

# Technical Support Document For the November 10, 2012, Lamar Exceptional Event



**CO L O R A D O**

**Department of Public  
Health & Environment**

Air Pollution Control Division  
Colorado Department of Public Health and  
Environment

April 6, 2015

## Executive Summary

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature<sup>1</sup> (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls). In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review. The EER allows for states and tribes to “flag” air quality monitoring data as an exceptional event and exclude those data from use in determinations with respect to exceedances or violations of the NAAQS, if EPA concurs with the demonstration submitted by the flagging agency.

Due to the semi-arid nature of large parts of the state, Colorado is highly susceptible to windblown dust events. These events are often captured by various air quality monitoring equipment throughout the state, sometimes resulting in exceedances or violations of the 24-hour PM<sub>10</sub> NAAQS. This document contains detailed information about the large regional windblown dust event that occurred on March 18, 2012. The Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD) has prepared this report for the U.S. Environmental Protection Agency (EPA) to demonstrate that the elevated PM<sub>10</sub> concentrations were caused by a natural event.

EPA’s June 2012, Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states, “the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed...”. In addition, in Colorado it has been shown that sustained wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see Blowing Dust Climatologies available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#misc2](http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2)). For this blowing dust event, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust on the plains of southeast Colorado.

On November 10 of 2012, a powerful autumn storm system caused an exceedance of the twenty-four hour PM<sub>10</sub> standard in Lamar, Colorado. An exceedance was recorded in Lamar at the Power Plant monitor with a concentration of 208 µg/m<sup>3</sup> and a near-exceedance at the Municipal Building monitor with a concentration of 152 µg/m<sup>3</sup>. The exceedance in Lamar was the result of intense surface winds in advance of an approaching cold front. These surface features were associated with a strong upper-level trough that was moving across the western United States. The surface winds were predominantly out of a southwesterly direction which moved over dry soils in southeast Colorado and northeast New Mexico, producing significant blowing dust.

The PM<sub>10</sub> exceedance in Lamar on November 10, 2012, would not have occurred if not for the following: (a) dry soil conditions over New Mexico and southern Colorado with 30-day precipitation totals below the threshold identified as a precondition for blowing dust in New Mexico and south-central and southeast Colorado; and (b) a surface low pressure system and

---

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

vigorous cold front that were associated with a strong upper-level trough that caused strong surface winds over the area of concern.

This PM<sub>10</sub> exceedance and associated high value were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over New Mexico and southern Colorado. These sources are not reasonably controllable during a significant windstorm under abnormally dry or moderate drought conditions.

**APCD is requesting concurrence on exclusion of the PM<sub>10</sub> values from Lamar Power Plant (08-099-0001) and Lamar Municipal Building (08-099-0002) on November 10, 2012.**

# Table of Contents

1.0	Exceptional Events Rule Requirements .....	6
1.1	Procedural Criteria .....	6
1.2	Documentation Requirements .....	7
2.0	Meteorological analysis of the November 10, 2012, blowing dust event and PM <sub>10</sub> exceedance - Conceptual Model and Wind Statistics.....	8
3.0	Evidence-Ambient Air Monitoring Data and Statistics.....	22
3.1	Historical Fluctuations of PM <sub>10</sub> Concentrations in Lamar .....	22
3.2	Wind Speed Correlations .....	30
3.3	Percentiles.....	31
4.0	News and Credible Evidence.....	33
5.0	Not Reasonably Controllable or Preventable: Local Particulate Matter Control Measures	42
5.1	Regulatory Measures - State .....	42
5.2	Lamar Regulatory Measures and Other Programs .....	44
6.0	Summary and Conclusions.....	62
7.0	References .....	63

## Figures

Figure 1: 24-hour PM <sub>10</sub> concentrations for November 10, 2012. ....	9
Figure 2: 700 mb (about 3 kilometers above mean sea level) analysis for 12Z November 10, 2012, or 5 AM MST November 10, 2012. ....	10
Figure 3: 500 mb (about 6 kilometers above mean sea level) analysis for 12Z November 10, 2012, or 5 AM MST November 10, 2012. ....	11
Figure 4: Surface analysis for 15Z November 10, 2012, or 8 AM MST November 10, 2012. ....	12
Figure 5: High Plains regional surface analysis for (a) 8:13 AM MST and (b) 10:13 AM MST, November 10, 2012. ....	13
Figure 6: NOAA HYSPLIT NAM 12 6-hour back trajectories for Lamar, CO from 5 AM MST (12Z) November 10, 2012, to 10 AM MST (17Z) November 10, 2012. ....	17
Figure 7: MODIS Terra satellite image at approximately 10:05 AM MST (1705Z) November 10, 2012. ....	18
Figure 8: Gobblers Knob webcam image at 10:15 AM MST November 10, 2012. ....	19
Figure 9: Firstview webcam image at 10:19 AM MST November 10, 2012. ....	19
Figure 10: Total precipitation in inches for the southwestern United States, October 10 - November 9, 2012. ....	20
Figure 11: Lamar Power PM <sub>10</sub> Time Series, 2008-2012 ....	24
Figure 12: Lamar Power PM <sub>10</sub> Histogram, 2008-2012 ....	25
Figure 13: Lamar Power PM <sub>10</sub> Box-Whisker Plot, 2008-2012 ....	26
Figure 14: Lamar Power PM <sub>10</sub> Box-Whisker Plot, Reduced Scale, 2008-2012. ....	26
Figure 15: Lamar Muni PM <sub>10</sub> Time Series, 2008-2012 ....	27
Figure 16: Lamar Muni PM <sub>10</sub> Histogram, 2008-2012 ....	28
Figure 17: Lamar Muni PM <sub>10</sub> Box-Whisker Plot, 2008-2012. ....	29
Figure 18: Lamar Muni PM <sub>10</sub> Box-Whisker Plot, Reduced Scale, 2008-2012. ....	29
Figure 19: Wind Speed (mph) Affected Sites, CO, 3/25/2012 - 4/09/2012 ....	30
Figure 20: PM <sub>10</sub> Concentrations, Affected Sites, 11/03/2012 - 11/17/2012 ....	31
Figure 21: Monthly PM <sub>10</sub> Percentile Plots. ....	31
Figure 22: Wind Direction relative to Lamar Power Plant PM <sub>10</sub> monitor and Lamar Municipal PM <sub>10</sub> monitor for the November 10, 2012 event. (Google Image 2014) ....	50
Figure 23: Southwest of Lamar Power Plant PM <sub>10</sub> monitor and Lamar Municipal PM <sub>10</sub> monitor for the November 10, 2012 event. (Google Image 2014) ....	51
Figure 24: Cowboy Corral Storage (Google Image 2012) ....	53
Figure 25: Feed Storage Company (Google Image 2012) ....	53
Figure 26: Railroad tracks with gravel on each side (Google Image 2012) ....	54
Figure 27: Site F- Century Link Fleet Storage Lot (Google Image 2012) ....	55
Figure 28: Site F- Parking lot for the Prowers County Jail and the Prowers County Municipal Court (Google Image 2012) ....	55
Figure 29: Further South of Lamar Power Plant PM <sub>10</sub> monitor and Lamar Municipal PM <sub>10</sub> monitor for the November 10, 2012 event. (Google Image 2014) ....	56
Figure 30: Restricted access, vegetated land southeast of PM <sub>10</sub> monitors. (Google Image 2012) ....	57
Figure 31: Lamar Ball Complex (Google Image 2012) ....	58
Figure 32: Southeast Colorado Counties ....	59

## Tables

Table 1: Weather observations for Lamar, Colorado, on November 10, 2012 .....	14
Table 2: Weather observations for Burlington, Colorado, on November 10, 2012 .....	15
Table 3: Weather observations for Clayton, New Mexico, on November 10, 2012 .....	16
Table 4: November 10, 2012, Event Data Summary .....	22
Table 5: November 10, 2012, Site Percentile (All Affected Sites).....	22
Table 6: November 10, 2012, PM <sub>10</sub> Evaluation by Month and Year .....	23
Table 7: Estimated Maximum Event PM <sub>10</sub> Contribution, Lamar Sites.....	32
Table 8: State Regulations Regulating Particulate Matter Emissions .....	42

## List of Appendices

Appendix A - Weather Warnings and Blowing Dust Advisories for November 10, 2012

## 1.0 Exceptional Events Rule Requirements

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

### 1.1 Procedural Criteria

This section presents a review of the procedural requirements of the EER as required by 40 CFR 50.14 (Treatment of Air Quality Monitoring Data Influenced by Exceptional Events) and explains how APCD fulfills them.

The Federal EER requirements include public notification that an event was occurring, the placement of informational flags on data in EPA's Air Quality System (AQS), submission of initial event description, the documentation that the public comment process was followed, and the submittal of a demonstration supporting the exceptional events flag. APCD has addressed all of these procedural and documentation requirements.

#### *Public notification that event was occurring (40 CFR 50.14(c)(1)(i))*

APCD issued Blowing Dust Advisories for southeastern Colorado advising citizens of the potential for high wind/dust events on November 10, 2012. This area includes: the town of Lamar and other areas in southeastern Colorado. The advisories that were issued on November 10, 2012 can be viewed at: [http://www.colorado.gov/airquality/forecast\\_archive.aspx?seeddate=11%2f10%2f2012](http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=11%2f10%2f2012) and are included in Appendix A.

#### *Place informational flag on data in AQS (40 CFR 50.14(c)(2)(ii))*

APCD and other applicable agencies in Colorado submit data into EPA's AQS. Data from both filter-based and continuous monitors operated in Colorado are submitted to AQS.

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

If APCD and/or the applicable operating agency have determined a potential exists that the sample value has been influenced by an exceptional event, a preliminary flag is submitted for the measurement when the data is uploaded to AQS. The data are not official until they are certified by May 1st of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

#### *Notify EPA of intent to flag through submission of initial event description by July 1 of calendar year following event (40 CFR 50.14(c)(2)(iii))*

In early 2011, APCD and EPA Region 8 staff agreed that the notification of the intent to flag data as an exceptional event would be done by submitting data to AQS with the proper flags and the initial event descriptions. This was deemed acceptable, since Region 8 staff routinely pull the data to review for completeness and other analyses.

On November 10, 2012, two sample values greater than 150 µg/m<sup>3</sup> were taken in Lamar, Colorado during the high wind event that occurred that day. These occurred at the monitors located in Lamar at the Municipal Building (SLAMS) and at the Power Plant monitor (SLAMS). Both of these monitors are operated by APCD in partnership with local operators.

APCD posted this report on the Air Pollution Control Division's webpage for public review. APCD opened a 30-day public comment period on March 2, 2015 and closed the comment period on April 3, 2015. A copy of comments received will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

***NOTE: No comments were received during the public comment period. Some minor non-substantial grammatical and formatting corrections were made.***

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

APCD will submit this document, along with any comments received (if applicable), and APCD's responses to those comments to EPA Region VIII headquarters in Denver, Colorado. The deadline for the submittal of this demonstration package is June 30, 2015.

## **1.2 Documentation Requirements**

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

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



## 2.0 Meteorological analysis of the November 10, 2012, blowing dust event and PM<sub>10</sub> Exceedance - Conceptual Model and Wind Statistics

On November 10 of 2012, a powerful autumn storm system caused an exceedance of the twenty-four hour PM<sub>10</sub> standard in Lamar, Colorado, at the Power Plant monitor with a concentration of 208 µg/m<sup>3</sup> and a near-exceedance at the Municipal Building monitor with a concentration of 152 µg/m<sup>3</sup>. These elevated readings and the location of the two monitors are plotted on a map of the Greater Lamar area in Figure 1. The exceedance in Lamar was the result of intense surface winds in advance of an approaching cold front. These surface features were associated with a strong upper-level trough that was moving across the western United States. The surface winds were predominantly out of a southwesterly direction which moved over dry soils in southeast Colorado and northeast New Mexico, producing significant blowing dust.

*EPA's June 2012, Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states, "the EPA will accept a threshold of a sustained wind of 25 mph for areas in the west provided the agencies support this as the level at which they expect stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed...". In addition, in Colorado it has been shown that sustained wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see Blowing Dust Climatologies available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#misc2](http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2)). For this blowing dust event, it has been assumed that sustained winds of 30 mph and higher or wind gusts of 40 mph and higher can cause blowing dust in southeast Colorado and northeast New Mexico.*

## High PM<sub>10</sub> Natural Event in Colorado (November 10, 2012)



Figure 1: 24-hour PM<sub>10</sub> concentrations for November 10, 2012.

(Source: [http://webapps.datafed.net/datafed.aspx?dataset=AQS\\_D&parameter=pm10](http://webapps.datafed.net/datafed.aspx?dataset=AQS_D&parameter=pm10))

The upper level trough associated with this storm system is shown on the 700 mb and 500 mb height analysis maps at 5 AM MST, November 10, 2012 in Figure 2 and Figure 3, respectively. The 700 mb level is located roughly 3 kilometers above mean sea level (MSL) while the 500 mb level is approximately 6 km above MSL. These two charts show that a deep trough of low pressure was present at both the 700 and 500 mb level at the onset of the blowing dust event of November 10, 2012, and that it was moving over the southwestern United States.

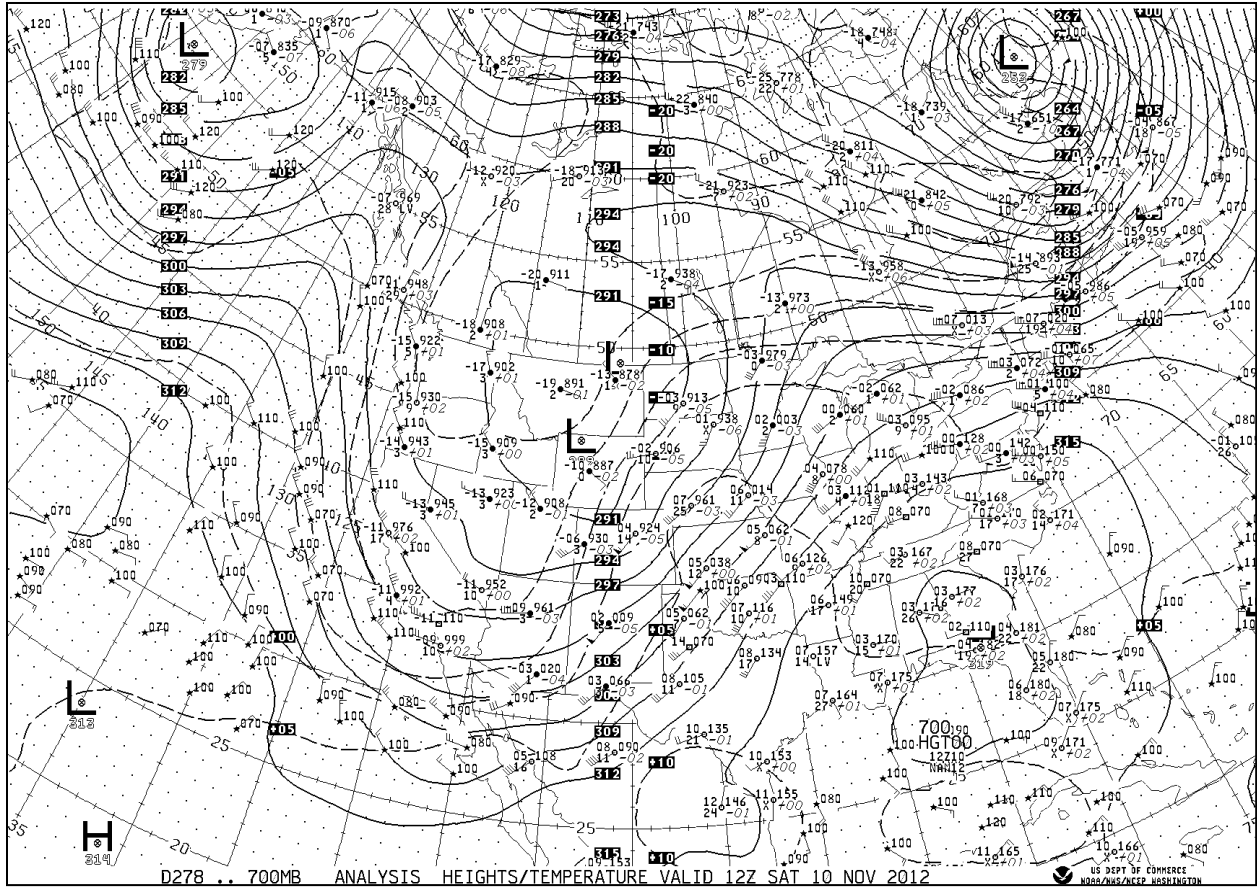


Figure 2: 700 mb (about 3 kilometers above mean sea level) analysis for 12Z November 10, 2012, or 5 AM MST November 10, 2012.

(Source: <http://nomads.ncdc.noaa.gov/ncep/NCEP>)

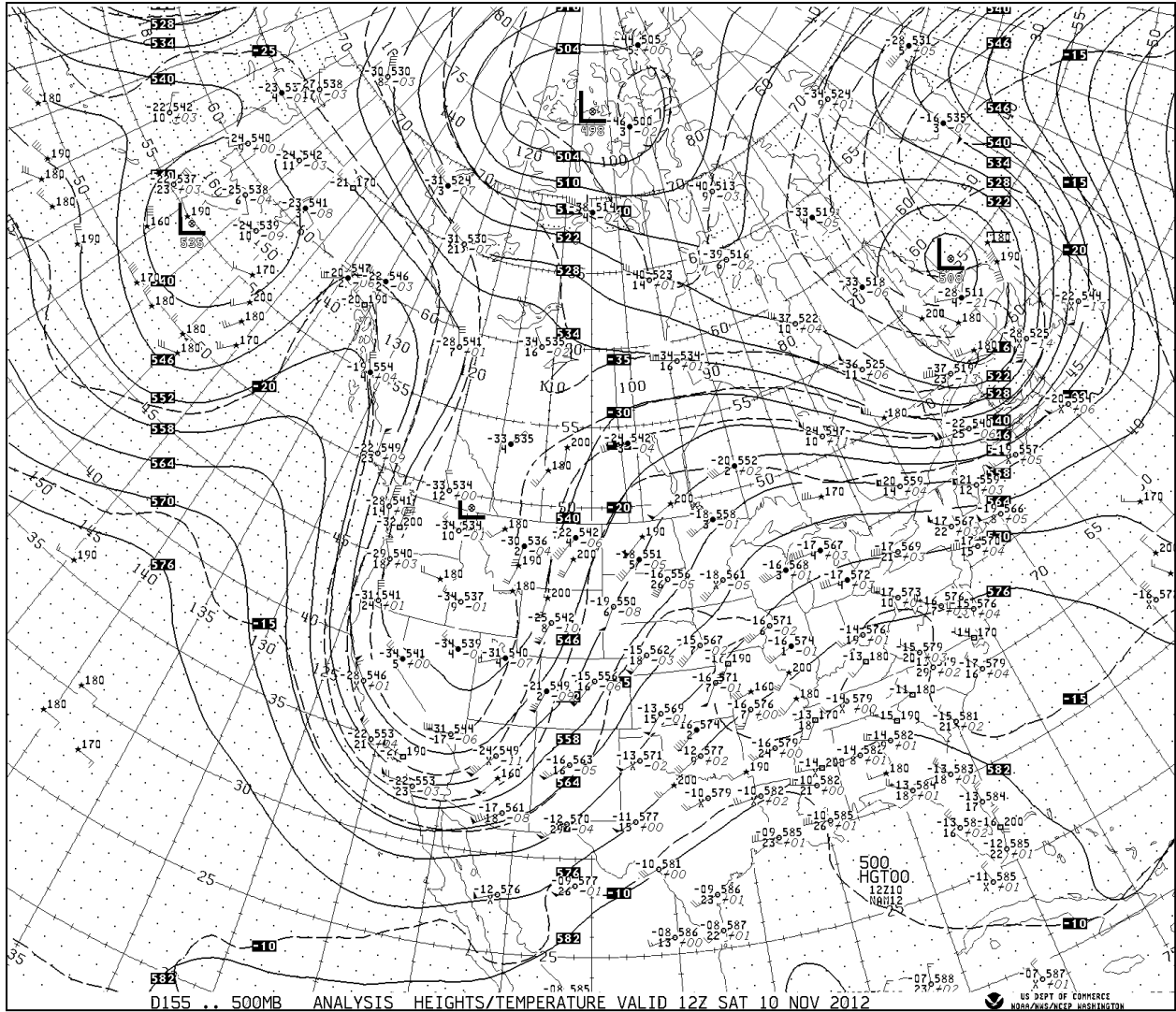


Figure 3: 500 mb (about 6 kilometers above mean sea level) analysis for 12Z November 10, 2012, or 5 AM MST November 10, 2012. (Source: <http://nomads.ncdc.noaa.gov/ncep/NCEP>)

The surface weather associated with the storm system of November 10, 2012, is presented in Figure 4. Significant surface features in southeast Colorado at 8 AM MST (15Z) included a “bunching” of isobars, indicating that a strong pressure gradient was in place. Wind speed is directly proportional to the pressure gradient, so a higher pressure gradient will produce stronger winds (see the following link for additional information on pressure gradient and its relationship to wind speed from the National Oceanic and Atmospheric Administration (NOAA): <http://www.srh.noaa.gov/jetstream/synoptic/wind.htm>). This tightening of the isobars was in response to an approaching cold front from the west.

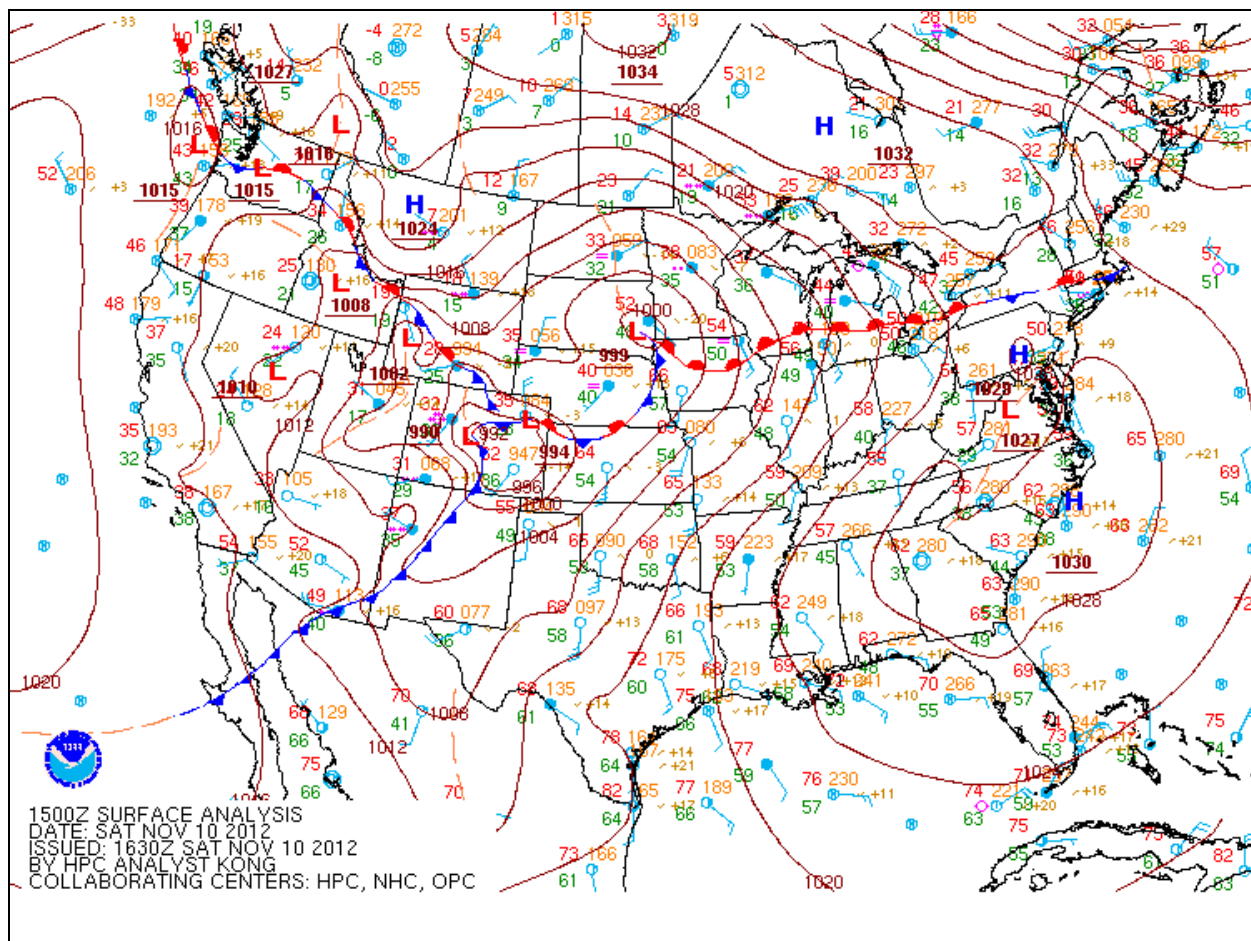


Figure 4: Surface analysis for 15Z November 10, 2012, or 8 AM MST November 10, 2012. (Source: <http://nomads.ncdc.noaa.gov/ncep/NCEP>)

In order to fully evaluate the synoptic meteorological scenario of November 10, 2012, regional surface weather maps are provided showing individual station observations during the height of the event in question. Figure 5 presents weather observations for southeast Colorado and adjacent states at (a) 8:13 AM and (b) 10:13 AM MST on November 10, 2012. On the map in Figure 5(a) the station observation for Lamar (LAA) shows winds sustained at 40 knots, gusts to 49 knots, and a reduced visibility of 6 statute miles with the weather symbol of infinity ( $\infty$ ). The infinity sign is the weather symbol for haze. Haze is often reported during dust storms, and in dry and windy conditions haze typically refers to blowing dust (see the following link for the description of haze published by the National Oceanic and Atmospheric Administration (NOAA): [http://www.crh.noaa.gov/lmk/?n=general\\_glossary](http://www.crh.noaa.gov/lmk/?n=general_glossary)).

Two hours later at 10:13 AM MST (Figure 5(b)), visibility in Lamar had deteriorated further to 4 statute miles with the wind remaining very strong (sustained at 40 knots with gusts to 52 knots). Concurrently other weather stations around the region were starting to report blowing dust and reduced visibility, indicating that this dust storm was a regional event. In Burlington (ITR, located directly to the north-northeast of Lamar), the surface observation shows high winds, haze and visibility reduced to 6 statute miles. To the south of Lamar, in northeast New Mexico, weather observations were also indicating a regional dust storm was

taking place. Clayton (CAO) was reporting very windy conditions with haze and visibility highly diminished to 3 statute miles.

Hourly surface observations, in table form, from Lamar, Burlington and Clayton provide additional evidence that there was an extended period of high winds and haze (blowing dust) throughout the region. Table 1: Weather observations for Lamar, Colorado, on November 10, 2012

(Source: <http://mesowest.utah.edu/>)

Time MST November 10, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	42	59	6		220		10
1:53	53	50	16		200		10
2:53	54	53	16		210		10
3:53	54	53	13		210		10
4:53	52	59	0				10
5:53	57	49	12		220		10
6:53	61	42	25	33	210		10
7:53	65	34	44	56	210	haze	6
8:53	69	29	43	56	220	haze	5
9:16	70	26	51	64	210	haze	4
9:53	71	25	46	60	200	haze	4
10:53	73	21	44	60	210	haze	5
11:53	74	21	37	52	220		10
12:53	73	24	31	46	210		10
13:15	68	28	17	31	270		10
13:53	60	55	21	28	280	mod rain	6
14:53	62	31	22		260		10
15:53	58	21	30	40	270		8
16:53	53	17	30	39	270		8
17:53	50	17	30	45	260		10
18:53	48	18	28	39	260		10
19:53	47	20	28	38	260		10
20:53	44	23	23		260		10
21:53	42	25	18		250		10
22:53	38	28	12		280		10
23:40	34	75	14	24	30		10
23:53	33	78	13	21	20		10

lists observations for the PM<sub>10</sub> exceedance location of Lamar while Burlington and Clayton observations can be found in Table 2 and Table 3, respectively. Observations that are climatologically consistent with blowing dust conditions (see Appendix A - Lamar, Colorado, Blowing Dust Climatology and the reference for the Technical Support Document for the April 3, 2009 Pagosa Springs Exceptional Event) are highlighted in yellow. Collectively these weather observation sites experienced many hours of reduced visibility along with sustained wind speeds and gusts at or above the thresholds for blowing dust.

*Surface weather maps and hourly observations show that a regional dust storm occurred under southwesterly flow in advance of a cold front. This data provides clear evidence of blowing dust and winds well above the threshold speeds for blowing dust on November 10, 2012.*

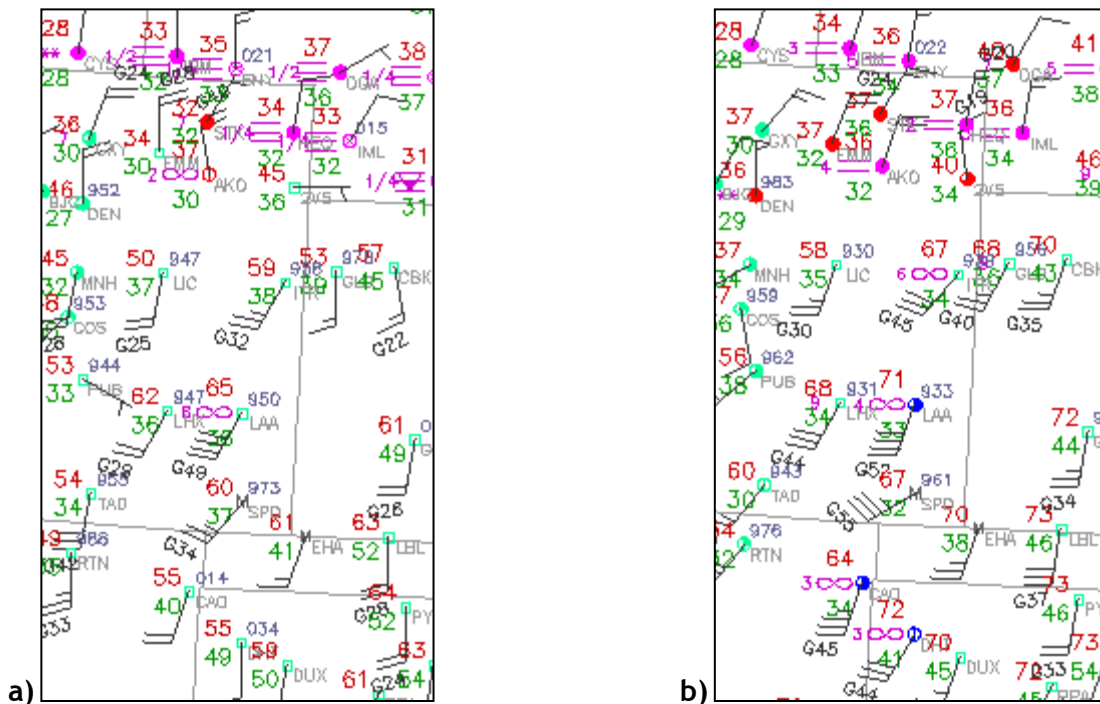


Figure 5: High Plains regional surface analysis for (a) 8:13 AM MST and (b) 10:13 AM MST, November 10, 2012.

(Source: <http://www.mmm.ucar.edu/imagearchive/>)

Table 1: Weather observations for Lamar, Colorado, on November 10, 2012  
 (Source: <http://mesowest.utah.edu/>)

Time MST November 10, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	42	59	6		220		10
1:53	53	50	16		200		10
2:53	54	53	16		210		10
3:53	54	53	13		210		10
4:53	52	59	0				10
5:53	57	49	12		220		10
6:53	61	42	25	33	210		10
7:53	65	34	44	56	210	haze	6
8:53	69	29	43	56	220	haze	5
9:16	70	26	51	64	210	haze	4
9:53	71	25	46	60	200	haze	4
10:53	73	21	44	60	210	haze	5
11:53	74	21	37	52	220		10
12:53	73	24	31	46	210		10
13:15	68	28	17	31	270		10
13:53	60	55	21	28	280	mod rain	6
14:53	62	31	22		260		10
15:53	58	21	30	40	270		8
16:53	53	17	30	39	270		8
17:53	50	17	30	45	260		10
18:53	48	18	28	39	260		10
19:53	47	20	28	38	260		10
20:53	44	23	23		260		10
21:53	42	25	18		250		10
22:53	38	28	12		280		10
23:40	34	75	14	24	30		10
23:53	33	78	13	21	20		10



Table 2: Weather observations for Burlington, Colorado, on November 10, 2012  
 (Source: <http://mesowest.utah.edu/>)

Time MST November 10, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	58	37	29	39	230		10
1:53	58	39	33	43	220		10
2:53	55	45	18		230		10
3:53	54	47	25	31	220		10
4:53	50	52	21		190		10
5:53	46	60	14		210		10
6:53	54	55	22	28	210		10
7:53	59	45	31	37	210		10
8:53	64	37	36	47	210		7
9:53	67	29	37	52	220	haze	6
10:53	70	26	32	51	220	haze	6
11:53	68	26	44	52	240	haze	6
12:53	61	33	14	41	360		10
13:00	57	38	17	24	350		10
13:53	49	56	14		350		10
14:53	46	65	20		340		10
15:53	42	76	14		350		10
16:31	39	81	17		350		10
16:53	40	79	17		350		10
17:53	38	85	14		10		10
18:04	37	87	17	22	340		10
18:53	37	85	14	24	350		10
19:09	37	81	18	22	10		10
19:53	35	78	18		10		10
20:11	34	86	16	24	10		10
20:53	32	81	21		360		10
21:16	30	80	20		360		10
21:53	28	75	21	25	360		10
22:03	27	80	16	24	360		10
22:53	27	78	18	25	360		10
23:53	25	85	10	22	350		10

Table 3: Weather observations for Clayton, New Mexico, on November 10, 2012  
 (Source: <http://mesowest.utah.edu/>)

Time MST November 10, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:55	55	55	24		220		10
1:55	54	57	18	27	220		10
2:55	49	66	12		210		10
3:55	48	66	10		210		10
4:55	49	66	17		200		10
5:55	48	71	22		200		10
6:55	50	66	20	27	200		10
7:55	55	57	24		200		10
8:55	63	37	35	45	200		7
9:28	64	34	40	51	200	haze	4
9:46	64	34	44	54	200	haze	2
9:55	64	33	46	58	210	haze	1.5
10:05	64	32	40	52	200	haze	3
10:55							
11:55							
12:55							
14:55							
15:55							
16:55							
17:55							
18:55							
19:55							
20:55							
21:55							
22:55							
23:55							

In order to definitively attribute at least a portion of the dust deposition in Lamar to long-range transport and establish that the November 10, 2012 storm was a regional event, a NOAA HYSPLIT backward trajectory analysis (Draxler and Rolph, 2012) was conducted (Figure 6). The analysis includes 6-hour duration back trajectories from Lamar initializing at 12Z (5 AM MST) and ending at 17Z (10 AM MST). This encompasses the time period when Lamar was reporting haze and reduced visibility observations (see the following link for more information on HYSPLIT from the NOAA Air Resources Laboratory: [http://www.arl.noaa.gov/HYSPLIT\\_info.php](http://www.arl.noaa.gov/HYSPLIT_info.php)). The trajectory analysis clearly shows the transport of air from New Mexico, including the northeastern part of the state where high surface winds and reports of haze with reduced visibility are known to have been occurring in Clayton on the morning of November 10, 2012 (Table 3).

NOAA HYSPLIT MODEL  
 Backward trajectories ending at 1700 UTC 10 Nov 12  
 NAM Meteorological Data

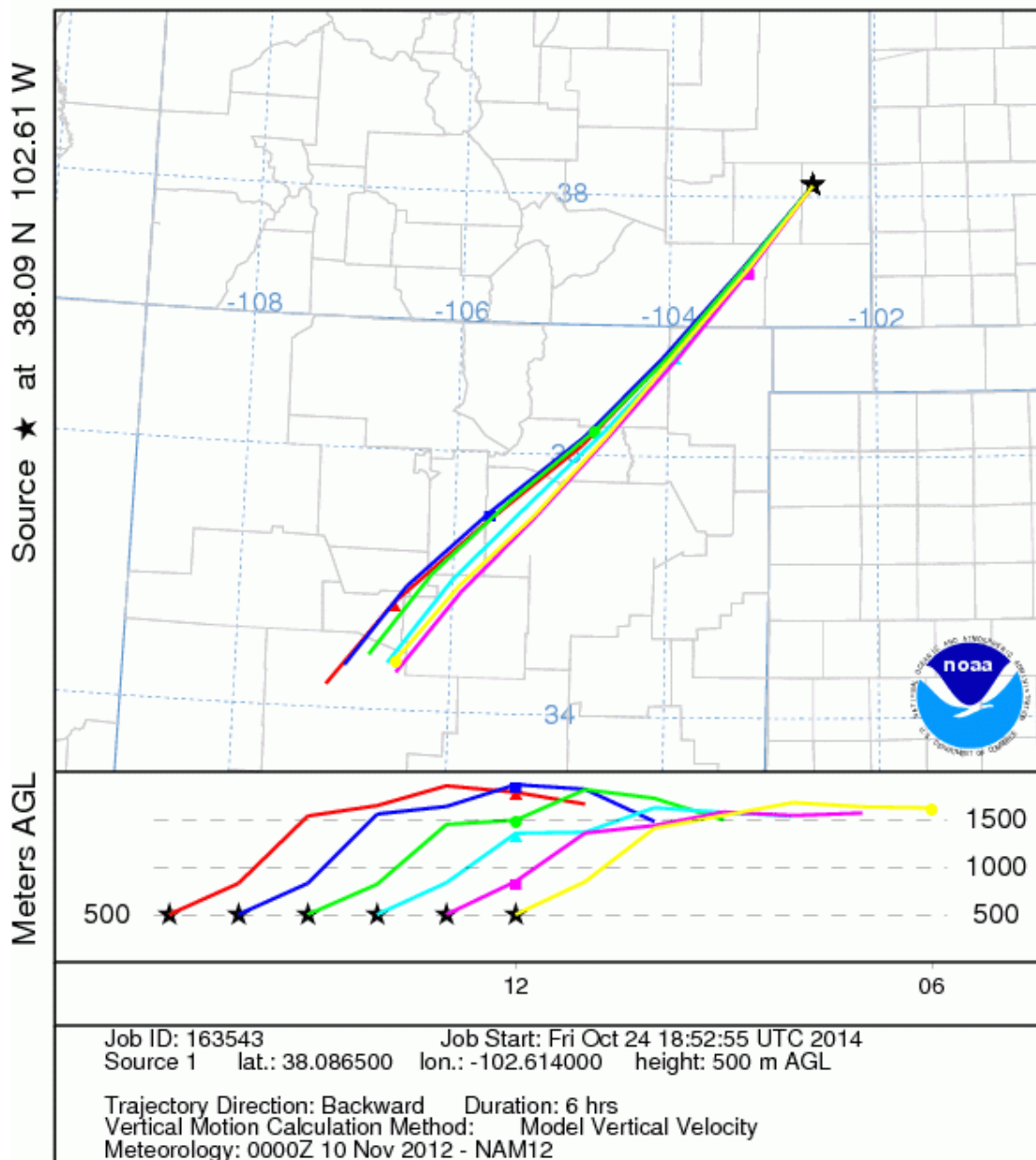


Figure 6: NOAA HYSPLIT NAM 12 6-hour back trajectories for Lamar, CO from 5 AM MST (12Z) November 10, 2012, to 10 AM MST (17Z) November 10, 2012. (Source: <http://ready.arl.noaa.gov/HYSPLIT.php>)

Satellite imagery from November 10, 2012 provides strong supporting evidence that dust caused the PM<sub>10</sub> exceedance in Lamar. Specifically, the MODIS (Moderate Resolution Imaging Spectroradiometer) clearly reveals dust plumes blowing across southeast Colorado at the same time haze and reduced visibility were being reported in Lamar. Additional information

on MODIS can be found at the National Aeronautics and Space Administration (NASA) website (<https://earthdata.nasa.gov/data/near-real-time-data/data/instrument/modis>)

Figure 7 shows the MODIS Terra satellite image zoomed on southeast Colorado at 10:05 AM MST (1705Z). Numerous dust plumes can be easily identified throughout the region. According to surface observations for Lamar in the hour before and the hour after this image was generated, sustained winds of 44-46 mph were recorded along with wind gusts of 60 mph and visibility reduced to 4-5 statute miles (Table 1: Weather observations for Lamar, Colorado, on November 10, 2012  
(Source: <http://mesowest.utah.edu/>)

Time MST November 10, 2012	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	42	59	6		220		10
1:53	53	50	16		200		10
2:53	54	53	16		210		10
3:53	54	53	13		210		10
4:53	52	59	0				10
5:53	57	49	12		220		10
6:53	61	42	25	33	210		10
7:53	65	34	44	56	210	haze	6
8:53	69	29	43	56	220	haze	5
9:16	70	26	51	64	210	haze	4
9:53	71	25	46	60	200	haze	4
10:53	73	21	44	60	210	haze	5
11:53	74	21	37	52	220		10
12:53	73	24	31	46	210		10
13:15	68	28	17	31	270		10
13:53	60	55	21	28	280	mod rain	6
14:53	62	31	22		260		10
15:53	58	21	30	40	270		8
16:53	53	17	30	39	270		8
17:53	50	17	30	45	260		10
18:53	48	18	28	39	260		10
19:53	47	20	28	38	260		10
20:53	44	23	23		260		10
21:53	42	25	18		250		10
22:53	38	28	12		280		10
23:40	34	75	14	24	30		10
23:53	33	78	13	21	20		10

). Winds of this magnitude are well above the thresholds to produce blowing dust according to local climatology (see Blowing Dust Climatologies available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#misc2](http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2)).

Webcam imagery was also able to capture the dust storm occurring during the afternoon of November 10, 2012. As stated in the previous paragraph, large plumes of dust are evident throughout southeast Colorado at approximately 10:05 AM MST from MODIS satellite imagery. The web cam image (Figure 8) taken at 10:15 AM MST shows a discernible haze over the horizon at Gobblers Knob, which is located approximately 20 miles to the south of Lamar on Highway 287 (Figure 7). Additionally, some haze can also be observed on the Firstview web camera in Figure 9 despite the fact that the majority of the dust plumes appear to be to the south and east of that location. Firstview is located about 50 miles to the north of Lamar on Highway 40 (Figure 7).

***Satellite and webcam imagery clearly reveal that a dust storm was taking place in southeast Colorado on November 10, 2012.***

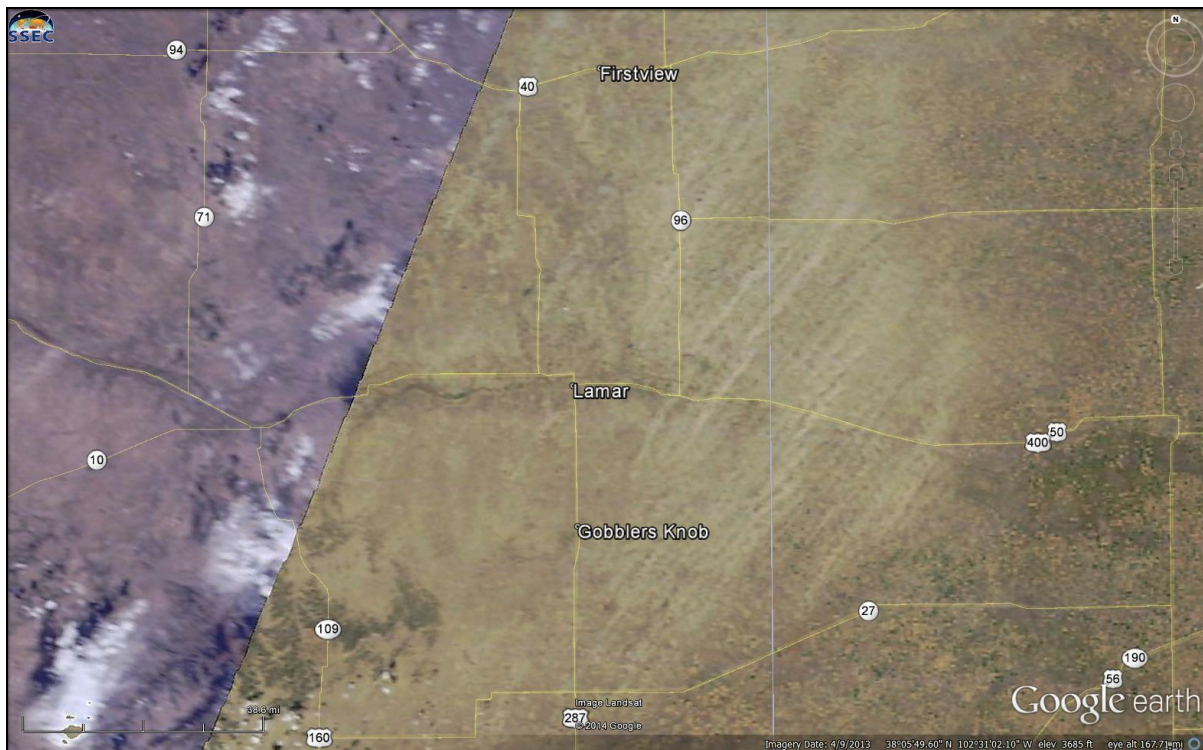


Figure 7: MODIS Terra satellite image at approximately 10:05 AM MST (1705Z) November 10, 2012.

(Source: <http://ge.ssec.wisc.edu/modis-today/index.php>)



Figure 8: Gobblers Knob webcam image at 10:15 AM MST November 10, 2012.  
(Source: <http://amos.cse.wustl.edu/>)



Figure 9: Firstview webcam image at 10:19 AM MST November 10, 2012.  
(Source: <http://amos.cse.wustl.edu/>)

Figure 10 shows the total precipitation in inches from October 10 to November 9, 2012 for eastern Colorado and adjacent states. Almost the entire area from Lamar upwind (southwest) into northeast New Mexico received less than 0.5 inches of precipitation during the 30 day period leading up to the November 10, 2012 dust event in Lamar. Based on previous research 0.5 to 0.6 inches of precipitation over a 30 day period has been found to be the approximate threshold, below which, blowing dust exceedances at Lamar are more likely to occur when combined with high winds (see Blowing Dust Climatologies available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#misc2](http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2)).

***30-day precipitation totals indicate that soils in southeast Colorado and northeast New Mexico were dry enough to produce blowing dust when winds were above the thresholds for blowing dust.***

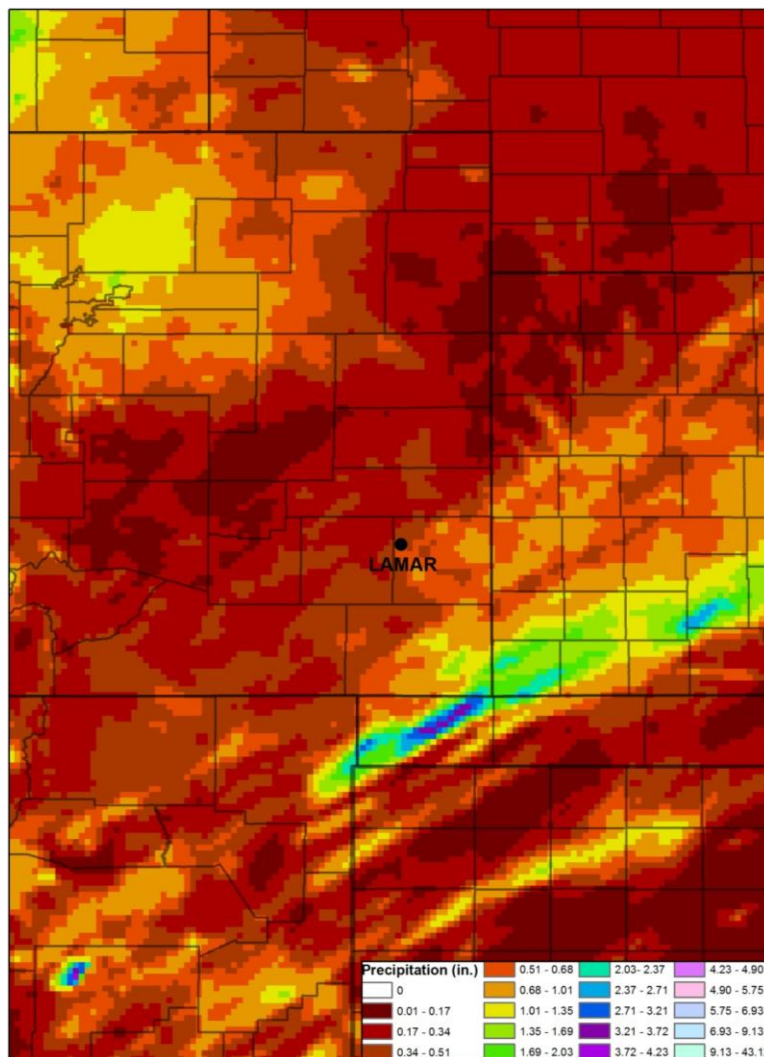


Figure 10: Total precipitation in inches for the southwestern United States, October 10 - November 9, 2012.  
(Source: <http://prism.nacse.org/recent/>).

The Pueblo National Weather Service (NWS) forecast office issues weather information and alerts for southeast Colorado, including Lamar. A High Wind Warning referencing dust as a health hazard in southeast Colorado was issued by this office on November 10, 2012, and is presented in Appendix A. Also included are warnings and advisories issued by the Albuquerque NWS forecast office mentioning blowing dust in northeast New Mexico, including locations directly upwind from Lamar. Additionally, the Colorado Department of Public Health and Environment (CDPHE) issued a Blowing Dust Advisory for southeast Colorado on November 10, 2012. This advisory can also be found in Appendix A.

The Smoke Text Product from the National Oceanic and Atmospheric Administration (NOAA) Satellite Services Division - Descriptive Text Narrative for Smoke/Dust Observed in Satellite Imagery mentions blowing dust at 10:15 AM MST (1715Z) on November 10, 2012. This narrative, which can be found in its entirety in Appendix A, shows that satellite imagery indicated that blowing dust was originating in eastern Colorado.

***Text products and advisories issued by the NWS, CDPHE and NOAA show that very strong winds and areas of blowing dust were anticipated and did occur in southeast Colorado and northeast New Mexico on November 10, 2012. This information, combined with other evidence provided in this report, proves that this dust storm was a natural, regional event that was not reasonably controllable or preventable.***



### 3.0 Evidence-Ambient Air Monitoring Data and Statistics

On November 10, 2012, an intense cold front moved across Southern Colorado. The strong west to southwest winds associated with this system transported blowing dust from southeast Colorado and northeast New Mexico into the Lamar area, affecting PM<sub>10</sub> samples in Lamar. The strong winds generated from the cold front's passing affected PM<sub>10</sub> samples at multiple sites in Lamar, CO. During this event samples in excess of 150 µg/m<sup>3</sup> were recorded at both the Lamar Power Plant monitoring site (Lamar Power, 208 µg/m<sup>3</sup>) and the Lamar Municipal monitoring site (Lamar Muni, 152 µg/m<sup>3</sup>).

#### 3.1 Historical Fluctuations of PM<sub>10</sub> Concentrations in Lamar

This evaluation of PM<sub>10</sub> monitoring data for sites affected by the November 10, 2012, event was made using valid samples from PM<sub>10</sub> samplers in Lamar from 2008 through 2012; APCD has been monitoring PM<sub>10</sub> concentrations in Lamar since 1985. The overall data summary for the affected sites is presented in Table 4, with all data values being presented in µg/m<sup>3</sup>:

**Table 4: November 10, 2012, Event Data Summary**

Evaluation	<i>Lamar Power</i>	<i>Lamar Muni</i>
<b>11/10/12</b>	<b>208</b>	<b>152</b>
Mean	28.4	21.8
Median	24	19
Mode	19	15
St. Dev	22.2	16.2
Var	495.1	261.7
Minimum	3	1
Maximum	367	242
Count	1818	1759

The approximate percentile values for various criteria were calculated and are displayed in Table 5. All percentile calculations presented in this table were made using the entire dataset, including known high wind events. There is no difference between the two datasets for any site (with and without high wind events) in regards to percentile calculations. Percentile calculations for the entire dataset ('Overall'), for samples taken in any November ('Any November'), and for any sample in 2012 for all sites affected by the event are presented in Table 5.

**Table 5: November 10, 2012, Site Percentile (All Affected Sites)**

Evaluation	<i>Lamar Power</i>	<i>Lamar Muni</i>
<b>11/10/2012</b>	<b>208</b>	<b>152</b>
Overall	99.8%	99.8%
Any November	Max Value	Max Value
2012	99.7%	99.4%

The percentile calculations in

Table 5 demonstrate the extreme nature of these samples as compared with each dataset. That all samples from affected sites are representative of extreme values for their independent data sets suggests that there was a common contribution to each sample from other than local sources.

The data set for the two are further summarized by month in Table 6. As with previous submittals these summaries the data presents no obvious ‘season’;  $PM_{10}$  levels at any particular site in Colorado do not necessarily fluctuate by season. Of greater importance affecting day-to-day, typical  $PM_{10}$  concentrations are local sources, e.g. road sanding and sweeping, local burning from agriculture and residential heating, vehicle contributions via road dust, unpaved lots or roads, etc. While the historic monthly mean values for the affected sites can be higher during the winter and spring months there is little month-to-month variation. Additionally, some of the sites exhibit monthly medians from these periods (winter and spring) that are generally lower than other months of the year. This time frame (winter and spring) is that which is most likely to experience the meteorological and dry soil conditions necessary for this type of event and are discussed elsewhere in this document. Although the maximum values for these months (winter and early spring) are the highest in the data set the ‘typical’ data (i.e. day-to-day, reflective of local conditions) are similar or lower than the same ‘typical’ data for the rest of the year. The summary data for the month of November (all samples in any November from 2008-2012) and for 2012 for both sites are presented in Table 6:

**Table 6: November 10, 2012,  $PM_{10}$  Evaluation by Month and Year**

<i>Evaluation</i>	<i>Lamar Power</i>		<i>Lamar Muni</i>	
	November	All 2012	November	All 2012
Mean	29.7	28.1	20.6	24.6
Median	25	24	17	20
Mode	21	27	15	17
St. Dev	23.8	23.1	16.3	21.4
Var	569.7	532.7	264.8	460.1
Minimum	5	3	5	3
Maximum	208	220	152	242
Count	149	361	145	364

**Lamar Power - 08-099-0001**

The  $PM_{10}$  sample on November 10, 2012, at Lamar Power of  $208 \mu\text{g}/\text{m}^3$  is the largest sample recorded among all November samples from 2008 through 2012, is the 2<sup>nd</sup> largest sample of all 2012 data. The sample exceeds the 99<sup>th</sup> percentile value ( $112 \mu\text{g}/\text{m}^3$ ) for the entire dataset. Overall, this sample is the 5<sup>th</sup> largest sample in the entire data set. All four samples greater than the event sample are associated with a high wind event. There are 1818 samples in the Lamar Power dataset. The sample of November 10, 2012 clearly exceeds the typical samples for this site.

Figure 11 through Figure 14 graphically characterize the Lamar Power  $PM_{10}$  data. The first, Figure 11, is a simple time series; every sample in this dataset (2008 - 2012) greater than  $150 \mu\text{g}/\text{m}^3$  is identified. Note the overwhelming mass of samples occupying the lower end of the graph. Of the 1818 samples in this data set less than 1% is greater than  $115 \mu\text{g}/\text{m}^3$ .

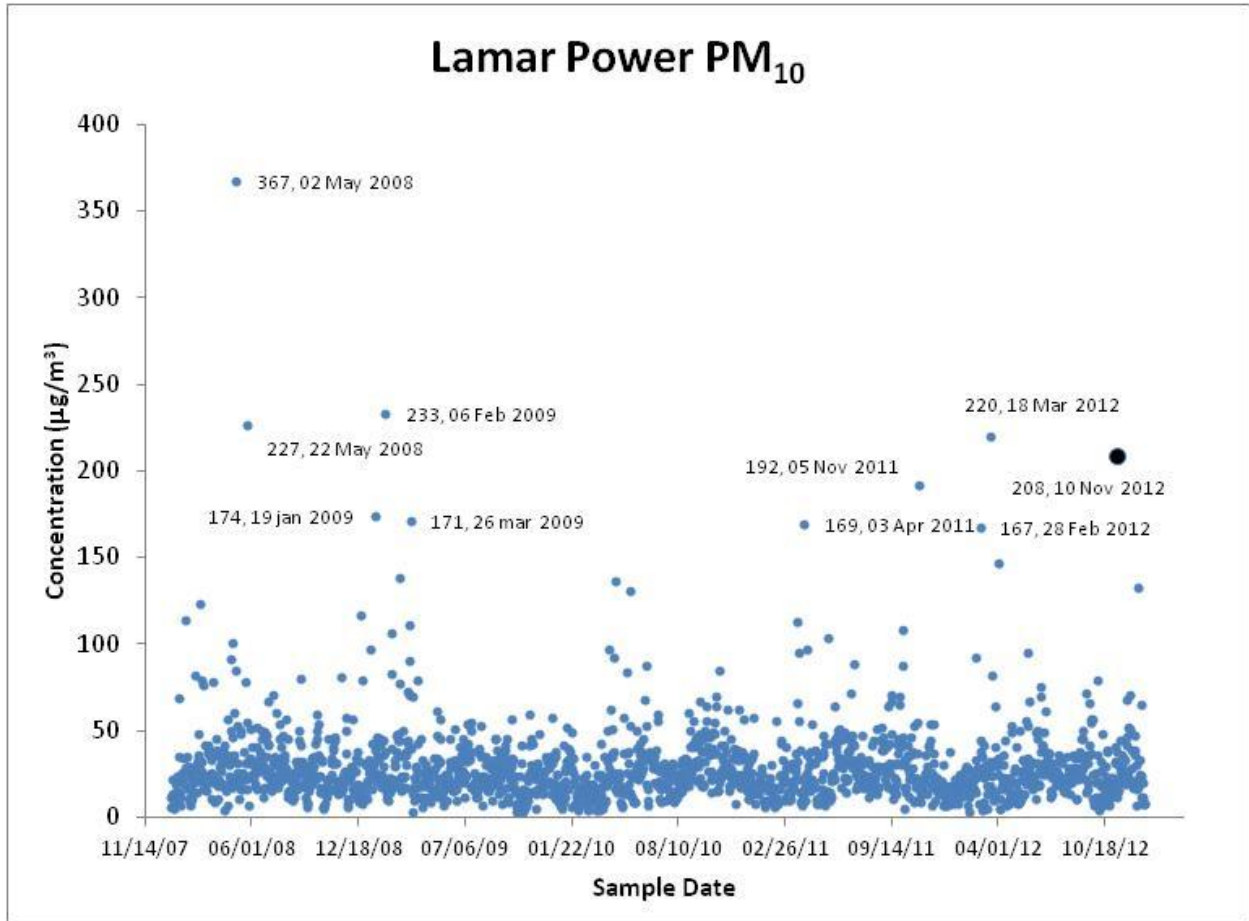


Figure 11: Lamar Power PM<sub>10</sub> Time Series, 2008-2012

Figure 12 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. This range of data can be considered typical, representing contributions from local sources. Well over 80% of the samples in this data set are less than 40 µg/m<sup>3</sup>. Even in the highly variable months comprising winter and early spring over 90% of the samples are less than 50 µg/m<sup>3</sup>. Clearly the sample of November 10, 2012, exceeds what is typical for this site.

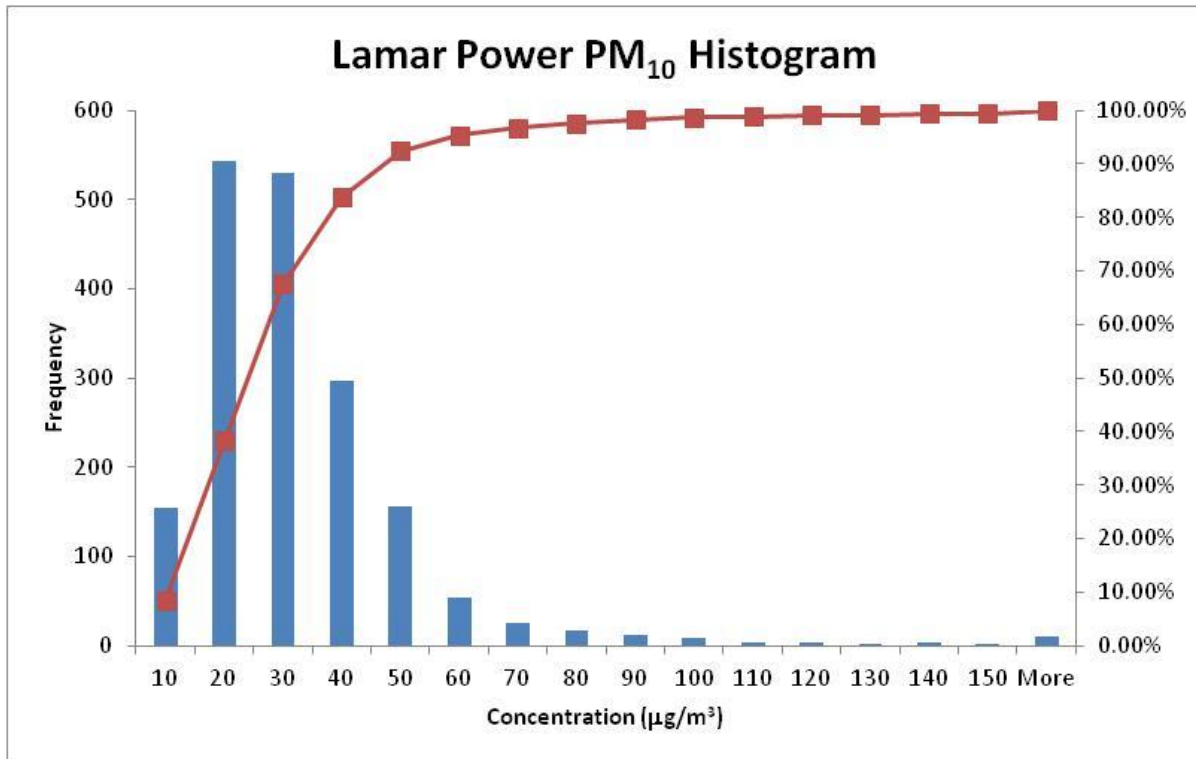
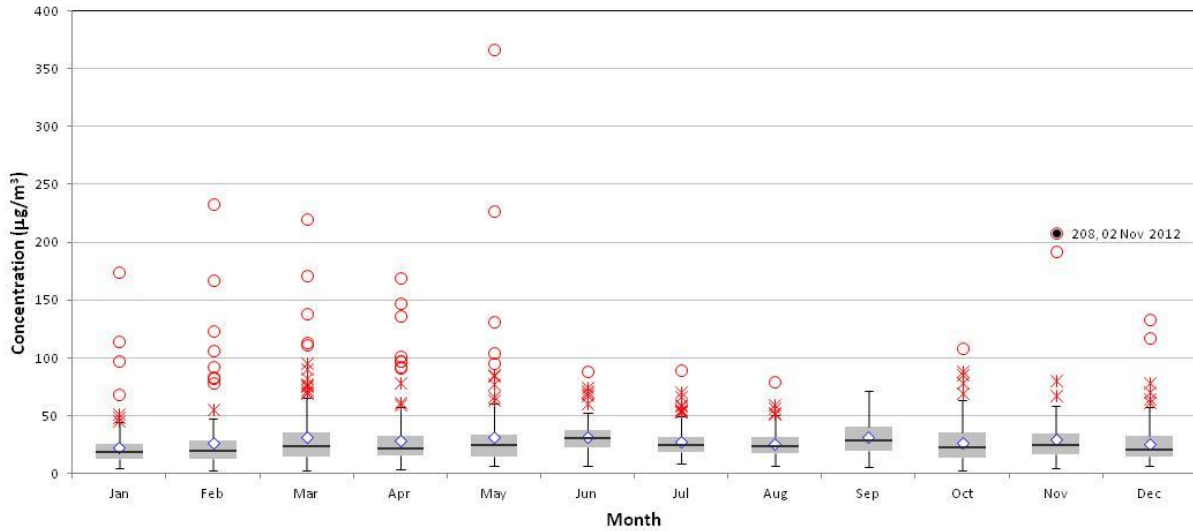


Figure 12: Lamar Power PM<sub>10</sub> Histogram, 2008-2012

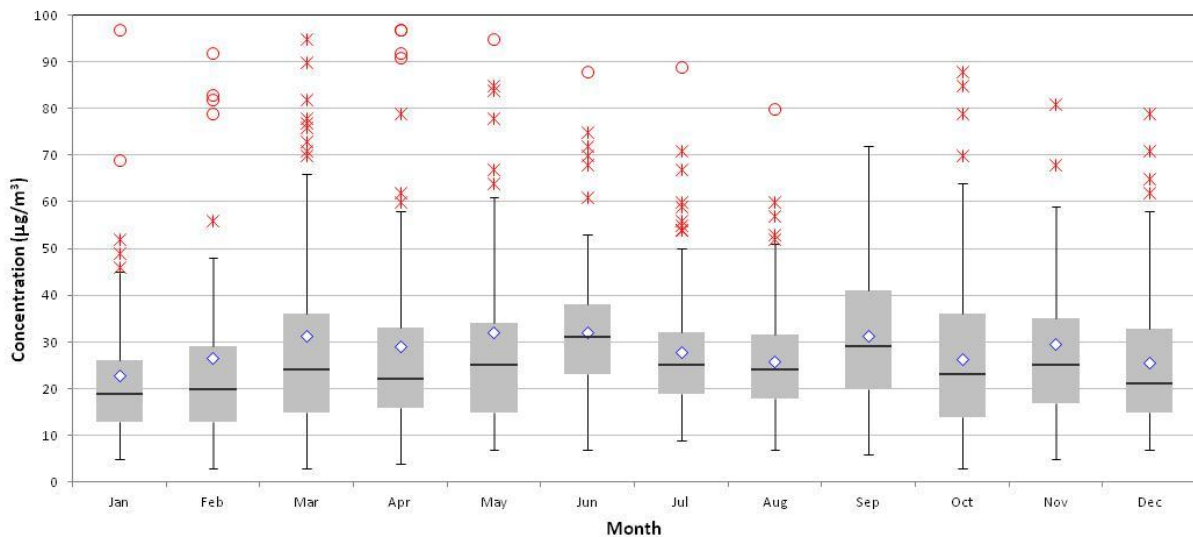
The monthly box-whisker plot in Figure 13 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on November 10, 2012. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.

The box-whisker plots graphically represent the overall distribution of each data set including the mean (  $\diamond$  ), the inner quartile range (  $\square$  IQR, defined to be the distance between the 75<sup>th</sup>% and 25<sup>th</sup>%), the median (represented by the horizontal black line) and two types of outliers identified in these plots: outliers greater than 75th% + 1.5\*IQR (  $\times$  ) and outliers greater than 75th% + 3\*IQR (  $\circ$  ). The outliers that satisfy the last criteria and are greater than 150 µg/m<sup>3</sup> are labeled with sample value and sample date. Each of these outliers is associated with a known high-wind event similar to that of November 10, 2012.



**Figure 13: Lamar Power PM<sub>10</sub> Box-Whisker Plot, 2008-2012**

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the small portion of the range where the majority of data resides. The same plot graphed to 100 µg/m<sup>3</sup>, which includes almost 99% of all the data, is presented in Figure 14. This expanded plot demonstrates that November is a month where contributions from local sources are similar to other months of the year but with a broad interquartile range - indicating a large amount of variation due to a small number of extreme samples.



**Figure 14: Lamar Power PM<sub>10</sub> Box-Whisker Plot, Reduced Scale, 2008-2012**

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The November mean (29.6 µg/m<sup>3</sup>) is greater than the November median value (25 µg/m<sup>3</sup>), the mean is greater than 65% of all samples in any November. The skew in the data is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are

somehow ‘dirtier’ than other months of the year. This data exposes that perception as flawed, typical data subject to local sources of variation are similar to every other month of the year. Figure 14 suggests that typical, day to day  $PM_{10}$  concentrations exposures for the month of June and September are highest among all months. The sample of November 10, 2012, clearly exceeds the typical data at this site.

**Lamar Muni - 08-099-0002**

The  $PM_{10}$  sample on November 10, 2012, at Lamar Muni of  $152 \mu\text{g}/\text{m}^3$  is the largest sample recorded among all November samples from 2008 through 2012, is the 3<sup>rd</sup> largest sample of all 2012 data, and is greater than the 99<sup>th</sup> percentile value ( $93 \mu\text{g}/\text{m}^3$ ) for the entire dataset. Overall, this sample is the 5<sup>th</sup> largest sample in the entire data set. All three samples greater than the event sample are associated with a high wind event, there are 1759 samples in the Lamar Muni dataset. The sample of November 10, 2012 clearly exceeds the typical samples for this site.

Figure 15 through Figure 18 graphically characterize the Lamar Muni  $PM_{10}$  data. The first, Figure 15, is a simple time series; every sample in this dataset (2008 - 2012) greater than  $150 \mu\text{g}/\text{m}^3$  is identified. Note the overwhelming number of samples occupying the lower end of the graph; an interested reader can count the number of samples greater than  $100 \mu\text{g}/\text{m}^3$ . Of the 1759 samples in this data set less than 1% are greater than  $100 \mu\text{g}/\text{m}^3$ .

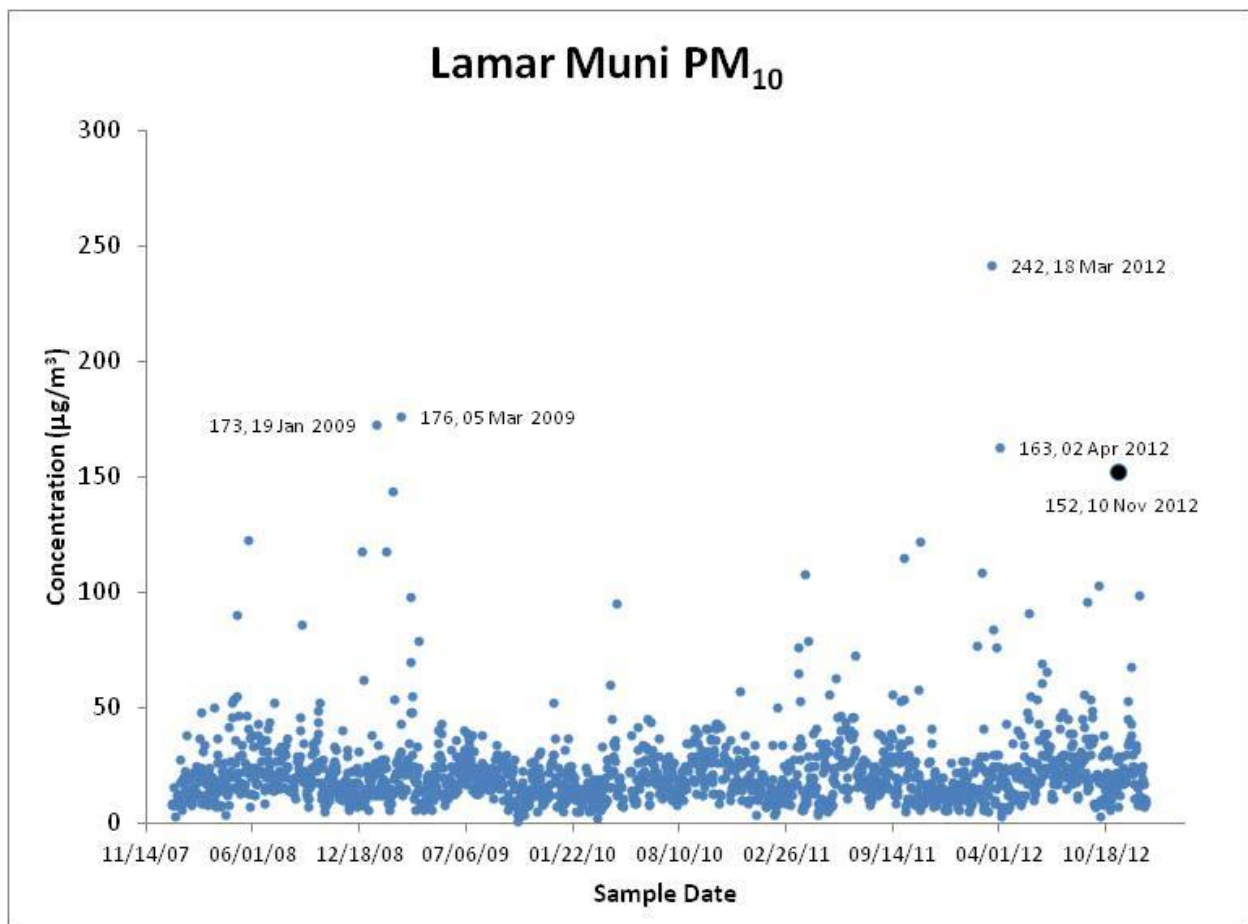


Figure 15: Lamar Muni  $PM_{10}$  Time Series, 2008-2012

Figure 16 is a simple histogram, demonstrating the overwhelming weight of samples on the low end of the curve. This range of data can be considered typical, representing contributions from local sources. Almost 85% of the samples in this data set are less than 30  $\mu\text{g}/\text{m}^3$ . Even in the highly variable months comprising winter and early spring over 90% of the samples are less than 50  $\mu\text{g}/\text{m}^3$ . Clearly the sample of November 10, 2012, exceeds what is typical for this site.

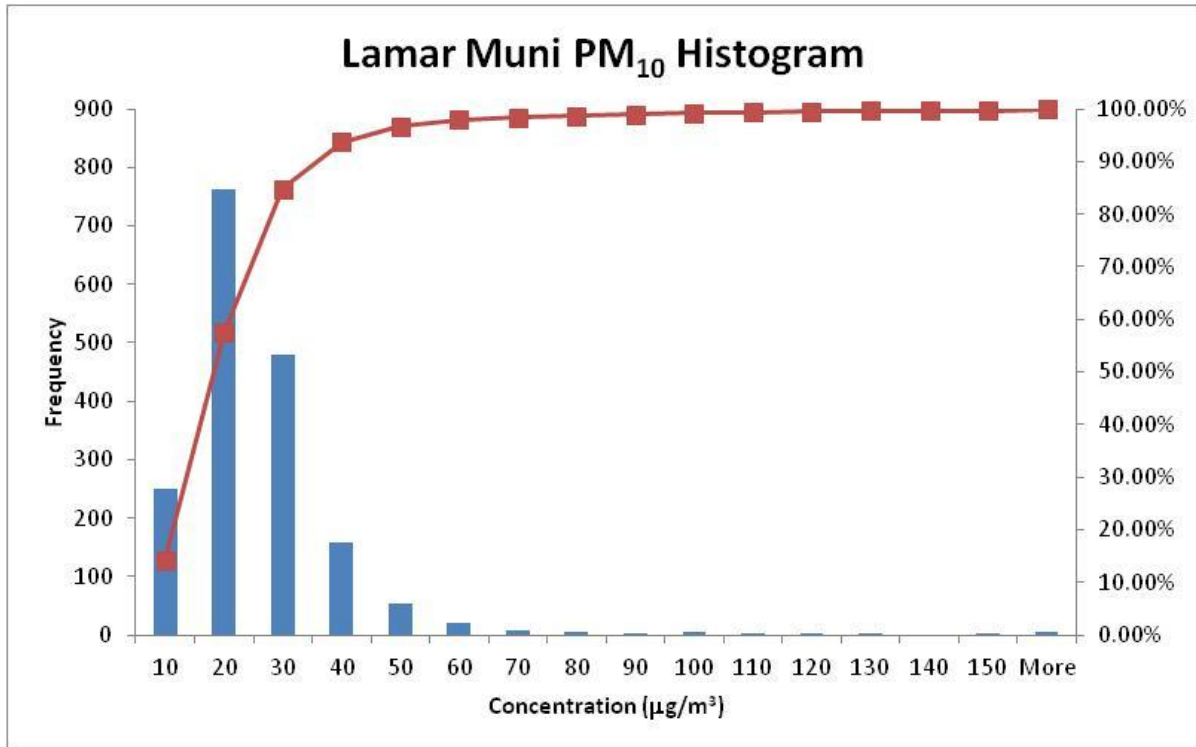
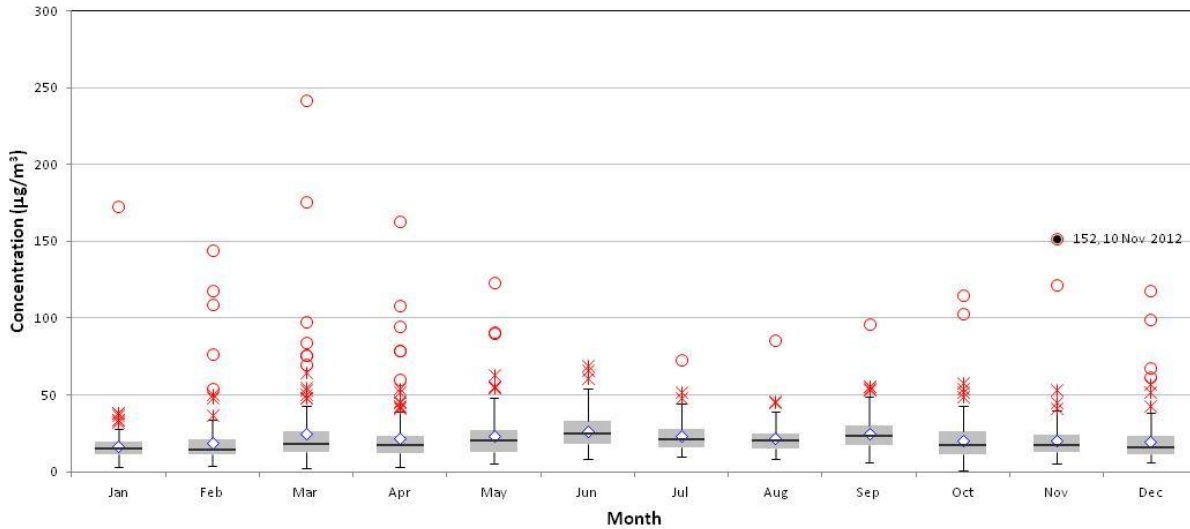


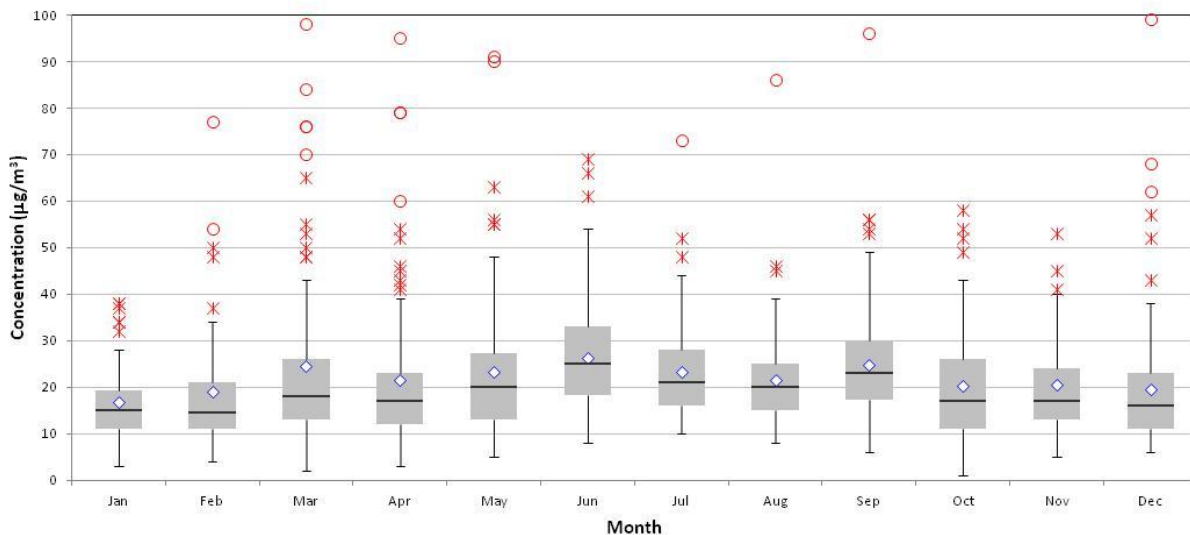
Figure 16: Lamar Muni PM<sub>10</sub> Histogram, 2008-2012

The monthly box-whisker plot in Figure 17 highlights the consistency of the majority of data from month to month. Note the greater variability (wider inner-quartile range) and greater range of the data through the winter and early spring months that's accompanied by typically greater monthly maxima. Recall, this time period experiences a greater number of days with meteorological conditions similar to those experienced on November 10, 2012. Although these high values affect the variability and central tendency (average) of the dataset they aren't representative of what is typical at the site.



**Figure 17: Lamar Muni PM<sub>10</sub> Box-Whisker Plot, 2008-2012**

The presence of the extreme values distorts the graph, losing definition and distorting information presented across the range where the majority of data resides. The same plot graphed to 100  $\mu\text{g}/\text{m}^3$ , which includes over 99% of all the data, is presented in Figure 18. This expanded plot demonstrates that November is a month where contributions from local sources are similar to other months of the year but with a broad interquartile range - indicating a large amount of variation in samples.



**Figure 18: Lamar Muni PM<sub>10</sub> Box-Whisker Plot, Reduced Scale, 2008-2012**

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The November mean ( $20.5 \mu\text{g}/\text{m}^3$ ) is greater than the November median value ( $17 \mu\text{g}/\text{m}^3$ ) and is greater than the 66% of all samples in any November. The skew in the data is due to the presence of a handful of extreme values and can create the perception that those months experiencing these high wind events are



somehow ‘dirtier’ than other months of the year. This data exposes that perception as flawed, typical data subject to local sources of variation are similar to every other month of the year. Figure 18 suggests that typical, day to day PM<sub>10</sub> concentrations exposures for the month of June and September are highest among all months. The sample of November 10, 2012, clearly exceeds the typical data at this site.

### 3.2 Wind Speed Correlations

Wind speeds in southeast Colorado increased early in the morning November 10, 2012 and stayed elevated throughout the day, gusting to speeds in excess of 50 mph. The four charts in Figure 19 display wind speed (mph) as a function of date from meteorological sites within the affected areas for a number of days before and after the event.

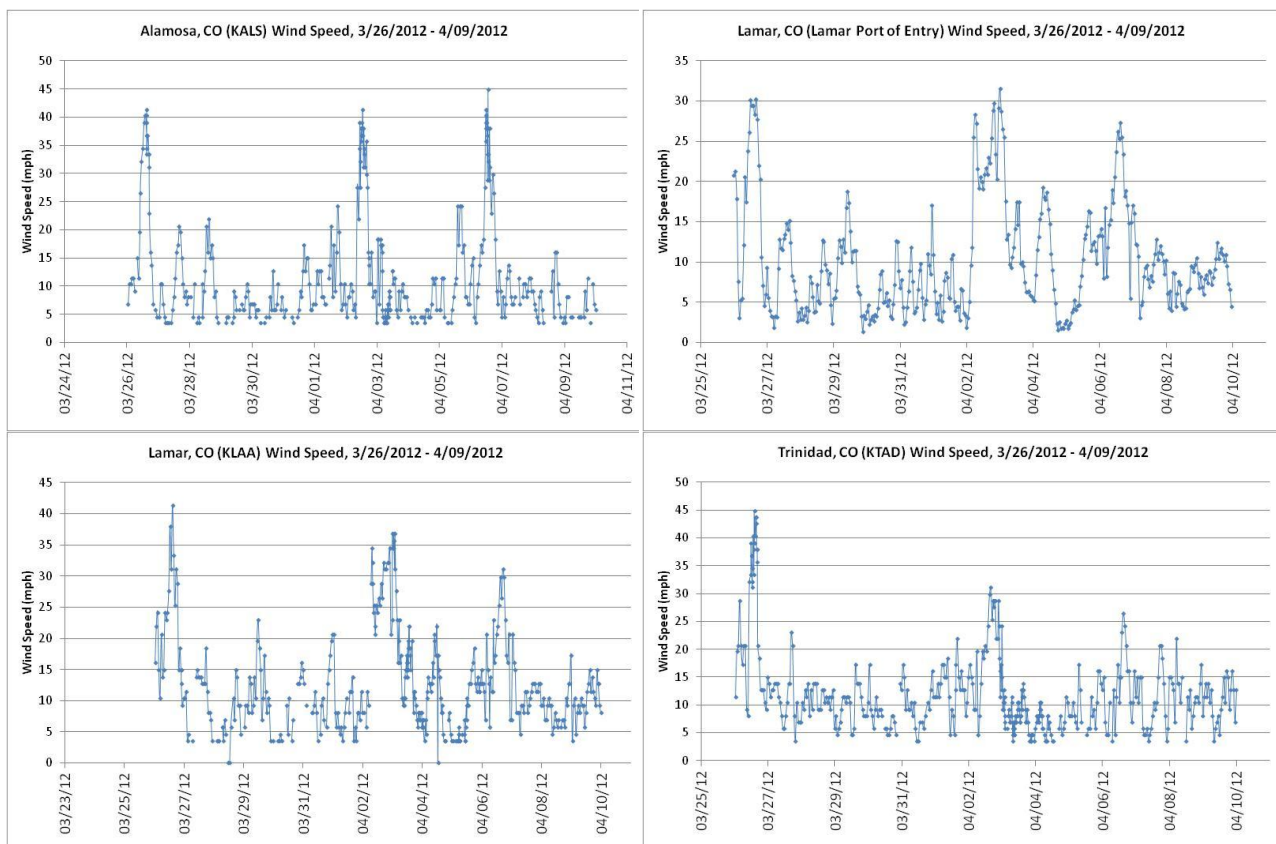


Figure 19: Wind Speed (mph) Affected Sites, CO, 3/25/2012 - 4/09/2012

Figure 20 plots PM<sub>10</sub> concentrations from the affected sites for the period for seven days prior to and following the samples of November 10, 2012.

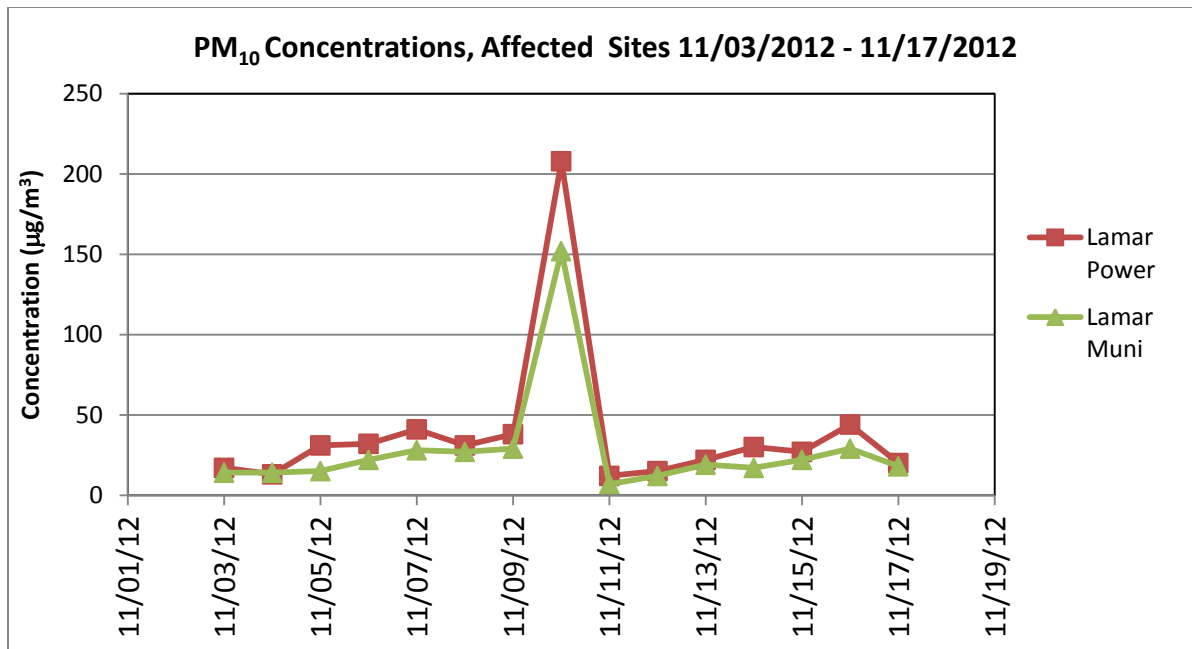


Figure 20: PM<sub>10</sub> Concentrations, Affected Sites, 11/03/2012 - 11/17/2012

Figure 20 mimics the plots for wind speed, suggesting an association between the regional high winds and PM<sub>10</sub> concentrations at the affected sites. Although the samples were affected to differing degrees by the event (possibly reflecting the variation in contribution from local sources) the elevated concentrations are clearly associated with the elevated wind speeds. Given the spatial dislocation of the sites the relationship between the two data sets would suggest that the regional high winds had an effect on PM<sub>10</sub> samples in Lamar and Alamosa on November 10, 2012.

### 3.3 Percentiles

Monthly percentile plots in Figure 21 demonstrate a high degree of association between monthly median values and relatively high monthly percentile values, e.g. the Pearson's r value between the monthly 90<sup>th</sup> percentile value at Lamar Power and the monthly median is 0.34. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the monthly median values increases sharply.

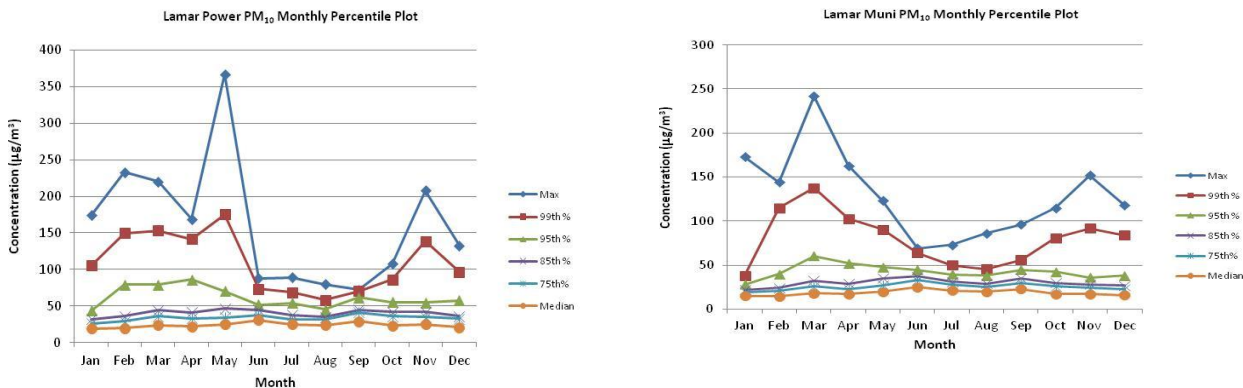


Figure 21: Monthly PM<sub>10</sub> Percentile Plots

It is certainly the case that monthly median values are indicative of typical, day to day concentrations. Additionally, there is a range of samples that are a product of normal variation subject to typical, day to day local effects. This range may be restricted to percentile values that are well correlated with the median. For the data sets of concern (Lamar Power and Lamar Muni) a conservative estimate of the percentile value that is reflective of typical, day to day variation is the 75<sup>th</sup> percentile value. Nearly all of the variation in the monthly 75<sup>th</sup> percentile values of these three data sets can be explained by the variation in monthly medians; for these three sites the correlation between the median and monthly 75<sup>th</sup> percentile values vary from an  $r^2 = 0.95$  (Lamar Muni) to an  $r^2 = 0.83$  (Lamar Power). A reasonable estimate of the contribution to the event from local sources for these data sets may be the monthly 85<sup>th</sup> percentile values; for these two sites the correlation between the median and the monthly 85<sup>th</sup> percentile values vary from an  $r^2 = 0.72$  (Lamar Power) to an  $r^2 = 0.88$  (Lamar Muni). If these percentile values are taken as an estimate of event PM<sub>10</sub> due to local variation then the portion of the sample concentration remaining from these monthly percentile values would be the sample contribution due to the event.

Table 7 identifies various percentile values that are representative of the maximum contribution due to local sources for each site from all November data for both sample dates. In Table 7 the range estimate in the 'Est. Conc. Above Typical' column is derived using the difference between the actual sample value and the 85<sup>th</sup> percentile as the minimum (reasonable) event contribution estimate and the difference between the actual sample value and the 75<sup>th</sup> percentile as the maximum (conservative) event contribution estimate. This column represents the range of estimated contribution to the November 10, 2012 sample at the sites listed in the table due to the high wind event.

**Table 7: Estimated Maximum Event PM<sub>10</sub> Contribution, Lamar Sites**

Site	Event Day Concentration (µg/m <sup>3</sup> )	November Median (µg/m <sup>3</sup> )	November Average (µg/m <sup>3</sup> )	November 75th % (µg/m <sup>3</sup> )	November 85th % (µg/m <sup>3</sup> )	Est. Conc. Above Typical (µg/m <sup>3</sup> )
Lamar Power Plant	208	25	29.6	35	42.4	165 - 173
Lamar Municipal	152	17	20.6	23	29	123 - 129

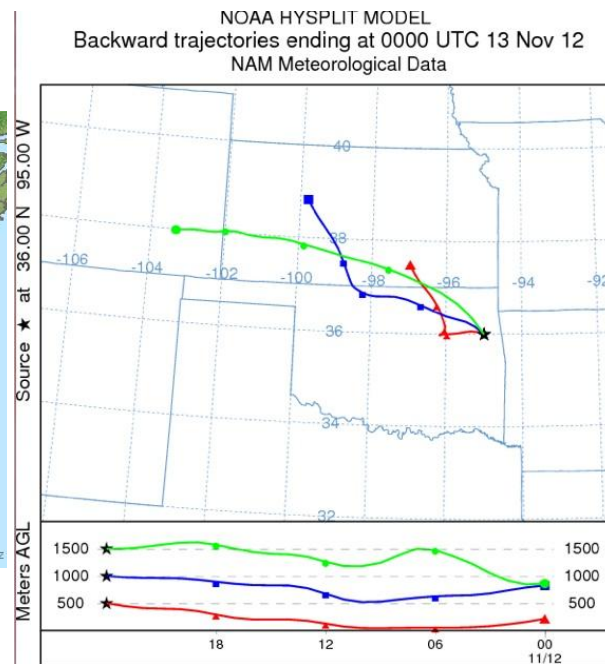
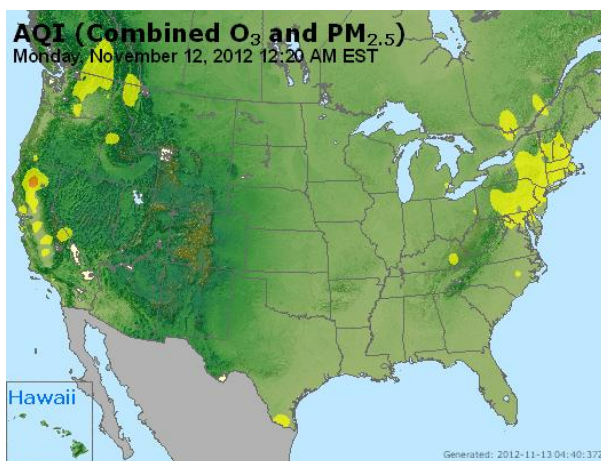
*Clearly, there would have been no exceedance but for the additional contribution to the PM<sub>10</sub> sample provided by the event.*

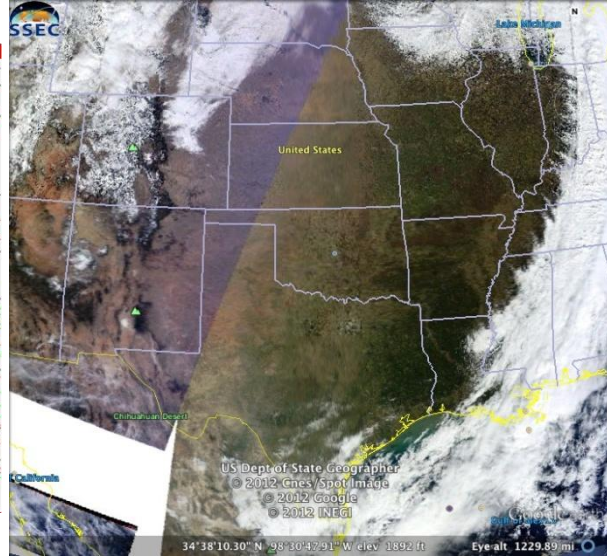
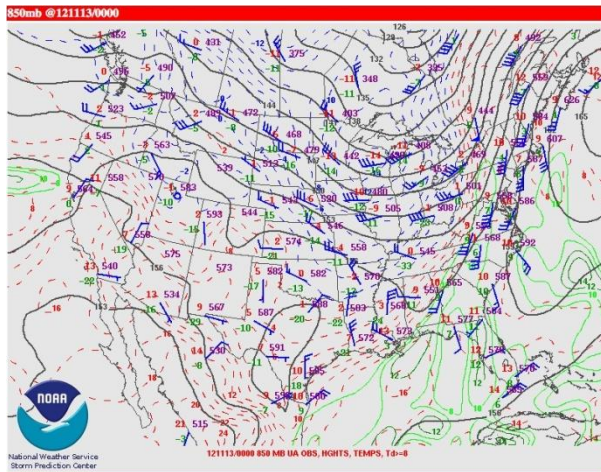
## 4.0 News and Credible Evidence

November 12, 2012

### ***UNHEALTHY AQI IN CALIFORNIA; BLOWING DUST TRAVERSES EAST***

Moderate (Code Yellow) AQI were recorded today across the Pacific Northwest, Southwest, and Northeast states. Extreme portions of southwest California near Carmel Valley experienced the worst air quality conditions, reaching Unhealthy (Code Red) by 8PM CST (top left, courtesy AIRNow). An extended area of remnant blowing dust believed to have originated from the blowing dust event that occurred over portions of New Mexico, western Texas and eastern Colorado this past weekend, was observed further east, stretching from central Wisconsin through Oklahoma. NOAA's HYSPLIT Trajectory model indicates the air mass over northeast Oklahoma originated west, near Colorado (top right). In addition, this evening's 00 UTC upper-air data shows dry air over the Mid-Mississippi Valley, as well as clockwise flow over Texas (bottom left, courtesy NOAA SPC). In addition to the anticyclonic wind flow, a cloud-free, subsidence driven atmosphere observed by MODIS Terra this afternoon over Texas tells the story of High Pressure affecting the region and possibly the capacity for air mixing in the Planetary Boundary Layer (bottom right). Further east in the same image we see a stark demarcation of stratocumulus clouds from the powerful cold front responsible for initiating the weekend dust storms.



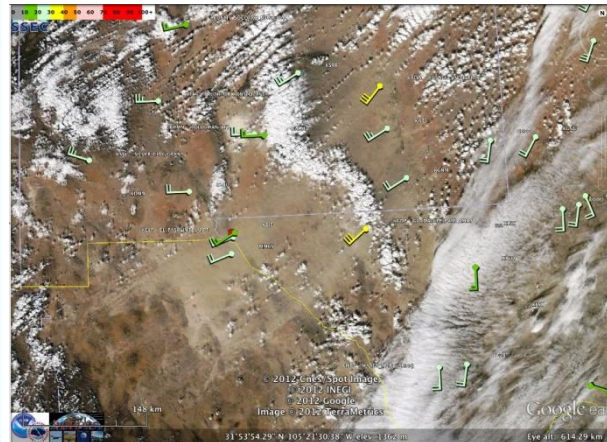
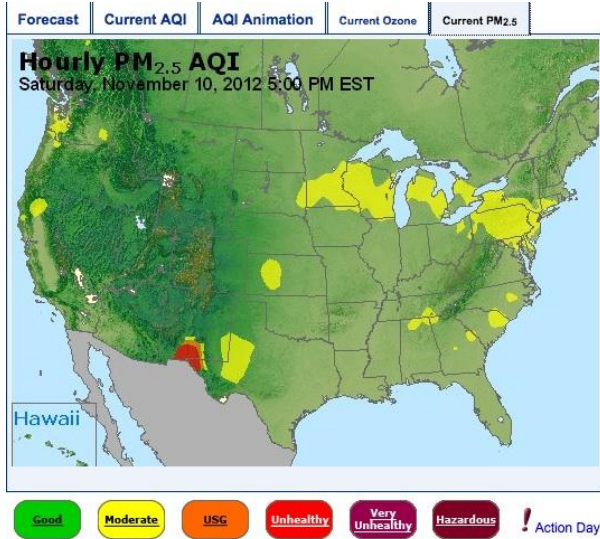


Posted by Alexandra St Pe at [11:02 PM](#) | [Comments \(0\)](#)  
Retrieved from: [http://alg.umbc.edu/usaq/archives/2012\\_11.html](http://alg.umbc.edu/usaq/archives/2012_11.html)

November 10, 2012

***WEEKEND EDITION: BIG DUST STORM ACROSS WEST TEXAS AND NEW MEXICO***

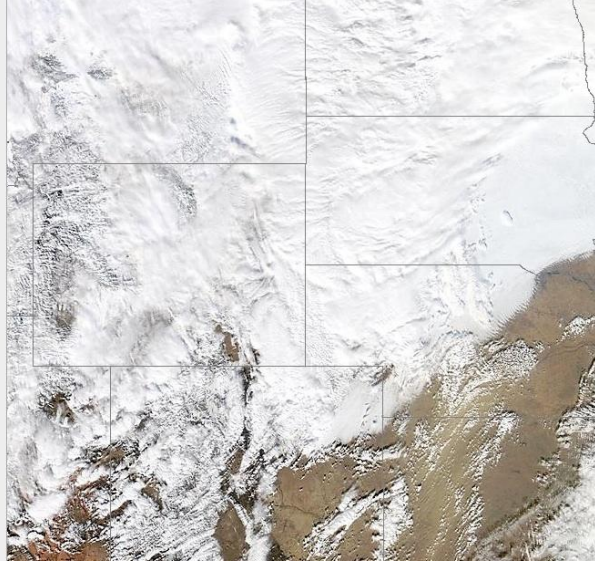
This afternoon a large dust storm blew up out of Mexico and caused El Paso Texas to have unhealthy breathing conditions. The AQI map below left highlights the area affected and the MODIS AQUA overpass at 13 CST shows that the dust is widespread across the region. NOAA METAR Winds are superimposed on the image and the El Paso AIRNOW site is shown as a red dot. Sustained hourly winds are at 20-30 knots.



A webcam from Weatherbug (Earth Networks) at Fabens Elementary School in Fabens, Texas, shows the difference between 7:45 AM, 11:45AM, and finally 15:45 PM. The middle image clearly shows the dust front blowing in.



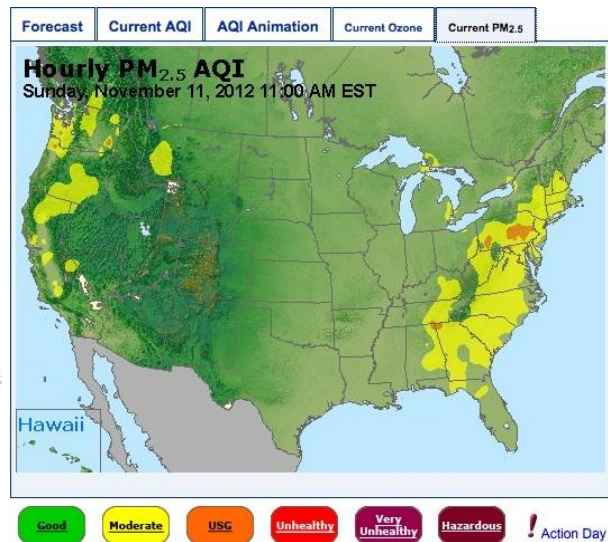
In the northern states, snow is the pollutant of the day and the image on the left shows a white blanket across Colorado, Wyoming, the Dakotas, and Nebraska. On Thursday, I flew back from Colorado and missed the snow, but I did get a few good images from the plane of why there was haze in Patricia's posting yesterday. This is a power plant on the Ohio River.



Update: 11/11/12 at 12:00 EST

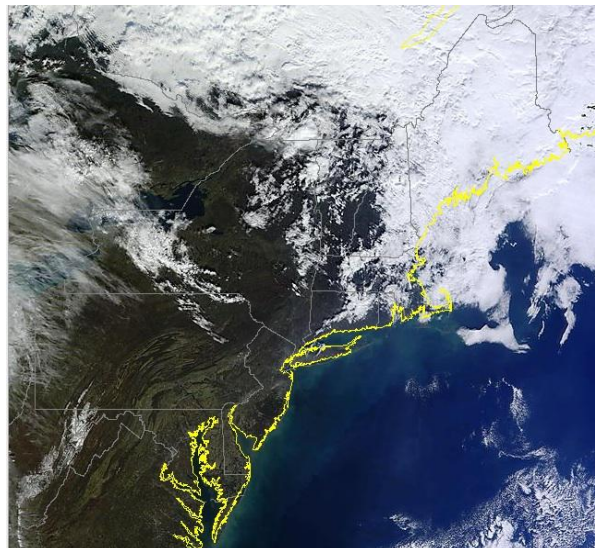
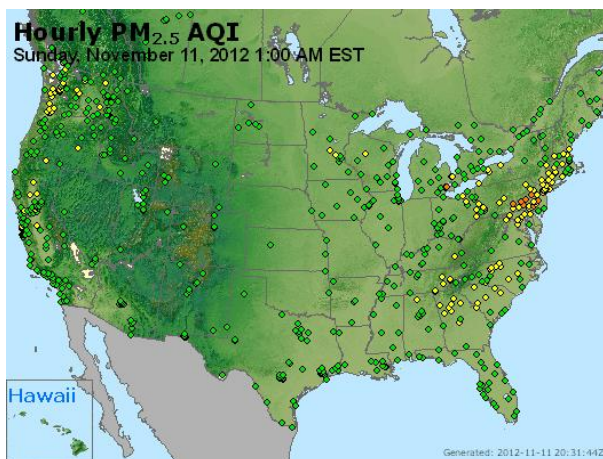
Lest we forget.

On the air quality front, moderate and unhealthy for sensitive groups readings are occurring in Pennsylvania and neighboring states. It is very warm in Maryland (approaching 70F) so it is likely that this is largely sulfate haze. We'll track more as the day goes on...



Poppy Photo Credit: American Legion

The MODIS Image is now in and while there is elevated PM early in the morning in Pennsylvania, the [AOD](#) is not high today. It looks like the haze may be overnight smoke since it clears out by the afternoon. We are getting into the period where it is cool at night, and I definitely smelled woodsmoke as people fire up their fireplaces in the evening.



Posted by Ray Hoff at [5:55 PM](#) | [Comments \(0\)](#)

Retrieved from: [http://alg.umbc.edu/usaq/archives/2012\\_11.html](http://alg.umbc.edu/usaq/archives/2012_11.html)

## Heavy Mountain Snows this Weekend/Windy on the Plains

- *November 11, 2011*
- **Brad**
- Skyview Weather
- No Comments

High Wind Watches are in place for the I-25 corridor from the Palmer Divide southward to the CO/NM border and High Wind Warnings are in place from the Palmer Divide northward to the CO/WY border. These watches and warnings are in place from late tonight through tomorrow evening. Some areas in the watch/warning area may experience wind gusts in excess of 60 mph, otherwise wind speeds of 15-30 and gust to 45 mph will be common. In the mountains there will be heavy wind blown snowfall with Winter Weather Advisories in effect for the higher terrain of Larimer, Boulder, Clear Creek and Gilpin Counties with Winter Storm Warnings and even Blizzard Warnings in effect for western Colorado. The snow will be piling up in the mountains but on the plains relatively dry conditions expected but a stray rain/snow shower cannot be completely ruled out overnight Saturday.

Retrieved from: <http://www.skyviewweather.com/tag/gusty-winds/>



# Thundersnow for some and heavy snow for others.

- November 10, 2012
- Brad
- Skyview Weather
- No Comments

Bands of moderate and heavy snowfall have developed late this afternoon and evening over NE Colorado which has resulted in winter driving conditions from the Denver area north and east. Snow continues to fall in the mountains to the west which will be piling up at the ski resorts helping to kick off the ski season. Winter Advisories and Winter Storm Warnings are in place for areas west of the continental divide until Sunday morning with additional Winter Weather Advisories for areas of NE Colorado until midnight tonight. Majority of the snow will fall through midnight with lighter snow showers mainly hugging the foothills and Palmer Divide tomorrow morning. Below are some of the wind/snow reports from the NWS as of this evening:

## PRELIMINARY LOCAL STORM REPORT...SUMMARY

NATIONAL WEATHER SERVICE DENVER CO

645 PM MST SAT NOV 10 2012

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

0635 PM	SNOW	5 E FORT LUPTON	40.09N 104.71W
11/10/2012	M8.0 INCH	WELD	CO TRAINED SPOTTER

### SOME DRIFTING OF SNOW

0620 PM	SNOW	1 W NORTHGLENN	39.91N 104.99W
11/10/2012	M2.0 INCH	ADAMS	CO TRAINED SPOTTER
0549 PM	SNOW	2 N LONGMONT	40.20N 105.11W
11/10/2012	M1.2 INCH	BOULDER	CO TRAINED SPOTTER

### 0.32 INCH LIQUID PCPN

0512 PM	SNOW	1 N GREELEY	40.44N 104.74W
11/10/2012	M4.1 INCH	WELD	CO TRAINED SPOTTER
0512 PM	SNOW	1 E FORT COLLINS	40.56N 105.05W

11/10/2012 M1.0 INCH LARIMER CO TRAINED SPOTTER

0508 PM SNOW 21 N NEW RAYMER 40.91N 103.83W

11/10/2012 M4.0 INCH WELD CO CO-OP OBSERVER

0442 PM SNOW FREDERICK 40.10N 104.94W

11/10/2012 M2.0 INCH WELD CO NWS EMPLOYEE

HEAVY SNOWFALL AT MEASUREMENT

0409 PM SNOW 2 W GREELEY 40.42N 104.78W

11/10/2012 M3.2 INCH WELD CO NWS EMPLOYEE

0337 PM SNOW 4 ENE NEDERLAND 39.99N 105.45W

11/10/2012 M1.0 INCH BOULDER CO TRAINED SPOTTER

0133 PM SNOW KEYSTONE 39.61N 105.97W

11/10/2012 M3.0 INCH SUMMIT CO TRAINED SPOTTER

PRELIMINARY LOCAL STORM REPORT...SUMMARY

NATIONAL WEATHER SERVICE PUEBLO CO

511 PM MST SAT NOV 10 2012

..TIME... ..EVENT... ..CITY LOCATION... ..LAT.LON...

..DATE... ..MAG.... ..COUNTY LOCATION..ST.. ..SOURCE....

..REMARKS..

1159 AM NON-TSTM WND GST 4 SW CAMPO 37.06N 102.63W

11/10/2012 M65.00 MPH BACA CO MESONET

UTE CANYON RAW SIDS UCNC2

0959 AM NON-TSTM WND GST 4 SW CAMPO 37.06N 102.63W

11/10/2012 M60.00 MPH BACA CO MESONET

UTE CANYON BLM RAW SIDS SITE

0955 AM NON-TSTM WND GST 4 N SPRINGFIELD 37.46N 102.62W

11/10/2012 M71.00 MPH BACA CO AWOS

AWOS K8V7

0951 AM NON-TSTM WND GST 17 NW TWO BUTTES 37.75N 102.60W

11/10/2012 M63.00 MPH PROWERS CO MESONET

CDOT STATION CO026-GOBBLE KNOB

0946 AM NON-TSTM WND GST 9 S SPRINGFIELD 37.28N 102.61W

11/10/2012 M66.00 MPH BACA CO ASOS  
 KSPD ASOS  
 0945 AM SNOW 8 WNW WESTCLIFFE 38.18N 105.60W  
 11/10/2012 M2.8 INCH CUSTER CO COCORAHS  
 CO-CU-25  
 0916 AM NON-TSTM WND GST 4 W LAMAR 38.07N 102.69W  
 11/10/2012 M64.00 MPH PROWERS CO ASOS  
 0913 AM NON-TSTM WND GST 1 WNW LA VETA 37.52N 105.03W  
 11/10/2012 M62.00 MPH HUERFANO CO MESONET  
 STATION DW8514  
 0910 AM NON-TSTM WND GST 17 NW TWO BUTTES 37.75N 102.60W  
 11/10/2012 M58.00 MPH PROWERS CO MESONET  
 CDOT GOBBLERS KNOB  
 0858 AM NON-TSTM WND GST 4 W LAMAR 38.07N 102.69W  
 11/10/2012 M61.00 MPH PROWERS CO ASOS  
 0855 AM NON-TSTM WND GST 4 N SPRINGFIELD 37.46N 102.62W  
 11/10/2012 E67.00 MPH BACA CO AWOS  
 0833 AM SNOW 1 SSE CRESTONE 37.98N 105.69W  
 11/10/2012 M1.0 INCH SAGUACHE CO TRAINED SPOTTER  
 FELL OVER THE PAST 2 HOURS. STILL LIGHTLY SNOWING.  
 0800 AM SNOW 10 W CREEDE 37.82N 107.11W  
 11/10/2012 M5.0 INCH MINERAL CO CO-OP OBSERVER  
 SANTA MARIA RESERVOIR  
 0800 AM SNOW 1 WSW CLIMAX 39.37N 106.19W  
 11/10/2012 M3.0 INCH LAKE CO CO-OP OBSERVER  
 0754 AM SNOW 1 W ANTONITO 37.08N 106.03W  
 11/10/2012 M1.0 INCH CONEJOS CO TRAINED SPOTTER  
 0700 AM HEAVY SNOW 1 SSE WOLF CREEK PASS 37.47N 106.79W  
 11/10/2012 M18.0 INCH MINERAL CO TRAINED SPOTTER  
 STORM TOTAL. 12 INCHES HAVE FALLEN IN THE PAST 24 HOURS.  
 0700 AM SNOW 2 NW LEADVILLE 39.27N 106.32W

11/10/2012	M1.2 INCH	LAKE	CO	COCORAHS
0700 AM	SNOW	8 W VILLA GROVE		38.25N 106.10W
11/10/2012	M3.1 INCH	SAGUACHE	CO	COCORAHS
0700 AM	SNOW	10 SW MONTE VISTA		37.48N 106.27W
11/10/2012	M3.0 INCH	RIO GRANDE	CO	COCORAHS
0700 AM	SNOW	10 SW MONTE VISTA		37.48N 106.27W
11/10/2012	M3.0 INCH	RIO GRANDE	CO	COCORAHS
	CO-RG-21			
0700 AM	SNOW	9 NNW PAGOSA SPRINGS		37.39N 107.08W
11/10/2012	M1.5 INCH	ARCHULETA	CO	COCORAHS

Retrieved from: <http://www.skyviewweather.com/tag/gusty-winds/>

## 5.0 Not Reasonably Controllable or Preventable: Local Particulate Matter Control Measures

While it is likely that some dust was generated within the local communities as gusts from the regional dust storm passed through the area, the amount of dust generated locally was easily overwhelmed by, and largely unnoticeable as compared to the dust transported in from southern Colorado and New Mexico. The following sections will describe in detail the regulations and programs in place designed to control PM<sub>10</sub> in each affected community. These sections will demonstrate that the event was not reasonably controllable, as laid out in Section 50.1(j) of Title 40 CFR 50, within the context of reasonable local particulate matter control measures. As shown from the meteorological and monitoring analyses (Sections 2 and 3), the source region for the associated dust that occurred during the November 10, 2012 event originated outside of the monitored areas, primarily from the desert regions of southern Colorado and New Mexico.

The APCD conducted thorough analyses and outreach with local governments to confirm that no unusual anthropogenic PM<sub>10</sub>-producing activities occurred in these areas and that despite reasonable control measures in place, high wind conditions overwhelmed all reasonably available controls. The following subsections describe in detail Best Available Control Measures (BACM), other reasonable control measures, applicable federal, state, and local regulations, appropriate land use management, and an in-depth analysis of potential areas of local soil disturbance for each affected community during the November 10, 2012, event. This information shall confirm that no unusual anthropogenic actions occurred in the local areas of Alamosa and Lamar during this time.

### 5.1 Regulatory Measures - State

The APCDs regulations on PM<sub>10</sub> emissions are summarized in Table 8.

**Table 8: State Regulations Regulating Particulate Matter Emissions**

Rule/Ordinance	Description
Colorado Department of Public Health and Environment Regulation 1- Emission Control For Particulate Matter, Smoke, Carbon Monoxide, And Sulfur Oxides	<p>Applicable sections include but are not limited to:</p> <p>Everyone who manages a source or activity that is subject to controlling fugitive particulate emissions must employ such control measures and operating procedures through the use of all available practical methods which are technologically feasible and economically reasonable and which reduce, prevent and control emissions so as to facilitate the achievement of the maximum practical degree of air purity in every portion of the State. Section III.D.1.a)</p> <p>Anyone clearing or leveling of land greater than five acres in attainment areas or one acre in non-attainment areas from which fugitive particulate emissions will be emitted are required to use all available and practical methods which are technologically feasible and</p>

	<p>economically reasonable in order to minimize fugitive particulate emissions. (Section III.D.2.b)</p> <p>Control measures or operational procedures for fugitive particulate emissions to be employed may include planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques approved by the APCD. (Section III.D.2.b)</p> <p>Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions (Section III.D.2.a.(i))</p>
<p>Colorado Department of Public Health and Environment Regulation 3- Stationary Source Permitting and Air Pollutant Emission Notice Requirements</p>	<p>Construction Permit required if a land development project exceeds 25 acres and spans longer than 6 months in duration (Section II.D.1.j)</p> <p>All sources with uncontrolled actual PM<sub>10</sub> emissions equal to or exceeding five (5) tons per year, must obtain a permit.</p> <p>The new source review provisions require all new and modified major stationary sources in non-attainment areas to apply emission control equipment that achieves the "lowest achievable emission rate" and to obtain emission offsets from other stationary sources of PM<sub>10</sub>.</p>
<p>Colorado Department of Public Health and Environment Regulation 4- New Wood Stoves and the Use of Certain Woodburning Appliances During High Pollution Days</p>	<p>Regulates wood stoves, conventional fireplaces and woodburning on high pollution days.</p> <p>Prohibits the sale and installation a wood-burning stove in Colorado unless it has been tested, certified, and labeled for emission performance in accordance with criteria and procedures specified in the Federal Regulations and meets emission standards. (Section II)</p> <p>Section III regulates pellet stoves. Section IV regulates masonry heaters. Section VII limits the use of stoves on high pollution days.</p>
<p>Colorado Department of Public Health and Environment Regulation 6- Standards of Performance for New Stationary Sources</p>	<p>Implements federal standards of performance for new stationary sources including ones that have particulate matter emissions. (Section I)</p>
<p>Colorado Department of Public Health and Environment</p>	<p>Prohibits open burning throughout the state unless a permit has been obtained from the appropriate air</p>

Regulation 9- Open Burning, Prescribed Fire, and Permitting	pollution control authority. In granting or denying any such permit, the authority will base its action on the potential contribution to air pollution in the area, climatic conditions on the day or days of such burning, and the authority’s satisfaction that there is no practical alternate method for the disposal of the material to be burned. Among other permit conditions, the authority granting the permit may impose conditions on wind speed at the time of the burn to minimize smoke impacts on smoke-sensitive areas. (Section III)
Colorado Department of Public Health and Environment- Common Provisions Regulation	Applies to all emissions sources in Colorado  When emissions generated from sources in Colorado cross the state boundary line, such emissions shall not cause the air quality standards of the receiving state to be exceeded, provided reciprocal action is taken by the receiving state. (Section II A)
Federal Motor Vehicle Emission Control Program	The federal motor vehicle emission control program has reduced PM <sub>10</sub> emissions through a continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles; the PM <sub>10</sub> emissions in areas will be reduced.

## 5.2 Lamar Regulatory Measures and Other Programs

### Natural Events Action Plan (NEAP)

In response to exceedances of the PM<sub>10</sub> NAAQS (two in 1995 and one in 1996), the APCD, in conjunction with the City of Lamar’s Public Works Department, Parks and Recreation, and Prowers County Commissioners, the Natural Resources Conservation Services, the Burlington Northern Santa Fe Railroad, and other agencies developed a Natural Events Action Plan. That Plan was presented to EPA in 1998 and subsequently approved. Since 1998, it is this plan that has assisted the area in addressing blowing dust due to uncontrollable winds.

The NEAP for High Wind Events in Lamar, Colorado was updated in 2003 and again in 2012. The NEAP addresses public education programs, public notification and health advisory programs, and determines and implements Best Available Control Measures (BACM) for anthropogenic sources of windblown dust in the Lamar area. The City of Lamar, Prowers County, the APCD, and participating federal agencies worked diligently to identify contributing sources and to develop appropriate BACM as required by the Natural Events Policy.

Please refer to the Final NEAPs for Lamar, available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=LamarNaturalEventsActionPlan2003.pdf](http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=LamarNaturalEventsActionPlan2003.pdf) and [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=LamarNaturalEventsActionPlan2012.pdf](http://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=LamarNaturalEventsActionPlan2012.pdf) for more detail if needed.

## Control Measures from the December 2012 Maintenance Plan

### *Control of Emissions from Stationary Sources*

Although there are few stationary sources located in the Lamar attainment/maintenance area, the State's comprehensive permit rules listed in Table 8 will limit emissions from any new source that may, in the future, locate in the area.

The EPA approval of the original PM<sub>10</sub> Maintenance Plan, effective on 11/25/2005, reinstates the prevention of significant deterioration (PSD) permitting requirements in the Lamar Attainment/Maintenance area. The federal PSD requirements apply to new or modified major stationary sources which must utilize "best available control technology" (BACT).

### *Federal Motor Vehicle Emission Control Program (FMVECP)*

The FMVECP has reduced PM<sub>10</sub> emissions through a continuing process of requiring diesel engine manufacturers to produce new vehicles that meet tighter and tighter emission standards. As older, higher emitting diesel vehicles are replaced with newer vehicles through fleet turnover; tailpipe PM<sub>10</sub> emissions in the Lamar area will be further reduced.

### *Voluntary and State-Only Measures*

Additional activities in Lamar that result in the reduction of PM<sub>10</sub> emissions include:

- The City of Lamar has historically cleaned their streets in town throughout the winter and spring using street sweepers. The frequency of this voluntary effort is determined by weather. As of October 2013, the Public Works Director informed APCD that the streets are swept on a weekly basis unless there is snow on the streets.
- The City of Lamar and immediately surrounding areas require that new developments have paved streets. As of October 2013, the City's Planning Commission is been working on making this an official city ordinance. In the past, it has been required despite the lack of official rule.

### *State Implementation Plan Measures*

Any owner or operator responsible for the construction or maintenance of any existing or new unpaved roadway which has vehicle traffic exceeding 200 vehicles per day in the Lamar attainment/maintenance area and surrounding areas must stabilize the roadway in order to minimize fugitive dust emissions. These statewide requirements are defined in detail in the AQCC's Regulation No. 1 as listed in Table 8.

## City of Lamar

The City of Lamar has been very proactive in addressing potential PM<sub>10</sub> sources within the Lamar area including the application of grass turf at baseball fields, implementing and enhancing a street sweeping program, and chip-seal paving of many unpaved roads. The City of Lamar - Public Works Department has implemented the following BACM controls within the area:

### 1. *Wind Break*

Beginning in the spring of 1997, a wind break of trees was planted north of the Power Plant monitoring site (080990001). The Russian Olive tree wind break is located approximately one



half mile north of the Power Plant monitoring site and will block potential contributing blowing dust sources such as the Lamar Transfer Station and other unpaved equipment traffic areas to the north. The Russian Olive is a quick growing large shrub/small tree that thrives despite the semi-arid and windy climate of Lamar. As of October 2013, the Public Works Director states that most of the trees are still alive and in place. According to section 3.5.2.1 of EPA guidance entitled "*Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures*", dated September 1992, one-row of trees is considered an effective windbreak.

In addition to the plantation of tree wind breaks, a drip irrigation system has been installed to promote sustained tree growth. As of October 2013, the Public Works Director states that the drip system is still operational but due to the drought the City has been on strict water restrictions.

## 2. Landfill Controls

The East Lamar Landfill is located approximately six (6) miles east of the city limits. The landfill has a CDPHE Permit (#09PR1379) which specifies that visible emissions shall not exceed twenty percent (20%) opacity during normal operation of the source and that fugitive PM<sub>10</sub> cannot exceed 5.77 tons per year. The permit also contains a Particulate Emissions Control Plan that states that:

- No off-property transport of visible emissions shall apply to on-site haul roads.
- There shall be no off-property transport of visible emissions from haul trucks.
- All unpaved roads and other disturbed surface areas on site shall be watered as often as needed to control fugitive particulate emissions.
- Surface area disturbed shall be minimized.
- Exposed land areas to be undisturbed for more than six months shall be revegetated.

According to section 3.5.1 of the "Operations and Closure Plan for the East Lamar Landfill", the Director of the Public Works Department and/or the landfill operator is required to do the following litter control measures under high wind conditions:

- Soil cover is required to be placed on the working face of the landfill daily during periods of wind in excess of 30 mph; and,
- The landfill must be closed down when sustained winds reach 35 mph or greater.

An on-site wind gauge monitors wind speed at the landfill. Operators have radios in their equipment connecting them with the main office so that when the decision to close the landfill is made, it can take place immediately. According to the Director of Public Works, landfill operators have been directed to close the landfill at their discretion. Because trash debris (paper) begins to lift and blow into the debris fences at wind speeds of 25 to 30 mph, the operator usually closes the landfill prior to wind speeds reaching 30 mph. The City of Lamar has agreed to make the closure of the Lamar landfill mandatory when wind speeds reach 30 mph, which reduces windblown dust from the landfill as earth moving activities are reduced or eliminated during periods of shut down. As of October 2013, the Public Works Director states that all of these practices are still enforced.

In addition, the placement of chain link fencing and various debris fences have been added to the previous litter entrapment cage. These additional fences better minimize the release of materials during high wind conditions. The Public Works Director states that this is a dynamic process; as the debris moves, the fences are moved too.

### 3. *Vegetative Cover/Sod*

The Lamar Recreation Department installed 100,000 square feet of turf sod at a recreational open space called Escondido Park in the early 2000s. Escondido Park is located in northwest Lamar at 11th and Logan Streets. A sprinkler system has also been installed by the Parks and Recreation Department. The sod provides a vegetative cover for the open area. This dense turf cover provides an effective control against windblown soil from the open area of the park.

In addition, the Lamar Public Works Department stabilizes the entrance road leading to and from Escondido Park with chemical soil stabilizer and chip-seal to reduce dirt tracked out onto city streets and minimize additional releases of PM<sub>10</sub>. This is done on an as needed basis.

### 4. *Additional Public Works Projects*

The Public Works Department implemented the following projects to further reduce emissions of PM<sub>10</sub>:

- The purchase of a TYMCO regenerative air street sweeper (May 2001) which is much more effective in reducing dust during street sweeping activities. The use of this sweeper allows for improved cleaning of the streets (e.g., sweeps the gutter and street);
- The fencing of an area around the City Shop at 103 North Second Street in 2011 to reduce vehicle traffic that may be responsible for lifting dust off of the dirt area between the railroad tracks and the Shop;
- The stabilization of a large dirt and mud hole in 2008 on the north side of the City Shop by installing a curb and gutter that allows for better drainage. This project is credited with keeping mud from being tracked out into the street and becoming airborne by vehicular traffic;
- The ongoing commitment to search for other stabilization projects that benefit the community and improve area air quality, and;
- The relocation of the Municipal Tree Dump in the early 2000s (formerly located in the northeastern corner of the city) to approximately six miles east of the city (now housed at the Municipal Landfill). This relocation eliminates a major source of smoke from agricultural burns that may have previously affected the community.

### **Regulatory Measures - City**

Lamar has an ordinance that requires that all off-street parking lots shall have a dust-free surface to control PM<sub>10</sub> emissions (City of Lamar Charter and Code, ARTICLE XVII, Sec. 16-17-60).

### **Burlington-Northern/Santa Fe Rail Line**

The rail line running east-west of the Lamar Power Plant monitoring site was deemed to be an important PM<sub>10</sub> source during conditions of high winds and low precipitation. Ground disturbance from vehicle traffic, which damages vegetation and breaks-up the hard soil surfaces, resulted in re-entrainment of dust from traffic, high winds or passing trains. This area is problematic in the two block area immediately west of the Power Plant monitoring site as shown in **Error! Reference source not found.** as Site M. Control of this open area requires a

close working agreement between the Burlington-Northern/Santa Fe Railroad Company (BNSF) and the City of Lamar Public Works Department. The purpose of this BACM is to reduce the amount of particulate matter susceptible to wind erosion under high wind conditions and general re-entrainment of dust in the ambient air as a result of local train traffic passing in close proximity of the PM10 monitor.

In September 1997, the City chemically stabilized exposed lands north of the rail line between Fourth and Second Street where there was evidence of vehicle traffic. All other lands on either side of the rail road tracks between Main Street (Fifth) and Second Street and extending westward have either natural, undisturbed ground cover or it is used for commercial/recreation purposes that do not allow for significant re-entrainment (BNSF is responsible for maintaining 50 feet of property on either side of the main track). Most of these lands are leased by the City. After September 1997, the City negotiated the lease of these lands. Once acquired, a long term plan, will be developed for these lands such as restricting vehicle access, permanently stabilizing lands with vegetation and gravel, increasing park and recreational use, and using the lands for city maintenance and storage activities. As of October 2013, the Public Works Director stated that gravel has been periodically added to minimize blowing dust.

According to the Manager of Environmental Operations for BNSF, the railroad company owns the main rail line and 200 feet on either side of the track. Much of this property has been sold or leased under private contracts. At this time BNSF is responsible only for the main rail line and for 50 feet of property on either side of the main track. All property sold or under contract is not the responsibility of BNSF. As a result, BNSF has stabilized the railroad corridor 50 feet on either side of the main rail line.

In May 1997, BNSF placed chips (gravel) 50 feet on either side of the main track from Main Street to Second Street (three blocks) to control fugitive dust emissions from this section of the track. Graveling exposed surfaces not exposed to regular vehicle traffic is considered a permanent mitigation measure. Details of this arrangement can be found in the documentation under the 1998 SIP Maintenance Plan submittal.

## **Prowers County**

### *Prowers County Land Use Plan:*

Beginning in 1997, Prowers County with the assistance of local officials, environmental health officers and the general public began preparing a county land use plan. The Prowers County Land Use Plan is designed to have wide-reaching authority over the myriad of land use issues involving building (construction sites), citing, health, fire, environmental codes, and other social concerns associated with the City of Lamar and Prowers County. The county land use plan, entitled “*Guidelines and Regulations for Areas and Activities of State Interest - County of Prowers - State of Colorado*”, was adopted on April 19, 2004 and amended on August 17, 2006. The plan incorporates provisions to minimize airborne dust including re-vegetation of disturbance areas associated with land development. The Prowers County Land Use Master Plan can be found on the County’s website at: <http://www.prowerscounty.net>.

Regulations and ordinances of the Land Use Plan specific to reducing blowing dust and its impacts include:

- Additional regulations on development of fragile lands and vegetation to protect topsoil;
- Development of performance standards and best management practices to prevent soil erosion;
- Development of best management practices to reduce blowing sands and movement of area sand dunes across the county;
- Development of new special use permits to address the citing of animal feedlots and feed yards;
- Development of special use permits for other future stationary sources. The special use permits will also likely include the requirement for comprehensive fugitive dust control plans for both construction and operation of facilities;
- Consideration and review of enforcement capabilities through the area zoning ordinances, and;
- Planned public review and comment processes following the legal update of the draft County Land Use Plan.

### **Windblown Dust from Disturbed Soils**

The City of Lamar is located in Prowers County in southeastern Colorado. Situated along the Arkansas River and near the Kansas border, Lamar serves as the largest city and the agricultural center for southeast Colorado. The area surrounding Lamar consists of gently rolling to nearly level uplands where the dominant slopes are less than 3 percent. The climate is generally mild and semiarid. Annual precipitation is about 15 inches. Summers are long and have hot days and cool nights. In winter and spring, windstorms are common, especially in drier years. It is due to these high velocity dust storms and drought conditions that Lamar experiences most of the PM<sub>10</sub> problems for the area. Figure 22 through Figure 31 illustrate potential areas of local soil disturbance that have been evaluated by the APCD for the Lamar Power Plant (080990001) and Lamar Municipal PM<sub>10</sub> monitors (080990002).

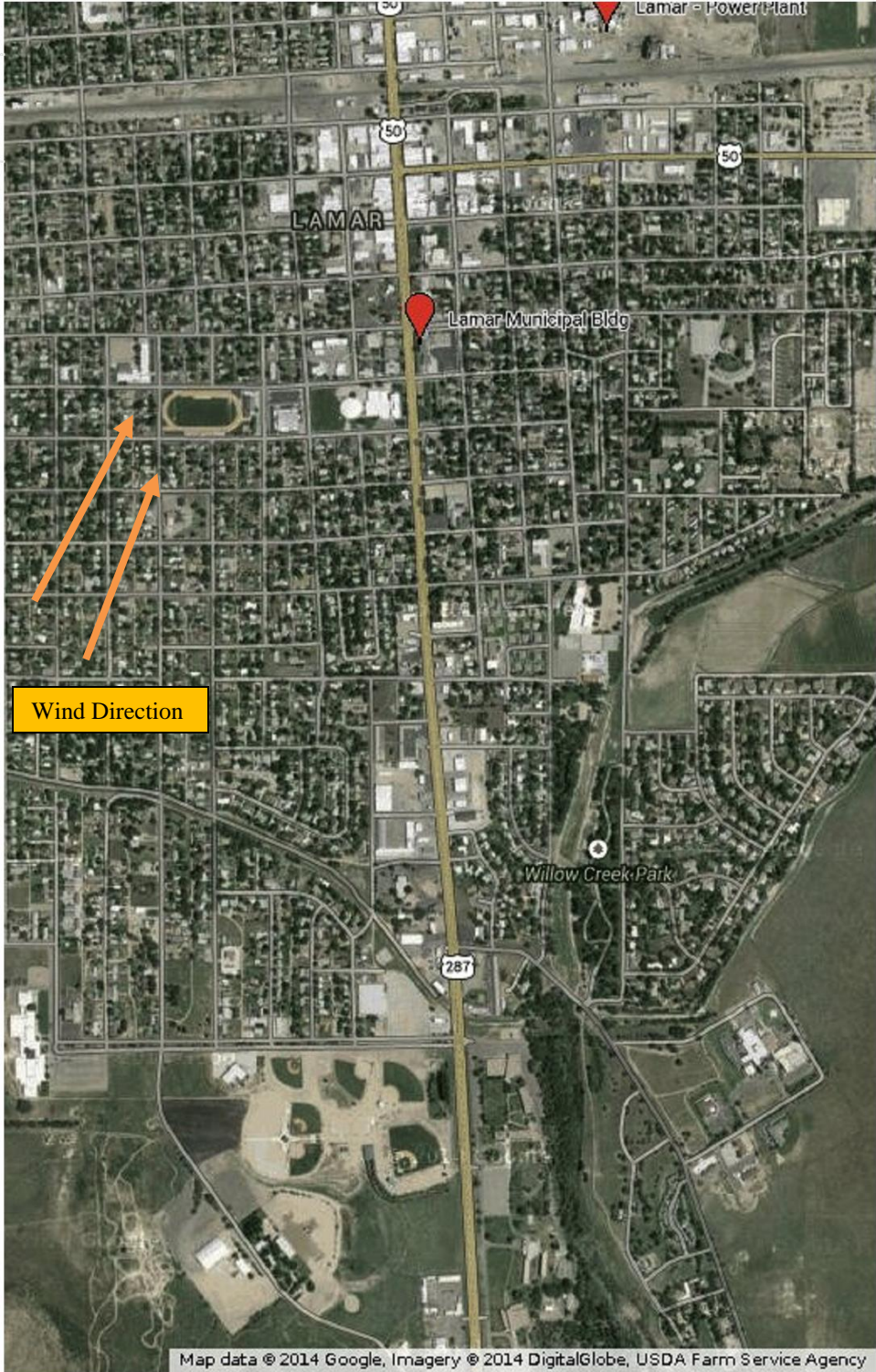


Figure 22: Wind Direction relative to Lamar Power Plant PM<sub>10</sub> monitor and Lamar Municipal PM<sub>10</sub> monitor for the November 10, 2012 event. (Google Image 2014)

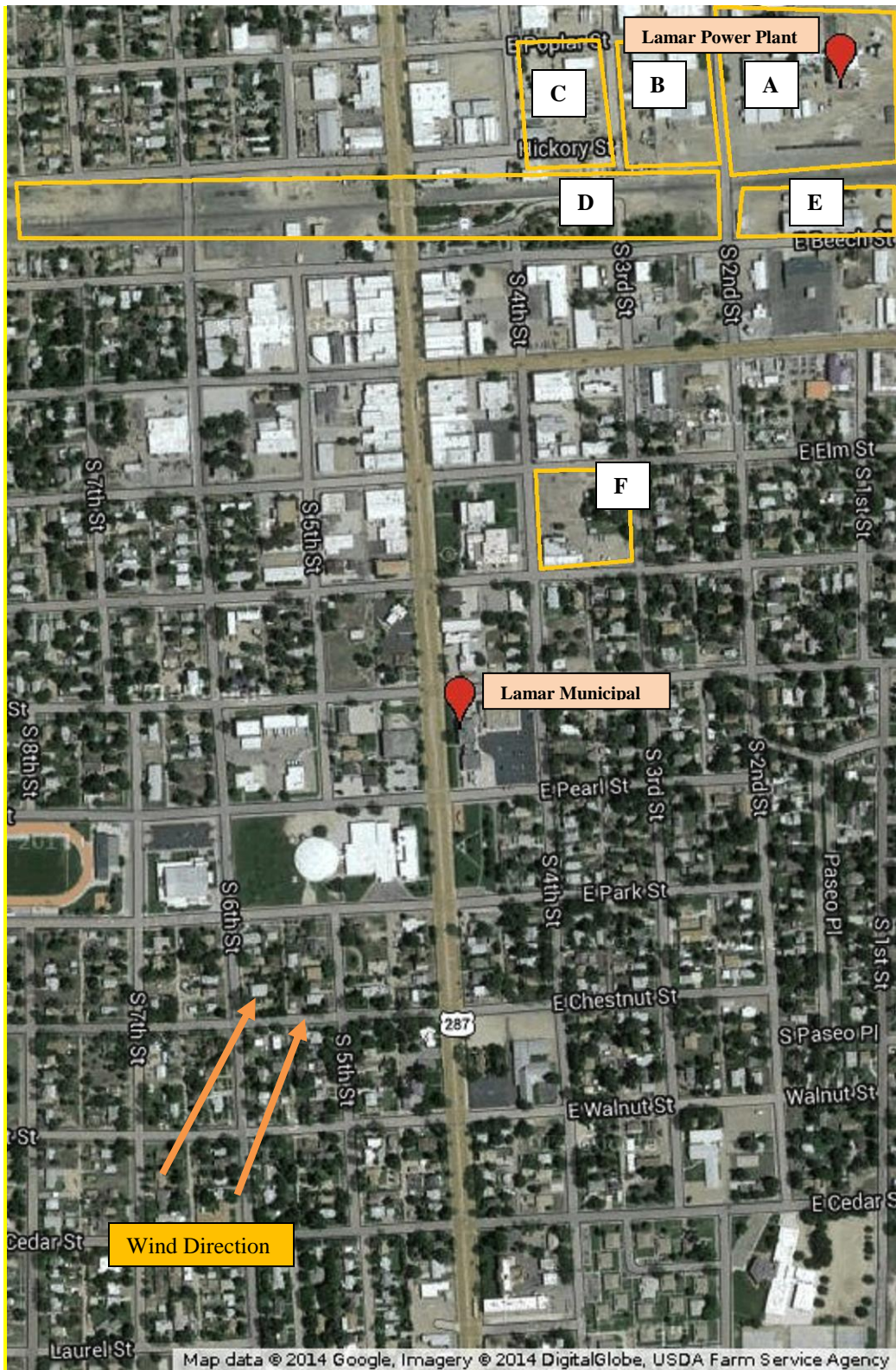


Figure 23: Southwest of Lamar Power Plant PM<sub>10</sub> monitor and Lamar Municipal PM<sub>10</sub> monitor for the November 10, 2012 event. (Google Image 2014)

Site A in Figure 23 is the power plant that the Lamar PM<sub>10</sub> monitor is located within at 100 North 2nd Street. “Lamar Light and Power” historically operated a natural gas-fired boiler that produced steam for a 25 MW turbine/generator set. This boiler was constructed prior to 1972 and was grandfathered from construction permitting requirements. In the early 2000s, factors such as increasing costs of natural gas made the plant uneconomical to run. As a result, Lamar Light and Power purchased power and ran the natural gas-fired boiler very infrequently or not at all. In February 2006, APCD issued a permit for Lamar Light and Power to replace the existing natural gas-fired boiler with a coal-fired circulating fluidized bed (CFB) boiler rated at approximately 42 MW. The conversion prompted legal challenges from Lamar residents partnered and WildEarth Guardians, a New Mexico-based environmental group. Lamar Light and Power settled and agreed to shut down the coal-fired power plant. The power plant was shut down on November 11, 2011. The settlement also calls for the plant to stay offline until at least 2022, when the current agreement to supply electricity to Lamar and other communities expires.

“Lamar Light and Power” has an air quality permit (CDPHE # 05PR0027). The permit includes the following point and fugitive dust control measures:

- Limestone and ash handling, processing, and storage are controlled by high efficiency baghouses.
- Water wash-down-systems are used for flushing down any accumulated dust on walkways, platforms, and other surfaces to prevent re-entrainment of the dust into the atmosphere.
- On-site haul roads are paved, and these surfaces are inspected at least once each day in which hauling activities occur, and cleaned as needed. Various cleaning methods are used depending on the extent of dust accumulations. These activities emit less than 1 ton per year of PM<sub>10</sub> and are APEN Exempt.
- All transport vehicles containing substances that potentially generate fugitive particulate matter emissions (such as trucks containing limestone, inert material, or ash) are fully enclosed, or covered with a mechanical closing lid or a tight tarp-like cover at all times while on the facility grounds except during loading / unloading operations.
- Emissions from emergency coal stockpile are effectively controlled with a water dust suppression system.

Access to the power plant is restricted by security fences. The APCD considers the enforceable conditions of the permit, including identified Best Available Control Technology (BACT) for limestone and ash handling, paving, wash-down systems, and enclosures, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site. The winds speeds on November 10, 2012 did exceed the blowing dust thresholds of 30 mph or greater and gusts of 40 mph or greater at which the APCD expects stable surfaces (i.e., controlled anthropogenic and undisturbed natural surfaces) to be overwhelmed (wind speeds were as high as 54 mph with wind gusts up to 68 mph).

Site B in Figure 23 is west of the Lamar PM<sub>10</sub> monitor at about 103 North 2<sup>nd</sup> Street. It is the “Lamar Water Department”. Also on site B is the “Lamar-Prowers County Volunteer Fire Department” at 300 E Poplar Street. Both sites have restricted access with security fences. The City of Lamar maintains their gravel lots by grating and watering them on an as needed basis. The APCD considers maintained gravel, limited access, grating, and watering to be the appropriate available and practical method for a small site of this size in this area of Colorado

that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site C in Figure 23 is west of the Lamar PM<sub>10</sub> monitor. The site is shared by a few businesses. All businesses have restricted access by fences surrounding the property. “Cowboy Corral Storage” at 102 North 4<sup>th</sup> St is one of the businesses on the lot. It has a very small gravel parking lot and is no longer in business according to the previous owner as of October 2013. The storage company has a small gravel parking lot with access being restricted by a security fence as shown in Figure 24. The lot is also shared with the “Powers Area Transit” county bus garage. The bus garage is very small, only four bays. The garage has a concrete slab that runs to the asphalt road to avoid the busses driving on the gravel in order to mitigate fugitive dust. The gravel lot is watered on an as needed basis. The other business is an old feed supply company with grain storage as shown in Figure 25. The feed supply company is out of business and the grain elevators are not being utilized. The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple small businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.



Figure 24: Cowboy Corral Storage (Google Image 2012)



Figure 25: Feed Storage Company (Google Image 2012)



Site D in Figure 23 is the Burlington Northern Santa Fe railroad that runs past the Lamar PM<sub>10</sub> monitor to the south. On either side of the rail road tracks is gravel as shown in Figure 26. In May 1997, Burlington Northern Santa Fe placed chips (gravel) 50 feet on either side of the main track from Main Street to Second Street (three blocks) to control fugitive dust emissions from this section of the track. Graveling exposed surfaces not exposed to regular vehicle traffic is considered a permanent mitigation measure. Also, all the train tracks are raised up on 3 inch diameter rock and tracks. Areas that are not used by the railroad are allowed to be naturally vegetated with Xeriscape. With regard to AQCC Regulation 1 requirements (Section III.D), the APCD considers gravel and 'Xeriscape' vegetation to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this type of source.



**Figure 26: Railroad tracks with gravel on each side (Google Image 2012)**

Site E in Figure 23 is Colorado Mills LLC a facility that produces sunflower oil and processes the leftover solids combined with grains and additives into feed that used locally for cattle and hogs. APDC issued the initial permit 95PR622 for this facility in 1996 to Cargill, Inc. A final approval permit and two transfers of ownership have since been issued in 1997, 1999 and 2000 respectively and the facility is now owned and operated by Colorado Mills, LLC. The permit includes the following point and fugitive dust control measures:

- Visible emissions shall not exceed 20% opacity during normal operations and 30% opacity at all other times.
- Permit limits on Particulate Matter
- Requirement to follow the developed Operation and Maintenance plan

This Facility was inspected by the APCD on 2/14/2012 and no visible emissions were observed. Records review revealed that Colorado Mills has been in compliance with their permitted emission limits. An Operating and Maintenance Plan was submitted to the APCD for this facility on November 21, 1996 and approved by the APCD on December 24, 1996. The General Manager of the facility stated during the inspection that Colorado Mills conducts monthly inspection and maintenance on process and control equipment at the facility and no evidence was observed during the inspection to suggest that process and control equipment at the facility are not operated and maintained in a manner consistent with good air pollution

control practices for minimizing emissions. Additionally, particulate emissions from oil extraction activities, grinding of grains, extruding and materials conveyance are controlled by several cyclones. The APCD considers the enforceable conditions of the permit, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site.

Site F in Figure 23 is southwest of the Lamar PM<sub>10</sub> monitor. It is located at about 356 South 4<sup>th</sup> Street. Part of the property is owned by Century Link. Century Link has a storage lot for fleet vehicles that is well maintained gravel. Access to the storage lot is restricted by a fence as shown in Figure 27. A large part of site F is a free public gravel parking lot for the Prowers County Jail and the Prowers County Municipal Court as shown in Figure 28. The lot is maintained by the County. The parking lot is chip sealed and covered in crushed gravel. Site F, as shown in Figure 27, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers maintained gravel and limited access to be the appropriate available and practical method for a small site of this size in this area of Colorado that has been designated a drought area for years, is in an economic recession, and is owned by multiple businesses to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.



**Figure 27: Site F- Century Link Fleet Storage Lot (Google Image 2012)**



**Figure 28: Site F- Parking lot for the Prowers County Jail and the Prowers County Municipal Court (Google Image 2012)**

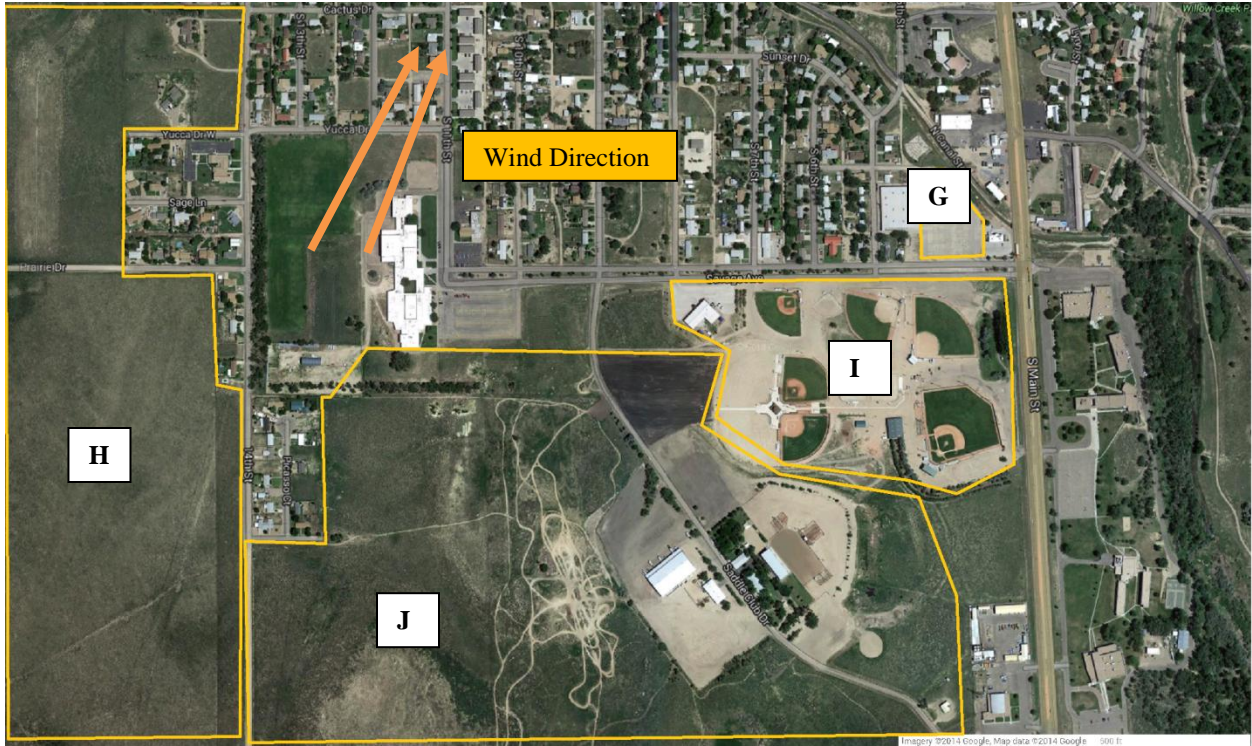


Figure 29: Further South of Lamar Power Plant PM10 monitor and Lamar Municipal PM10 monitor for the November 10, 2012 event. (Google Image 2014)

Site G in

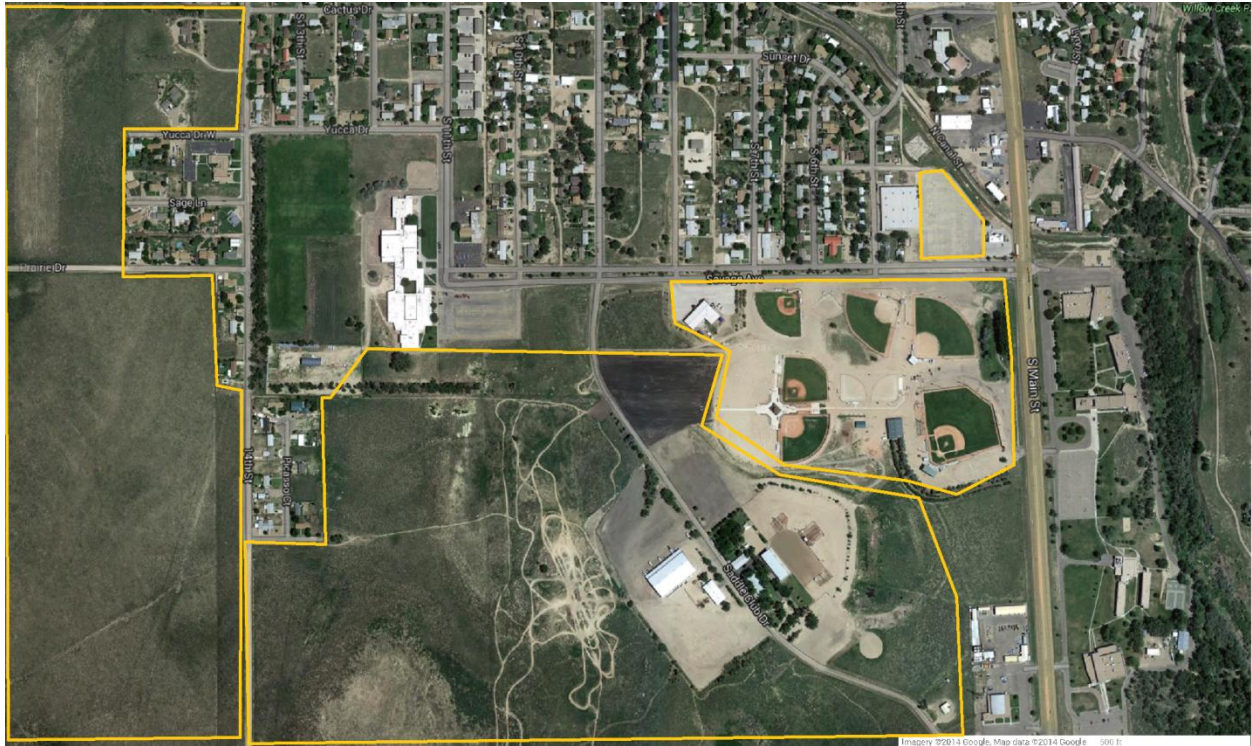


Figure 29 is further south/southwest of the Lamar PM10 monitors. It is located at approximately 106 Savage Ave. This parking lot has been paved over and is not a source of PM<sub>10</sub>.

Site H in

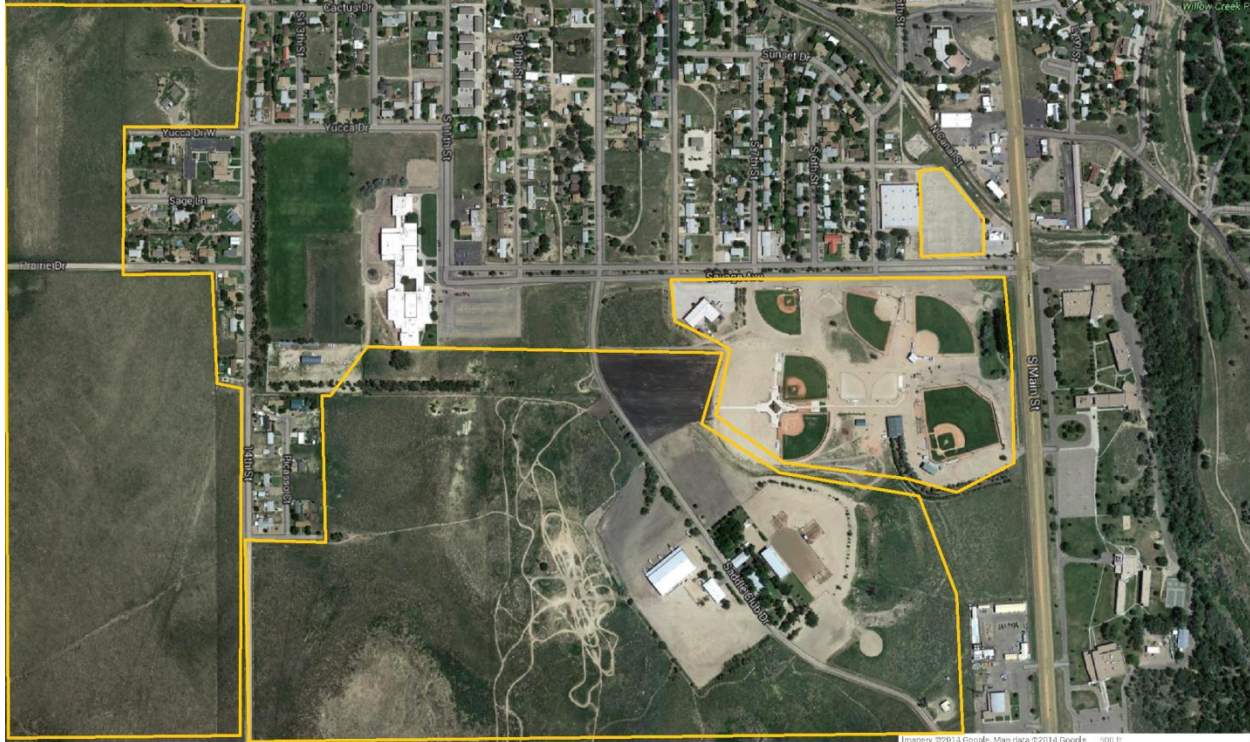


Figure 29 is restricted access property located just south of County Road 6.5 and Fort Bent Canal. The land is naturally vegetated and undisturbed as shown in Figure 30. Figure 30 demonstrates that this site has minimally (if any) disturbed soil as of this writing. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.



rotamilling and pea gravel in to help with dust control. Rotamilling is ground up asphalt that has been spread across parts of the parking areas and much of the open areas around the fields consist of pea gravel. The city will also drag the parking areas and apply water as needed for dust. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site. The fields are turf and regularly watered as shown in Figure 31. This complex is well maintained by the City and implements reasonable dust control measures on a regular basis.



**Figure 31: Lamar Ball Complex (Google Image 2012)**

Site J in

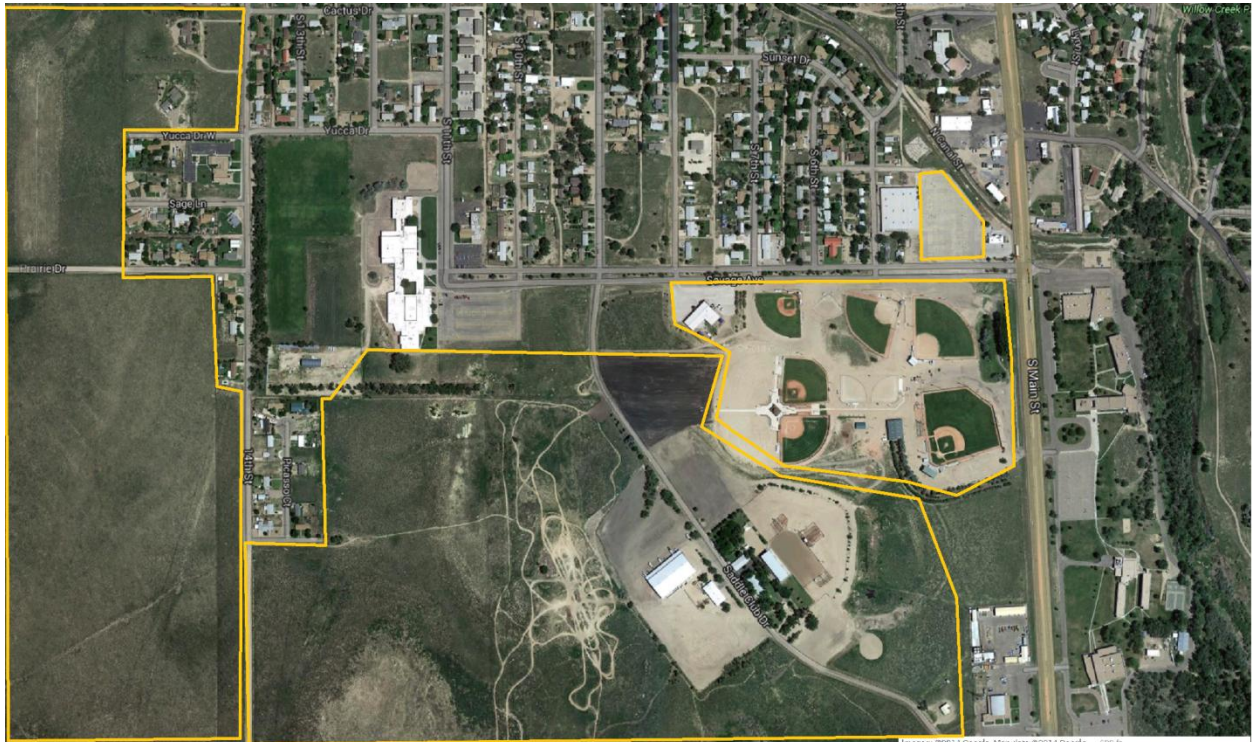


Figure 29 is the Prowers County Fairgrounds located at 2206 Saddle Club Dr. The land is maintained by the county and is graded annually and watered frequently during most of the year. County personnel reported that the facility is frequently used from April to September and watered as needed during these times. The APCD considers pavement, maintained gravel, natural vegetation, and restricted access to be the appropriate available and practical methods that are technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

### Colorado State University CO-OP Extension Office

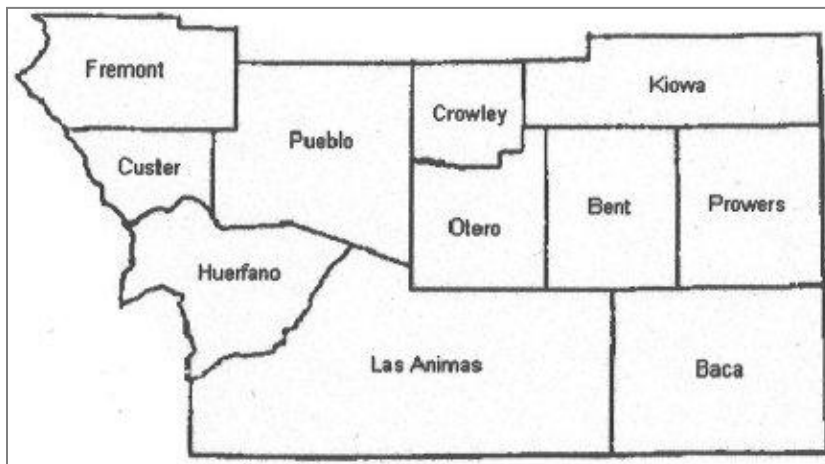
While the following initiatives are not meant to be enforceable, the CSU Co-Op Extension Office has many efforts underway that further reduce blowing dust and its impacts. These include:

- Crop residue efforts that encourage no- or low-till practices. These have been deemed appropriate and useful in reducing blowing dust.
- Ongoing outreach efforts to educate area agricultural producers on soil management programs. These include one-on-one visitations and annual meetings with various corn and wheat programs to discuss crop management.
- Drought workshops to protect topsoil throughout the county.

### USDA: Natural Resources Conservation Service (NRCS)

1. *Conservation Reserve Program*

Prowers County is a predominately agricultural area that is made up of 1,053,037 acres of land area - 1,037,336 acres (or 92.7%) of which is land in farms.<sup>2</sup> For comparison, Baca County to the south is 78.4% land in farms, Bent County to the west is 88.9% land in farms, and Kiowa County to the north is 83.8% land in farms. It should be noted that cropland percentage in Bent County is lower than other Southeast Colorado counties at 21%. Figure 32 illustrates the counties of Southeast Colorado. Of the farm land acreage in Prowers County, cropland accounts for over half of the total (552,476 acres) and is approximately 53% of the total land in the county. Water, and often the lack of it, coupled with the frequent high winds experienced during late fall and early spring commonly destroy crops, encourage pests, and damage soil surfaces lending them susceptible to wind erosion, especially in recent drought years. Prowers County has been in a severe drought for almost three years, and entered an extreme drought in 2013. In 2011, most of Prowers County cropland acreage is farmed using dryland practices (versus irrigated) and consists of soils classified as highly-erodible-land (HEL) by the Department of Agriculture.



**Figure 32: Southeast Colorado Counties**

Recognizing the problems associated with erodible land and other environmental-sensitive cropland, the U.S. Department of Agriculture (USDA) included conservation provisions in the Farm Bill. This legislation created the Conservation Reserve Program (CRP) to address these concerns through conservation practices aimed at reducing soil erosion and improving water quality and wildlife habitat.

The CRP encourages farmers to enter into contracts with USDA to place erodible cropland and other environmentally-sensitive land into long-term conservation practices for 10-15 years. In exchange, landowners receive annual rental payments for the land and cost-share assistance for establishing those practices.

The CRP has been highly successful in Prowers County by placing approximately 156,195 acres of Prowers County cropland, or 27% of total cropland, under contract. Most of this land has been planted with a perennial grass cover to protect the soil and retain its moisture. Strong support of the program by Prowers County farmers continues as 38% of the counties HEL cropland has been offered for conservation practices. Prowers County employs NRCS

<sup>2</sup> 2007 Census of Agriculture. Vol. 1: Geographic Area Series, Part 6 Colorado State & County Data. U.S. Dept. Of Commerce: Bureau of Census.



practices at approximately 1.6 times the rate of the surrounding nine-county Southeast Colorado area (including Bent, Kiowa, Baca, Crowley, Otero, Las Animas, Cheyenne, Lincoln, and Prowers) as of 2011.

While the following initiatives are not meant to be enforceable, many efforts are underway that further reduce blowing dust and its impacts. These include:

- The CRP has moved to include all available area lands into area contracts. These contracts are good through 2007. Success of the CRP initiatives is measured through ongoing monitoring of the contracts to ensure ample grass coverage to minimize blowing dust.
- CRP sends out information several times per year through radio and the area newspaper to further reach farmers interested in topsoil protection.
- In response to the significant Colorado drought (2011-2013) the NRCS and FSA are working with multiple parties in extensive annual planning efforts to limit blowing dust and its impacts. These planning efforts change year to year depending on the severity of the drought.

## 2. *Limestone-Graveyard Creeks Watershed Project*

A watershed improvement project is currently underway in the Limestone-Graveyard Creeks Watershed. This project covers approximately 60,000 acres of land north of the Arkansas River between Hasty (Bent County) and Lamar. An estimated 44,500 acres of the watershed area are classified as priority land due to the highly erodible nature of the soil. Over 2,000 acres of agricultural cropland northwest of Lamar are included in this watershed project. As of 2013, NRCS informed the APCD that this project is approximately 99% complete.

Working with the NRCS, each farmer will create their own conservation plan with costs for improvements split equally between farmers and the federal government. The 15-year project will help reduce soil erosion and improve water quality and efficiency through conservation tillage practices and/or other conservation efforts. In short, the Limestone-Graveyard Creeks Watershed Project will help to reduce soil erosion and lower the impacts of blowing soils during future high wind events.

More recently (since the 1998 NEAP submittal), the Watershed project has been evaluated and is seen as an ongoing successful program as most eligible acres are signed up.

## 3. *New Initiatives*

While the following initiatives are not meant to be enforceable, the Natural Resources Conservation Service has many efforts underway that further reduce blowing dust and its impacts. These include:

- A comprehensive rangeland management program;
- Tree planting program;
- Drip irrigation purchase program, and;
- A multi-party drought response planning effort coordinated through the State of Colorado Governor's office.

- In 2013, NRCS also tried a proactive approach to drought management by offering producers incentives to mitigate erosion hazard areas before they became an erosion problem.

These are but a few of the efforts at the local, county, and regional level underway to reduce emissions of  $PM_{10}$  and limit impacts.

## 6.0 Summary and Conclusions

**APCD is requesting concurrence on exclusion of the PM<sub>10</sub> values from Lamar Power Plant (08-099-0001) and Lamar Municipal Building (08-099-0002) on November 10, 2012.**

Elevated 24-hour PM<sub>10</sub> concentrations were recorded in parts of Colorado on November 10, 2012. All of the noted November 10, 2012, twenty-four-hour PM<sub>10</sub> concentrations were above the 90<sup>th</sup> percentile concentrations for their locations (see Table 5). This event exceeded the 99<sup>th</sup> percentile values for these monitors. The statistical and meteorological data clearly shows that but for this high wind blowing dust event, Lamar would not have exceeded the 24-hour NAAQS on November 10, 2012. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM<sub>10</sub> dust from distant sources in these areas. This is evidence that the event was associated with a measured concentration in excess of normal historical fluctuations including background.

The PM<sub>10</sub> exceedance at the Power Plant site and near-exceedance at the Municipal Building site in Lamar on November 10, 2012, would not have occurred if not for the following: (a) dry soil conditions over New Mexico and southern Colorado with 30-day precipitation totals below the threshold identified as a precondition for blowing dust in New Mexico and south-central and southeast Colorado; and (b) a surface low pressure system and vigorous cold front that were associated with a strong upper-level trough that caused strong surface winds over the area of concern.

Surface weather observations from Colorado and New Mexico provide strong evidence that a dust storm took place on November 10, 2012. The combination of intense surface winds in advance of an approaching cold front, with a strong upper-level trough that was moving across the western United States caused regional surface winds over 40 mph with gusts exceeding 50 mph for several hours. These speeds are above the thresholds for blowing dust identified in EPA draft guidance and in detailed analyses completed by the State of Colorado (see Blowing Dust Climatologies available at [http://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx#misc2](http://www.colorado.gov/airquality/tech_doc_repository.aspx#misc2)). Specifically, these high values were the consequence of intense surface winds in advance of an approaching cold front. The surface winds were predominantly out of a southwesterly direction which moved over dry soils in southeast Colorado and northeast New Mexico, producing significant blowing dust. These PM<sub>10</sub> exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large area of New Mexico and southern Colorado. These sources are not reasonably controllable during a significant windstorm under abnormally dry or moderate drought conditions.

Both wind speeds and soil moisture in New Mexico and southern and eastern Colorado were conducive to the generation of significant blowing dust. Multiple sources of data for the event in question and analyses of past dust storms in this area prove that this was a natural event and, more specifically, a significant natural dust storm originating in New Mexico, and southern Colorado. But for the dust storm on November 10, 2012, this exceedance would not have occurred.

As demonstrated in this report, the PM<sub>10</sub> exceedances in Lamar on November 10, 2012, would not have occurred “but for” the large regional dust storm on November 10, 2012.

## 7.0 References

Draxler, R.R. and G.D. Rolph. 2012. *HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website* (<http://ready.arl.noaa.gov/HYSPLIT.php>). NOAA Air Resources Laboratory, Silver Spring, MD.

Marticorena, B., G. Bergametti, D. Gillette, and J. Belnap. 1997. Factors controlling threshold friction velocity in semiarid and arid areas of the United States, *Journal of Geophysical Research* 102 D19, 23,277-23, 287.

United States Environmental Protection Agency, June 2012. *Draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule.*

## **Appendix A**

### **Weather Advisories and Text Products Blowing Dust Event November 10, 2012**

007  
WWUS75 KPUB 101539  
NPWPUB

**URGENT - WEATHER MESSAGE**  
NATIONAL WEATHER SERVICE PUEBLO CO  
839 AM MST SAT NOV 10 2012

COZ088-089-093>099-102145-  
/O.NEW.KPUB.HW.W.0013.121110T1600Z-121111T0100Z/  
TRINIDAD VICINITY/WESTERN LAS ANIMAS COUNTY BELOW 7500 FT-  
CROWLEY COUNTY-LA JUNTA VICINITY/OTERO COUNTY-  
EASTERN LAS ANIMAS COUNTY-WESTERN KIOWA COUNTY-  
EASTERN KIOWA COUNTY-LAS ANIMAS VICINITY/BENT COUNTY-  
LAMAR VICINITY/PROWERS COUNTY-SPRINGFIELD VICINITY/BACA COUNTY-  
INCLUDING...TRINIDAD...ORDWAY...OLNEY SPRINGS...LA JUNTA...  
ROCKY FORD...BRANSON...KIM...EADS...SHERIDAN LAKE...LAS ANIMAS...  
**LAMAR**...SPRINGFIELD...WALSH  
839 AM MST SAT NOV 10 2012

...HIGH WIND WARNING IN EFFECT UNTIL 6 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN PUEBLO HAS ISSUED A HIGH WIND  
WARNING...WHICH IS IN EFFECT UNTIL 6 PM MST THIS EVENING.

\* LOCATION...THE EASTERN PLAINS OF COLORADO...GENERALLY EAST OF A  
LA JUNTA TO TRINIDAD.

\* CAUSE AND TIMING...A STRONG PACIFIC STORM WILL BRING WIND GUSTS  
TO 60 MPH TO THE REGION. THE STRONGEST WINDS WILL OCCUR THIS  
MORNING THROUGH MID AFTERNOON.

\* WIND...WEST TO SOUTHWEST 25 TO 35 MPH WITH GUSTS TO 60 MPH.

\* IMPACT...WINDS WILL CAUSE DIFFICULT DRIVING CONDITIONS. IN  
ADDITION...IF A FIRE SHOULD START IT WILL CAUSE EXTREME FIRE  
BEHAVIOR.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

HIGH WINDS CAPABLE OF CAUSING POWER OUTAGES AND PROPERTY DAMAGE  
ARE EXPECTED.

THESE WINDS CAN CAUSE LIGHTWEIGHT OBJECTS TO BECOME DANGEROUS  
AIRBORNE PROJECTILES. HIGH PROFILE VEHICLES AND VEHICLES PULLING  
TRAILERS CAN BE FLIPPED BY CROSSWINDS. BLOWING DUST CAN QUICKLY  
REDUCE VISIBILITY TO NEAR ZERO...RESULTING IN HAZARDOUS DRIVING  
CONDITIONS AND ACCIDENTS INVOLVING MOTORISTS TAKEN BY SURPRISE.

BLOWING DUST OR SAND CAN ALSO BE A HEALTH HAZARD FOR THOSE WITH RESPIRATORY PROBLEMS. SECURE LIGHTWEIGHT OBJECTS. AVOID TRAVELING ON ROADS WITH CROSSWINDS.

&&

\$\$

155

WWUS75 KABQ 101101

NPWABQ

**URGENT - WEATHER MESSAGE**

NATIONAL WEATHER SERVICE ALBUQUERQUE NM

401 AM MST SAT NOV 10 2012

...STRONG SOUTHWEST WINDS TO IMPACT NEW MEXICO...

.WINDS ARE FORECAST TO INCREASE SIGNIFICANTLY TODAY AHEAD OF AN APPROACHING COLD FRONT. WIND SPEEDS WILL REACH THEIR PEAK OVER CENTRAL AND EASTERN NEW MEXICO AROUND MID DAY AS STRONG JET STREAM SHIFTS EAST OVER THE AREA. VERY STRONG AND POTENTIALLY DAMAGING WINDS WILL BE POSSIBLE ALONG THE CENTRAL AND SOUTH CENTRAL MOUNTAINS BEGINNING EARLY THIS MORNING...AND THESE WINDS WILL SPREAD ONTO THE ADJACENT HIGHLANDS AND PLAINS BY LATE MORNING. AREAS OF BLOWING DUST ARE ALSO EXPECTED WITH THE STRONGER WINDS.

NMZ527-530-534-101900-

/O.UPG.KABQ.WI.Y.0046.121110T1300Z-121111T0300Z/

/O.EXA.KABQ.HW.W.0014.121110T1300Z-121111T0300Z/

RATON RIDGE/JOHNSON MESA-UNION COUNTY-QUAY COUNTY-

401 AM MST SAT NOV 10 2012

...HIGH WIND WARNING IN EFFECT UNTIL 8 PM MST THIS EVENING...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT UNTIL 8 PM MST THIS EVENING. THE WIND ADVISORY HAS BEEN UPGRADED AND IS NO LONGER IN EFFECT.

\* LOCATION...RATON RIDGE/JOHNSON MESA AND PORTIONS OF THE EAST CENTRAL AND NORTHEAST PLAINS.

\* WINDS...SOUTHWEST SUSTAINED AT 35 TO 45 MPH WITH OCCASIONAL GUSTS BETWEEN 55 TO 60 MPH.

\* TIMING...STRONG TO DAMAGING SOUTHWEST WINDS WILL DEVELOP IN THE EARLY TO MID MORNING AND CONTINUE THROUGH SUNSET.

\* VISIBILITY...OCCASIONAL AND SOMETIMES SUDDEN REDUCTIONS IN VISIBILITY BELOW 2 MILES CAN BE EXPECTED IN DUST PRONE AREAS

**SUCH AS OPEN FIELDS AND ONGOING CONSTRUCTION SITES.**

\* LOCAL IMPACTS... VISIBILITY WILL DROP SUDDENLY AT TIMES IN DUST PRONE AREAS. HAZARDOUS CROSS WINDS WILL IMPACT NORTHWEST TO SOUTHEAST ORIENTED ROADS. LOOSE OBJECTS WILL BECOME AIRBORNE AND LIGHT WEIGHT STRUCTURES MAY TOPPLE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

\$\$

NMZ521>526-528-529-531>533-537>540-101900-  
/O.CON.KABQ.HW.W.0014.121110T1300Z-121111T0300Z/  
SANDIA/MANZANO MOUNTAINS-ESTANCIA VALLEY-CENTRAL HIGHLANDS-  
SOUTH CENTRAL HIGHLANDS-UPPER TULAROSA VALLEY-  
SOUTH CENTRAL MOUNTAINS-FAR NORTHEAST HIGHLANDS-  
NORTHEAST HIGHLANDS-HARDING COUNTY-EASTERN SAN MIGUEL COUNTY-  
GUADALUPE COUNTY-DE BACA COUNTY-CHAVES COUNTY PLAINS-  
EASTERN LINCOLN COUNTY-SOUTHWEST CHAVES COUNTY-  
401 AM MST SAT NOV 10 2012

...HIGH WIND WARNING REMAINS IN EFFECT UNTIL 8 PM MST THIS EVENING...

\* LOCATION...SANDIA/MANZANO MOUNTAINS...ESTANCIA VALLEY...FAR NORTHEAST...NORTHEAST...CENTRAL AND SOUTH CENTRAL HIGHLANDS... AND TULAROSA VALLEY...SOUTH CENTRAL MOUNTAINS AND THE EASTERN PLAINS FROM ROY TO ROSWELL.

\* WINDS...SUSTAINED SOUTHWEST WINDS OF 35 TO 45 MPH WITH OCCASIONAL GUSTS BETWEEN 55 AND 65 MPH.

\* TIMING...THE STRONGER WINDS WILL DEVELOP EARLY SATURDAY MORNING AT HIGHER ELEVATIONS...THEN SPREAD TO LOWER ELEVATIONS BY LATE MORNING. WIND SPEEDS WILL DIMINISH SOMEWHAT AFTER DARK.

\* VISIBILITY...OCCASIONAL AND SOMETIMES SUDDEN REDUCTIONS IN VISIBILITY BELOW 2 MILES CAN BE EXPECTED IN DUST PRONE AREAS SUCH AS OPEN FIELDS AND ONGOING CONSTRUCTION SITES. LOWER TERRAIN AREAS WILL BE MOST IMPACTED BY THE BLOWING DUST.

\* LOCAL IMPACTS...VISIBILITY WILL DROP SUDDENLY AT TIMES IN DUST PRONE AREAS. HAZARDOUS CROSS WINDS WILL IMPACT NORTHWEST TO



SOUTHEAST ORIENTED ROADS...LIKE ROUTE 120 FROM OCATE TO ROY AND HIGHWAY 285 FROM VAUGHN TO MESA. LOOSE OBJECTS WILL BECOME AIRBORNE AND LIGHT WEIGHT STRUCTURES MAY TOPPLE.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

REMEMBER...A HIGH WIND WARNING MEANS DAMAGING WINDS ARE IMMINENT OR HIGHLY LIKELY. SUSTAINED WIND SPEEDS OF AT LEAST 40 MPH OR GUSTS OF 58 MPH OR MORE CAN LEAD TO PROPERTY DAMAGE.

&&

\$\$

NMZ516-101900-  
/O.EXA.KABQ.WI.Y.0046.121110T1300Z-121111T0000Z/  
UPPER RIO GRANDE VALLEY-  
401 AM MST SAT NOV 10 2012

...WIND ADVISORY IN EFFECT UNTIL 5 PM MST THIS AFTERNOON...

THE NATIONAL WEATHER SERVICE IN ALBUQUERQUE HAS ISSUED A WIND ADVISORY...WHICH IS IN EFFECT UNTIL 5 PM MST THIS AFTERNOON.

\* LOCATION...UPPER RIO GRANDE VALLEY.

\* WINDS...SOUTHWEST SUSTAINED AT 25 TO 35 MPH WITH GUSTS BETWEEN 40 AND 50 MPH.

\* TIMING...STRONG WINDS WILL DEVELOP IN THE EARLY TO MID MORNING PERIOD THEN PERSIST THROUGH THE AFTERNOON.

\* VISIBILITY...OCCASIONAL AND SOMETIMES SUDDEN REDUCTIONS IN VISIBILITY BELOW 2 MILES CAN BE EXPECTED IN DUST PRONE AREAS SUCH AS OPEN FIELDS AND ONGOING CONSTRUCTION SITES.

\* LOCAL IMPACTS...TAKE ACTION TO SECURE TRASH CANS...LAWN FURNITURE...AND OTHER LOOSE OR LIGHTWEIGHT OUTDOOR OBJECTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELLING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

&&

\$\$

NMZ535-536-101900-

/O.CON.KABQ.WI.Y.0046.121110T1300Z-121111T0300Z/  
CURRY COUNTY-ROOSEVELT COUNTY-  
401 AM MST SAT NOV 10 2012

...WIND ADVISORY REMAINS IN EFFECT UNTIL 8 PM MST THIS EVENING...

- \* LOCATION...CURRY AND ROOSEVELT COUNTIES.
- \* WINDS...SOUTHWEST SUSTAINED AT 25 TO 35 MPH WITH GUSTS UP TO 45 MPH.
- \* TIMING...STRONG SOUTHWEST WINDS WILL DEVELOP IN THE EARLY TO MID MORNING SATURDAY AND CONTINUE THROUGH SUNSET.
- \* VISIBILITY...OCCASIONAL AND SOMETIMES SUDDEN REDUCTIONS IN VISIBILITY BELOW 2 MILES CAN BE EXPECTED IN DUST PRONE AREAS SUCH AS OPEN FIELDS AND ONGOING CONSTRUCTION SITES.
- \* LOCAL IMPACTS...TAKE ACTION TO SECURE TRASH CANS...LAWN FURNITURE...AND OTHER LOOSE OR LIGHTWEIGHT OUTDOOR OBJECTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELLING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

&&

\$\$

NMZ507-508-517>520-101900-  
/O.CON.KABQ.WI.Y.0046.121110T1300Z-121111T0000Z/  
WEST CENTRAL HIGHLANDS-SOUTHWEST MOUNTAINS-  
LOWER CHAMA RIVER VALLEY-SANTA FE METRO AREA-  
ALBUQUERQUE METRO AREA-LOWER RIO GRANDE VALLEY-  
401 AM MST SAT NOV 10 2012

...WIND ADVISORY REMAINS IN EFFECT UNTIL 5 PM MST THIS AFTERNOON...

- \* LOCATION...THE WEST CENTRAL HIGHLANDS...LOWER CHAMA RIVER VALLEY...THE ALBUQUERQUE AND SANTA FE METRO AREAS AND THE LOWER RIO GRANDE VALLEY.
- \* WINDS...SOUTHWEST SUSTAINED AT 25 TO 35 MPH WITH GUSTS BETWEEN 40 AND 50 MPH.
- \* TIMING...STRONG WINDS WILL DEVELOP IN THE EARLY TO MID MORNING PERIOD SATURDAY AND CONTINUE THROUGH SUNSET.

\* VISIBILITY...OCCASIONAL AND SOMETIMES SUDDEN REDUCTIONS IN VISIBILITY BELOW 2 MILES CAN BE EXPECTED IN DUST PRONE AREAS SUCH AS OPEN FIELDS AND ONGOING CONSTRUCTION SITES.

\* LOCAL IMPACTS...TAKE ACTION TO SECURE TRASH CANS...LAWN FURNITURE...AND OTHER LOOSE OR LIGHTWEIGHT OUTDOOR OBJECTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOTORISTS SHOULD EXERCISE CAUTION WHILE TRAVELLING. SUDDEN GUSTS OF WIND MAY CAUSE YOU TO LOSE CONTROL OF YOUR VEHICLE. EXTRA ATTENTION SHOULD BE GIVEN TO CROSS WINDS.

&&

\$\$

## **BLOWING DUST ADVISORY**

Issued for **Southeast Colorado, including Lamar**  
Issued by Colorado Department of Public Health and Environment  
Issued at 3:00 PM Friday, November 9, 2012  
Updated at 9:00 AM Saturday, November 10, 2012

### Update:

Advisory language clarified to indicate that the advisory includes "Southeast Colorado, including Lamar."

Advisory in Effect: 8:00 AM Saturday 11/10/2012 to 4:00 PM Saturday 11/10/2012

Affected Area: The town of **Lamar** and other areas in southeastern Colorado

Advisory in Effect: 8:00 AM Saturday 11/10/2012 to 4:00 PM Saturday 11/10/2012

Public Health Recommendations: If significant blowing dust is present and reducing visibility to less than 10 miles across a wide area, the elderly, the very young, and those with respiratory problems should avoid prolonged exertion; everyone else should limit prolonged exertion. Limiting outdoor exposure is also advised.

Outlook: Strong winds are expected to develop across southeast Colorado on Saturday. There could be areas of blowing dust in southeastern Colorado. There could be sustained winds near 30 mph and gusts over 40 mph with little or no precipitation expected in this area.

**Saturday, November 10, 2012**

**DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1715Z November 10, 2012**

Central Plains:

An area of blowing dust originating in **eastern Colorado** and the Panhandle of Oklahoma around 1530z is moving northeast into western Kansas and southern Nebraska.

J Kibler

THIS TEXT PRODUCT IS PRIMARILY INTENDED TO DESCRIBE SIGNIFICANT AREAS SMOKE ASSOCIATED WITH ACTIVE FIRES AND SMOKE WHICH HAS BECOME DETACHED FROM THE FIRES AND DRIFTED SOME DISTANCE AWAY FROM THE SOURCE FIRE.. TYPICALLY OVER THE COURSE OF ONE OR MORE DAYS. AREAS OF BLOWING DUST ARE ALSO DESCRIBED. USERS ARE ENCOURAGED TO VIEW A GRAPHIC DEPICTION OF THESE AND OTHER PLUMES WHICH ARE LESS EXTENSIVE AND STILL ATTACHED TO THE SOURCE FIRE IN VARIOUS GRAPHIC FORMATS ON OUR WEB SITE:

JPEG: <http://www.osdpd.noaa.gov/ml/land/hms.html>

GIS: <http://www.firedetect.noaa.gov/viewer.htm>

KML: <http://www.ssd.noaa.gov/PS/FIRE/kml.html>

ANY QUESTIONS OR COMMENTS REGARDING THIS PRODUCT SHOULD BE SENT TO [SSDFireTeam@noaa.gov](mailto:SSDFireTeam@noaa.gov)