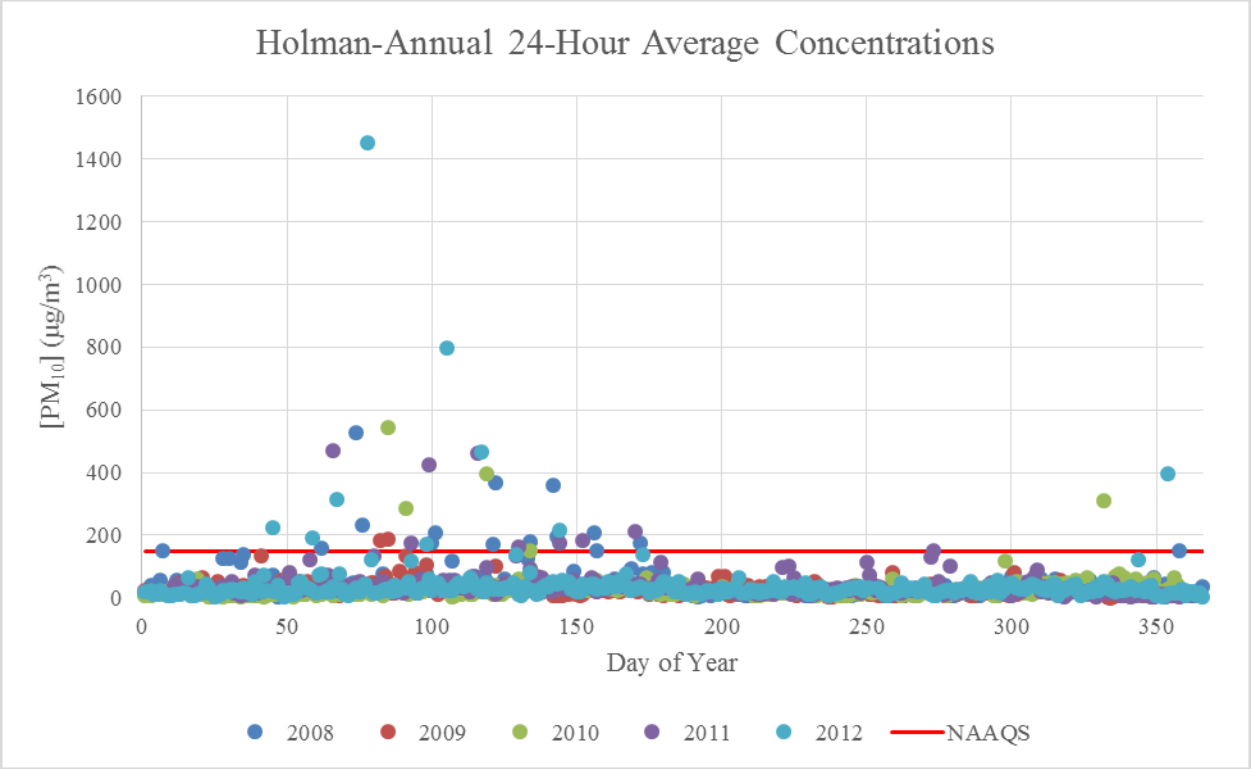
16 Appendix A-Historical Fluctuations 2008-2012

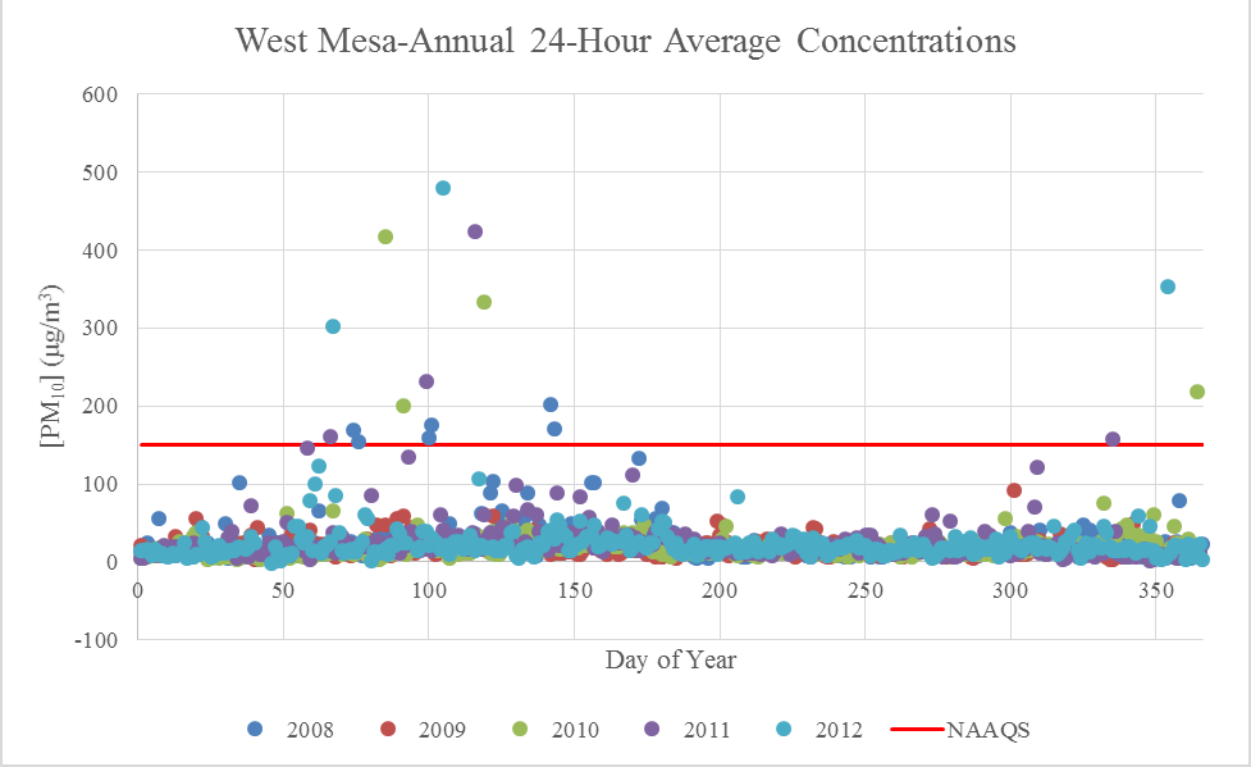


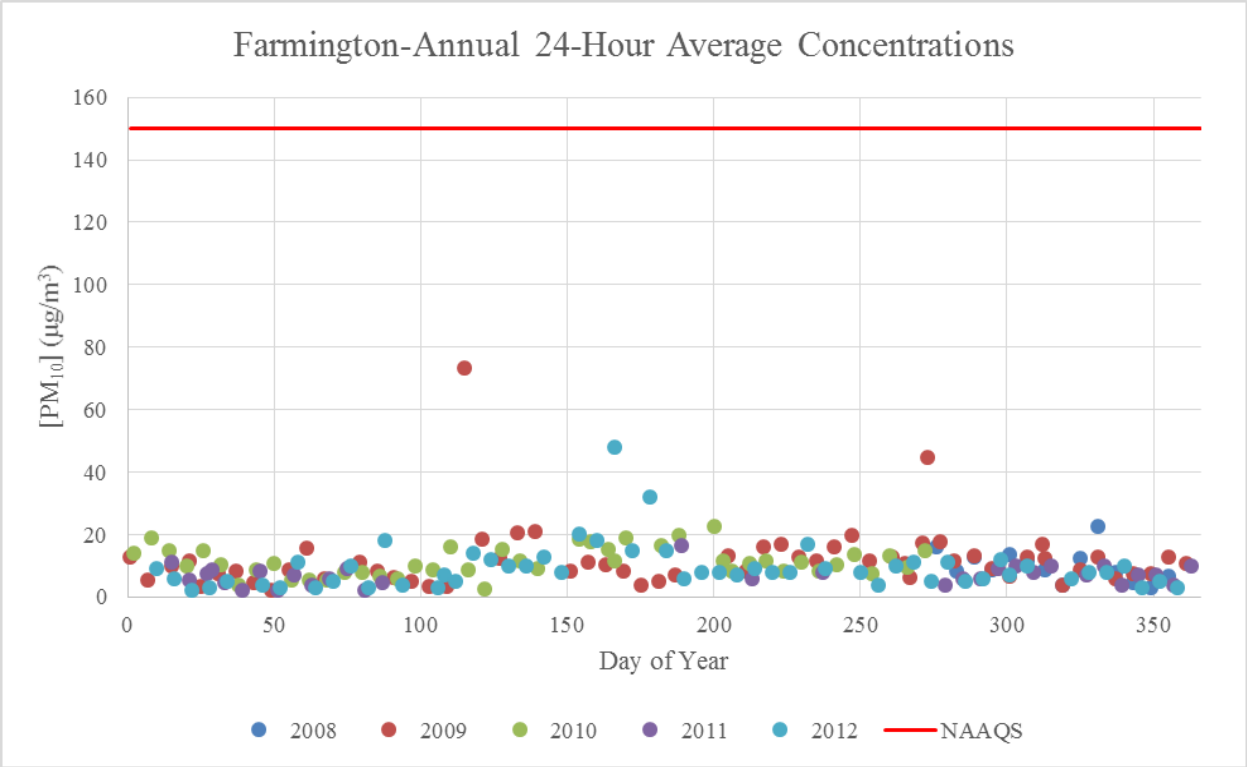



Deming-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


Desert View-Annual 24-Hour Average Concentrations
[PM10] (µg/m3)
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


Holman-Annual 24-Hour Average Concentrations
1600
1400
1200
1000
800
600
400
200
0
[PM10] (µg/m3)
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS


West Mesa-Annual 24-Hour Average Concentrations
600
500
400
300
200
100
0
-100
[PM10] (µg/m3)
0
50
100
150
200
250
300
350
Day of Year
2008
2009
2010
2011
2012
NAAQS



17 Appendix B-Public Notice and Comments