Technical Support Document
For the
April 1 and April 2, 2015
Lamar Exceptional Events

Prepared by the Technical Services Program
Air Pollution Control Division
Colorado Department of Public Health and Environment

October 30, 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[1] (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 On May 2, 2011, in an attempt to clarify this rule, EPA released draft guidance documents on the implementation of the EER to State, tribal and local air agencies for review.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 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_{10} NAAQS. This document contains detailed information about the large regional windblown dust events that occurred on April 1st and 2nd, 2015. 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_{10} 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EPA's June 2012 draft Guidance on the Preparation of Demonstrations in Support of Requests to Exclude Ambient Air Quality Data Affected by High Winds under the Exceptional Events Rule states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 both eastern and western Colorado it has been shown that wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see the Lamar, Colorado, Blowing Dust Climatology at http://www.colorado.gov/airquality/tech_doc_repository.aspx). For these blowing dust events, 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 Colorado and the surrounding states.

The PM_{10} exceedance in Lamar on April 1st and 2nd, 2015, would not have occurred if not for the following: a) dry soil conditions over source regions with 30-day precipitation totals below the threshold identified as a precondition for blowing dust; and (b) meteorological conditions that caused strong surface winds over the area of concern. This PM_{10} exceedance was due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources outside the monitored areas. These sources are not reasonably controllable during significant windstorms under abnormally dry or moderate drought conditions.

APCD is requesting concurrence on exclusion of the PM_{10} values from the Lamar Municipal Building (08-099-0002) monitor on April 1st and 2nd, 2015.

[1] Section 319 of the Clear 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.

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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 a Blowing Dust Advisory for southwestern, south-central and southeastern Colorado advising citizens of the potential for high wind/dust on April 2nd and 3rd, 2015. The cities impacted included: Telluride, Cortez, Durango, Pagosa Springs, Alamosa, Springfield, Ordway, La Junta, Las Animas, Lamar, Eads, Cheyenne Wells, Springfield, and Trinidad. The advisory that was issued on April 2nd and 3rd, 2015 can be viewed at: http://www.colorado.gov/airquality/report.aspx and is described further in Section 2.

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 the Primary Quality Assurance Organization 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 with the measurement when the data are 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 with a date/time stamp 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 April 1st and 2nd, 2015, sample values greater than 150 µg/m^3 were taken in Lamar, Colorado during the high wind events that occurred on those days. These high values were taken at the monitor located in Lamar at the Municipal Building (SLAMS). This monitor is operated by APCD in partnership with local operators.

Document that the public comment process was followed for event documentation (40 CFR 50.14(c)(3)(iv))
APCD posted this report on the Air Pollution Control Division's webpage for public review. APCD opened a 30-day public comment period on November 2, 2015 and closed comments on December 3, 2015. A copy of the public notice certification (in cover letter), along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

Submit demonstration supporting exceptional event flag (40 CFR 50.14(a)(1-2))
At the close of the comment period, and after APCD has had the opportunity to consider any comments submitted on this document, 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.

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 April 2015, Blowing Dust Events and PM_{10} Exceedances – Conceptual Model and Wind Statistics

Two powerful storm systems caused exceedances of the 24-hour PM_{10} standard in Lamar, Colorado in April 2015. Exceedances were recorded in Lamar at the Lamar Municipal Building (08-099-0002) monitor. A meteorological analysis for both events is discussed further below.

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 wind speeds of 30 mph or greater and gusts of 40 mph or greater can cause blowing dust (see the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx). For these blowing dust events, 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 Colorado.

2.1 April 1, 2015 Meteorological Analysis

On April 1, 2015, a powerful spring storm system caused an exceedance of the twenty-four hour PM_{10} standard in Lamar, Colorado, at the Municipal Building (08-099-0002) monitor with a concentration of 253 $\mu g/m^3$. This elevated reading and the location of the monitor is plotted on a map of the Greater Lamar area in Figure 1. The exceedance in Lamar was the result of intense surface winds in the wake of a passing cold front. The surface winds in southeast Colorado were also likely enhanced by post-frontal thunderstorms moving to the north of Lamar. 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 northerly direction which moved over dry soils in eastern Colorado, producing significant blowing dust.

High PM10 Natural Event in Colorado (April 1, 2015)

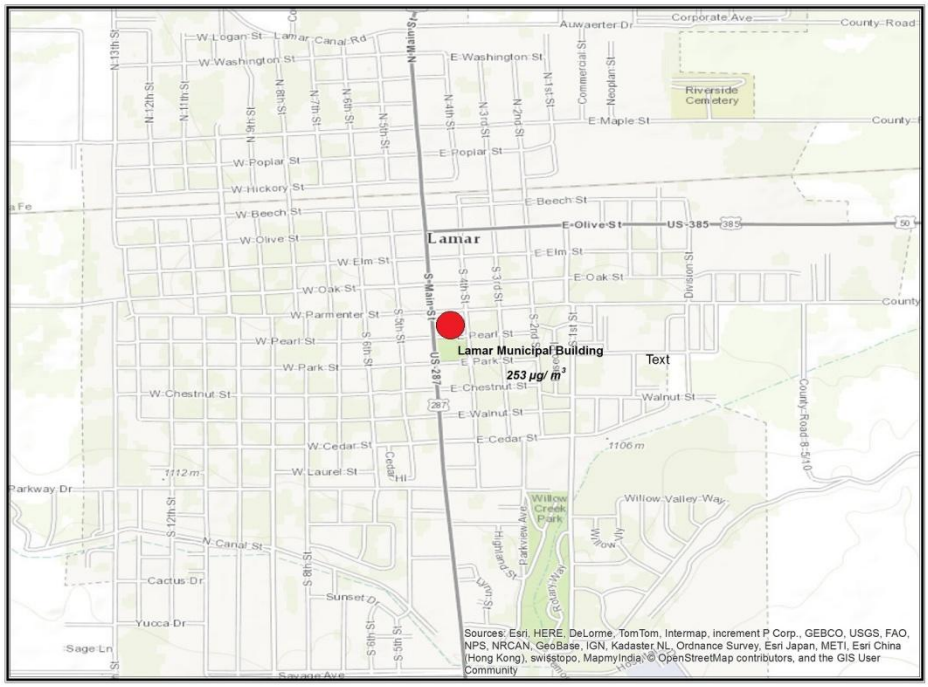


Figure 1: 24-hour PM_{10} concentration for the Lamar Municipal Building monitor, April 1, 2015.
(Source: http://webapps.datafed.net/datafed.aspx?dataset=AQS_D&parameter=pm10)

The upper level trough associated with this storm system is shown on the North American 700 mb height analysis maps at 5:00 PM MST, April 1, 2015 in Figure 2. The 700 mb level is located roughly 3 kilometers above mean sea level (MSL). This chart shows that a deep trough of low pressure was present at the 700 mb level at the onset of the blowing dust event of April 1, 2015, and that it was moving over eastern Colorado. During the spring months, this is a typical scenario for the development of strong thunderstorms with gusty winds in eastern Colorado (see the Technical Support Document for the May 25, 2013 Lamar Exceptional Event and the Lamar Blowing Dust Climatology document at http://www.colorado.gov/airquality/tech_doc_repository.aspx)

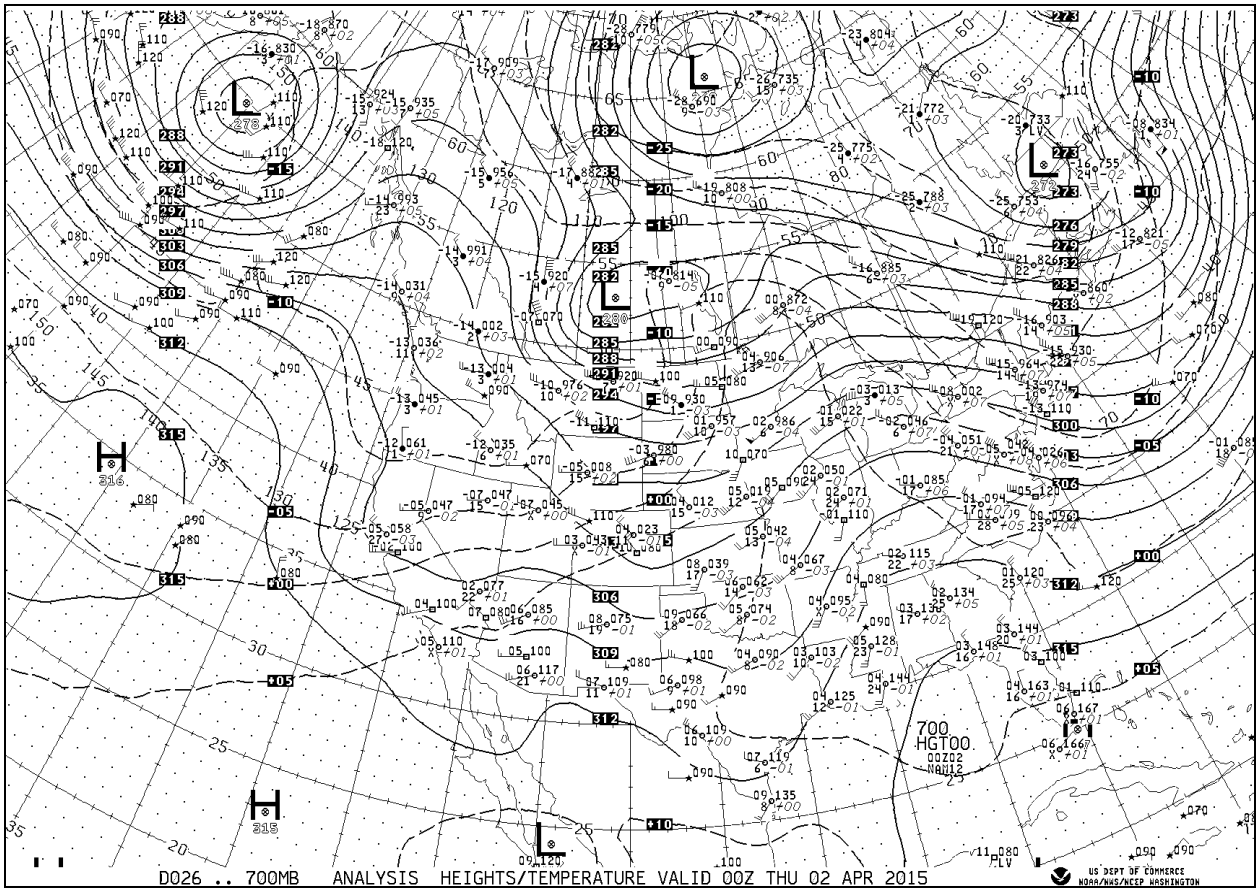


Figure 2: 700 mb (about 3 kilometers above mean sea level) analysis for 0Z April 2, 2015, or 5:00 PM MST April 1, 2015.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The surface weather associated with the storm system of April 1, 2015, is presented in Figure 3 and Figure 4. Significant surface features at 2:00 PM MST, April 1 (21Z, Figure 3) included a strong cold front which was moving through eastern Colorado. In advance of this front the wind in southeast Colorado was predominantly out of a west to southwesterly direction and was occasionally gusty, however the wind increased significantly once the cold front passed (Figure 4). By 8:00 PM MST, a "tightening" of isobars was occurring in southeast Colorado behind the cold front (circled in Figure 5). This indicates that a strong pressure gradient was developing. 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). The increasing pressure gradient was in response to a building ridge of high pressure over western parts of South Dakota and Nebraska interacting with a strong low pressure area moving into southwest Kansas. This chain of events consequently produced extremely gusty northerly winds across southeast Colorado by the evening of April 1, 2015.

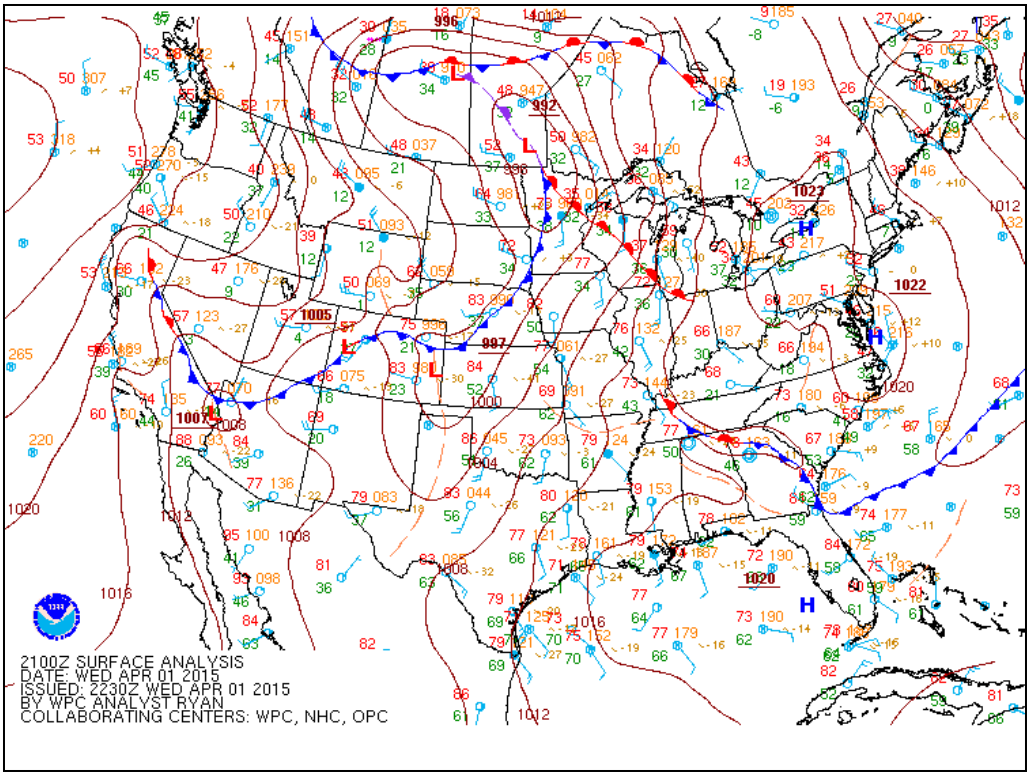


Figure 3: Surface Analysis for 21Z April 1, 2015, or 2:00 PM MST April 1, 2015. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

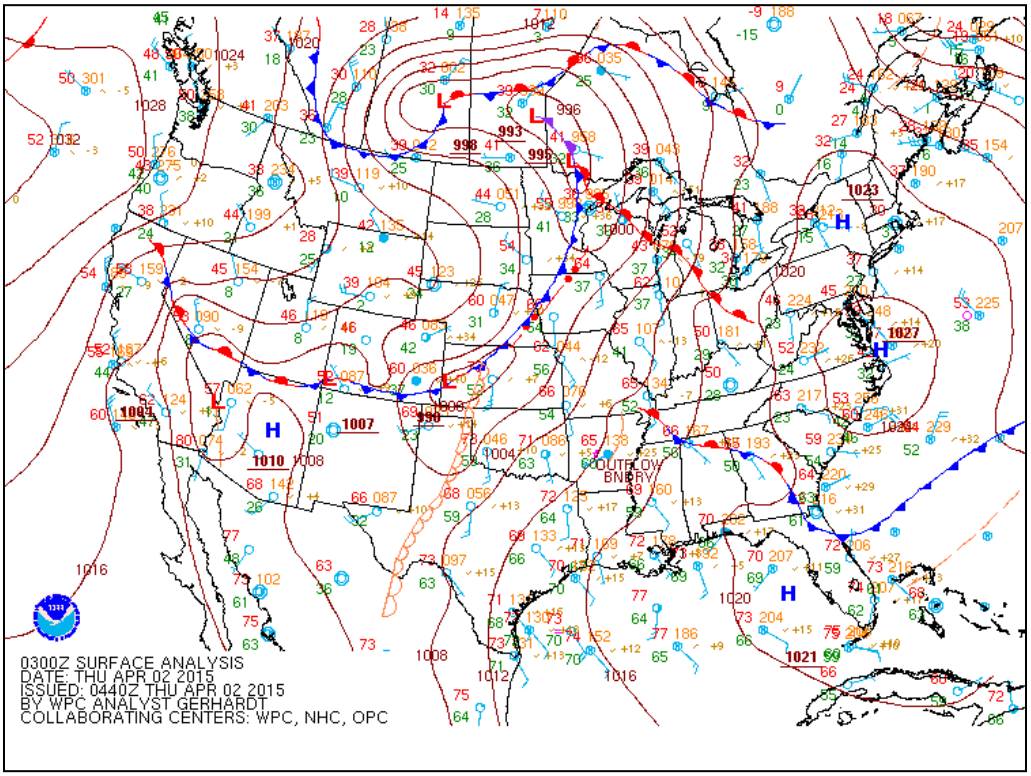


Figure 4: Surface Analysis for 3Z April 2, 2015, or 8:00 PM MST April 1, 2015. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

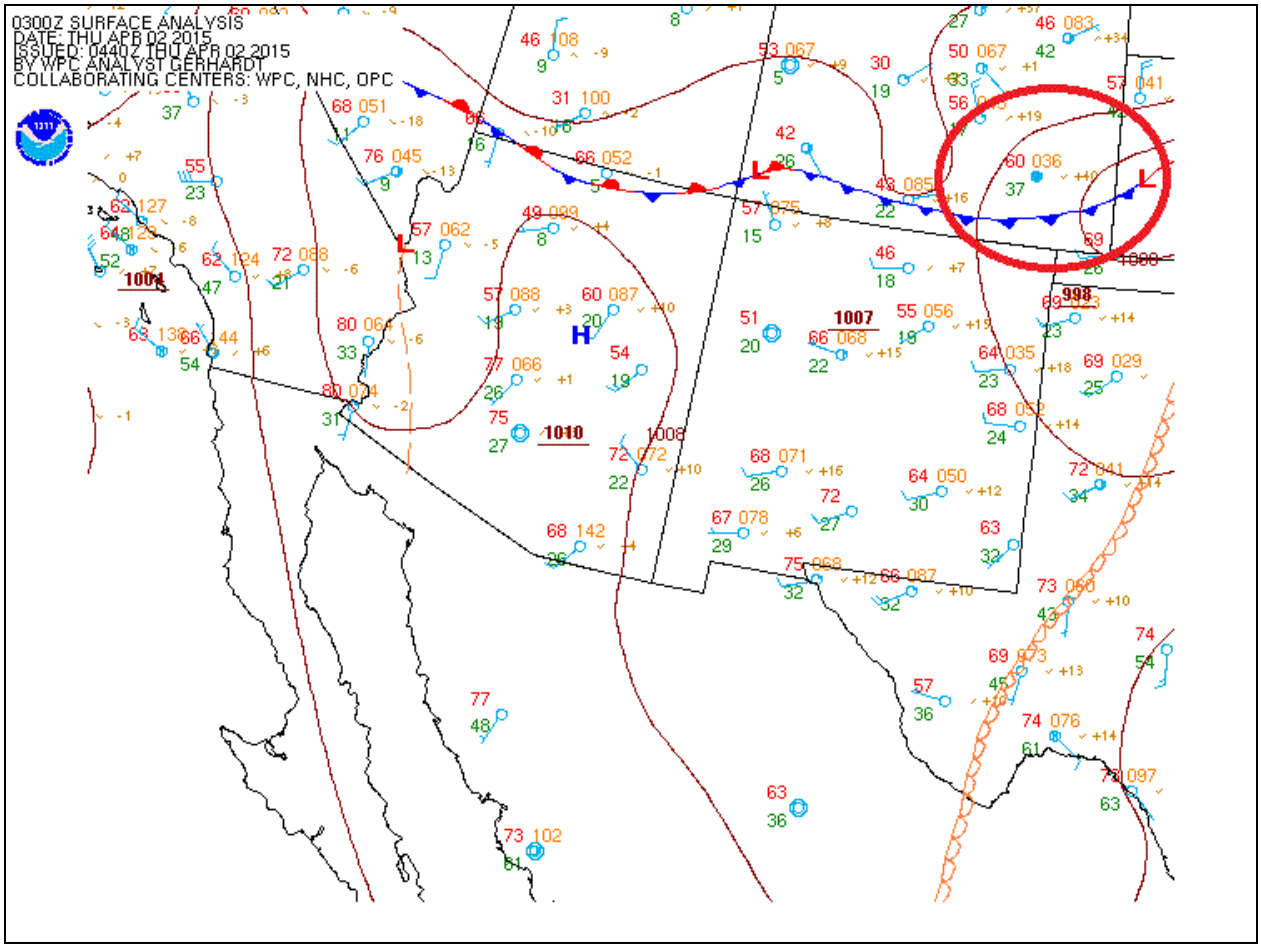


Figure 5: Southwestern United States Regional Surface Analysis for 3Z April 2, 2015, or 8:00 PM MST April 1, 2015.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The synoptic weather conditions described above impacted a region that was in the midst of a long-term drought (Figure 6). Notice that western Kansas and southeast Colorado both show "Severe" drought conditions. Sustained drought conditions are known to make topsoil susceptible to high winds and produce blowing dust (see the following link from the National Climatic Data Center for more information: https://www.ncdc.noaa.gov/paleo/drought/drght_history.html). Figure 7 shows the total precipitation in inches from March 2, 2015 to March 31, 2015 for Colorado. Note the entire area surrounding Lamar received less than 0.34 inches of precipitation during the 30-day period leading up to the April 1, 2015 dust event. 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 the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx).

The U.S. Drought Monitor and 30-day precipitation totals indicate that soils in southeast Colorado near Lamar were dry enough on April 1, 2015, to produce blowing dust when winds were at or above the thresholds for blowing dust.

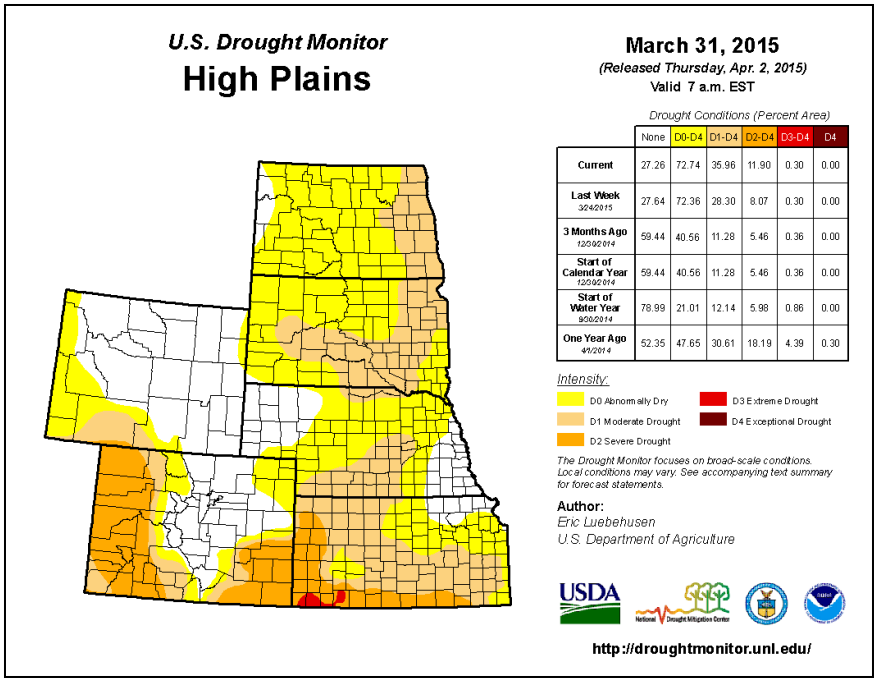


Figure 6: Drought conditions for High Plains region at 5:00 AM MST March 31, 2015. (Source: http://droughtmonitor.unl.edu/MapsAndData/MapArchive.aspx)

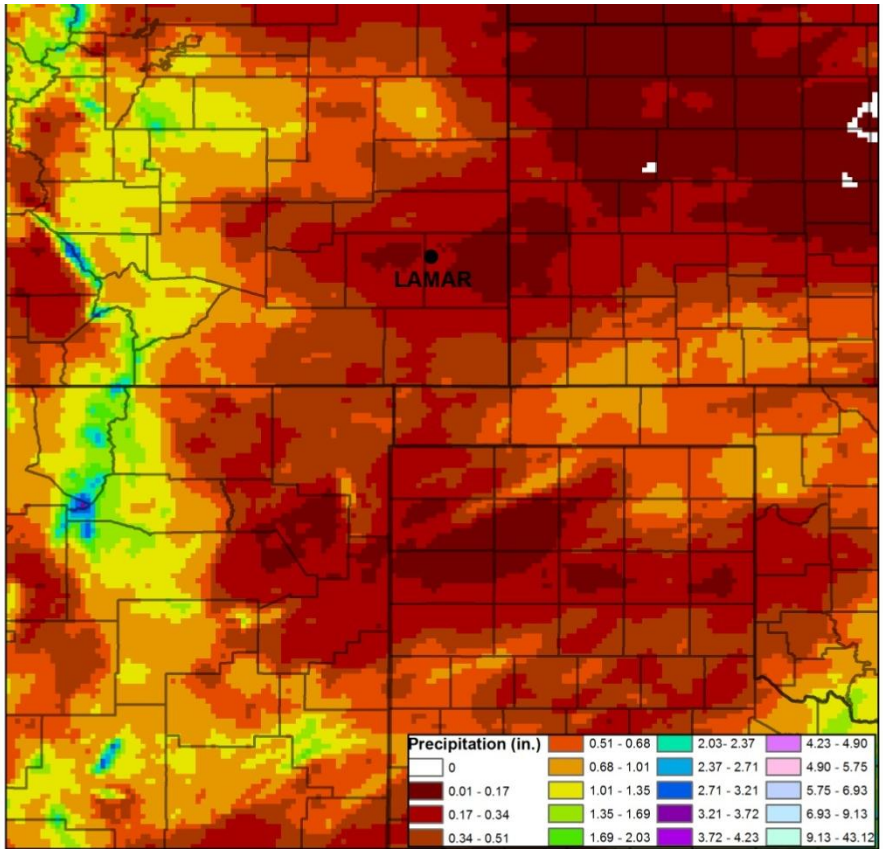


Figure 7: Total precipitation in inches for Colorado, March 2, 2015 – March 31, 2015. (Source: http://prism.nacse.org/recent/)

Based on the developing weather conditions and the drought-stricken soils described above, high winds and the potential for blowing dust were anticipated by regional National Weather Service (NWS) offices. The 4:12 AM MDT, April 1 Forecast Discussion from the Pueblo NWS office stated:

> "Models are showing potential for isold to sct high-based convection developing this afternoon over the SE plains. Given surface dewpoints in the 20s…there is a potential for isold dry lighting (sic)…and erratic gusty winds from virga and convective downdrafts." (Source: http://mesonet.agron.iastate.edu/wx/afos/)

Additionally, the 3:08 PM MST Area Forecast Discussion from the NWS in Goodland, Kansas (about 100 miles northeast of Lamar) includes the possibility for blowing dust from the same cold front which would soon impact southeast Colorado:

> "North winds will rapidly increase as the low level jet and rapid surface pressure rises move through the area. Gusts approaching 40 mph are certainty (sic) likely during the evening as a result. Due to the very dry conditions…there could be some blowing dust for locations that have not yet received rainfall." (Source: http://mesonet.agron.iastate.edu/wx/afos/)

The 7:59 PM MST Forecast Discussion from the Goodland NWS also notes that convection was a contributor to the high winds behind the cold front:

> "Strong winds…sometimes aided by convection…developed west of Highway 83. Briefly considered issuing a short fused high wind warning." (Source: http://mesonet.agron.iastate.edu/wx/afos/)

Observations and forecasts issued by local NWS offices confirm that high winds and blowing dust were anticipated across the region on April 1, 2015.

In order to fully evaluate the synoptic meteorological scenario of April 1, 2015, a regional surface weather map is provided showing individual station observations during the height of the event in question. Figure 8 presents weather observations for eastern Colorado and adjacent states at 9:43 PM MST on April 1. In Figure 8 the station observation for Lamar (LAA) shows winds sustained at 25 knots (29 mph), gusts to 35 knots (40 mph), and a reduced visibility of 2 statute miles with the weather symbol of infinity (∞). 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.erh.noaa.gov/er/box/glossary.htm). Also note that a suspected blowing dust observation can be found in western Kansas, as Hill City (HLC) was reporting sustained winds of 30 knots (35 mph), gusts to 40 knots (46 mph), haze, and visibility reduced to 5 statute miles. This observation suggests that the dust event of April 1 was regional in scale and not solely confined to the Lamar area.

Hourly surface observations, in table form, from Lamar along with La Junta, Colorado and Goodland, Kansas provide supporting evidence that there was an extended period of high winds and haze (blowing dust) across the region on April 1, 2015. Table 1 lists observations for the PM_{10} exceedance location of Lamar while observations for La Junta and Goodland can be found in Table 2 and Table 3, respectively. Observations that are climatologically consistent

with blowing dust conditions (see the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx) are highlighted in yellow. Each of these weather observation sites experienced many hours of reduced visibility along with sustained wind speeds and gusts at or well above the thresholds for blowing dust.

Surface weather maps and hourly observations show that a regional dust storm occurred under north to northeasterly flow in the wake of a cold front. This data provides clear evidence of blowing dust and winds well above the threshold speeds for blowing dust on April 1, 2015.

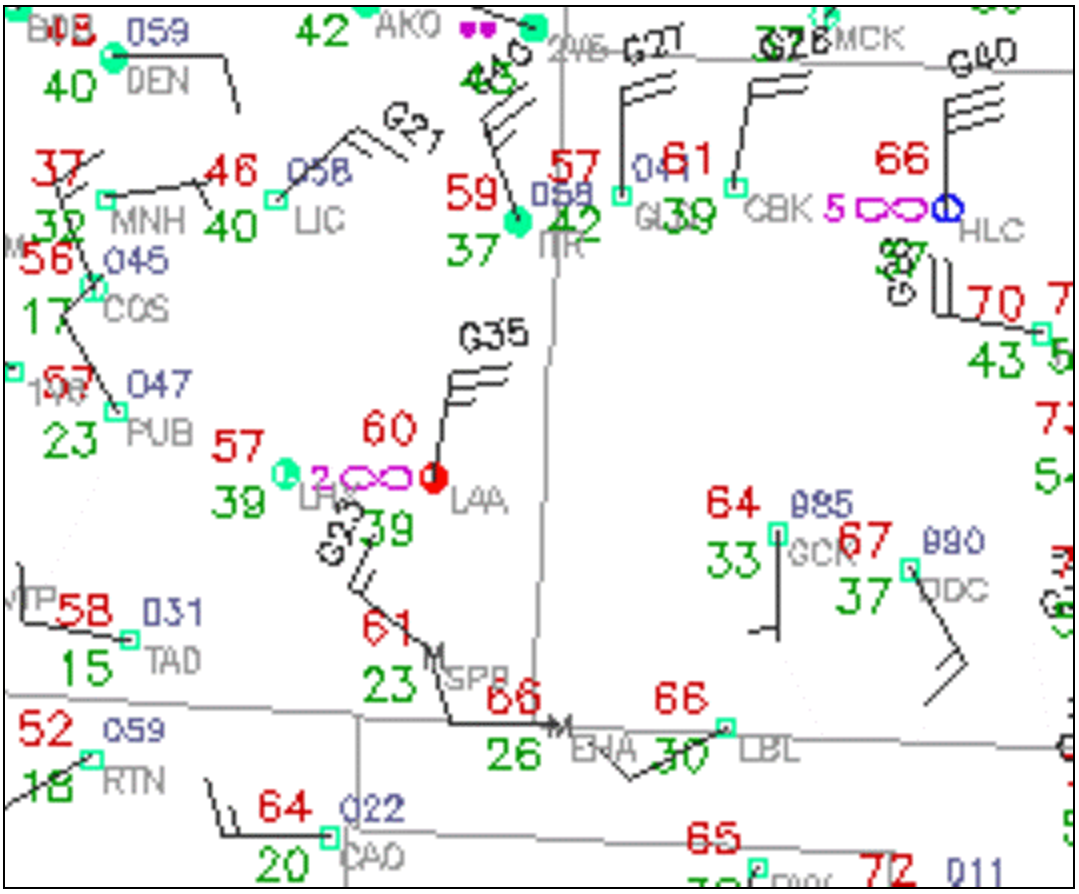


Figure 8: High Plains regional surface analysis for 9:43 PM MST, April 1, 2015. (Source: http://www.mmm.ucar.edu/imagearchive/)

Table 1: Weather observations for Lamar, Colorado, on April 1, 2015
(Source: http://mesowest.utah.edu/)

Time MST April 1, 2015	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	55	55	7		300		10
1:53	51	56	7		310		10
2:53	51	52	4		40		10
3:53	41	79	0				10
4:53	39	76	0				10
5:53	36	79	6		40		8
6:53	48	56	4		300		9
7:53	56	42	4		330		9
8:53	68	25	10		290		10
9:53	74	17	12		280		10
10:53	78	15	12		290		10
11:53	82	12	16	25	300		10
12:53	83	12	13	25	270		10
13:53	84	11	10	24	240		10
14:53	81	11	13		210		10
15:53	81	11	10		220		10
16:53	78	13	7		240		10
17:34	76	15	10	36	140		9
17:53	75	15	10		300		10
18:53	70	18	9		260		10
19:48	68	28	48	67	350	lt rain; squalls	0.5
19:53	67	29	45	67	350	lt rain	0.25
20:00	65	34	38	55	350	lt rain	0.25
20:17	62	43	25	43	360	haze	1.25
20:22	61	44	32	39	360	haze	2
20:35	60	46	31	40	10	haze	2
20:40	60	46	31	39	10	haze	3
20:53	60	44	30	41	10	haze	4
21:53	55	55	14	27	30		7
22:53	50	63	8		30		8
23:53	44	73	4		250		8

Table 2: Weather observations for La Junta, Colorado, on April 1, 2015
(Source: http://mesowest.utah.edu/)

Time MST April 1, 2015	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	54	31	4				10
1:53	56	28	14		220		10
2:53	54	30	15		220		10
3:53	48	39	8		230		10
4:53	49	37	8		210		10
5:53	42	50	7		260		10
6:53	53	33	6		250		10
7:53	60	28	9		270		10
8:53	65	24	10		260		10
9:53	76	16	16	23	290		10
10:53	79	13	18	28	280		10
11:53	81	13	14	21	250		10
12:53	82	11	18	23	220		10
13:53	83	11	12	18	280		10
14:53	81	11	6		200		10
15:53	78	12	16	28	280		10
16:53	77	13	18	32	300		10
17:53	74	15	16		260		10
18:53	70	19	32	40	300		8
19:26	67	26				haze	1.5
19:32	65	30				haze	0.75
19:45	62	38					
19:53	60	42					
20:01	60	42				haze	1.5
20:08	59	44				haze	3
20:35	57	51					10
20:53	56	53					10
21:53	53	59					10
22:53	50	66					10
23:53	47	68					10

Table 3: Weather observations for Goodland, Kansas, on April 1, 2015
(Source: http://mesowest.utah.edu/)

Time MST April 1, 2015	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	54	53	15		180		10
1:53	55	62	20	28	180		10
2:53	54	69	17		180		10
3:53	50	82	14		180		10
4:53	49	83	16		180		10
5:53	48	86	15		200		10
6:53	51	79	21		180		10
7:53	57	62	20		190		10
8:53	64	45	18		200		10
9:53	72	31	16		200		10
10:53	77	24	12		190		10
11:53	83	12	17		350		10
12:53	82	11	13		360		10
13:53	82	11	4				10
14:53	81	12	8		350		10
15:39	77	14	15	23	360		10
15:53	77	14	12		360		10
16:53	77	14	10	21	10		10
17:53	70	21	30	39	340		10
18:04	65	32	37	59	330	haze	5
18:53	60	47	29	40	10		10
19:53	57	57	25	31	360		10
20:53	55	55	23	36	340		10
21:53	52	63	12		350		10
22:53	51	61	13		50		10
23:53	44	79	7		360		10

Radar imagery provides strong supporting evidence that a regional dust storm was taking place on April 1, 2015. The Goodland, KS base reflectivity radar image at 7:04 PM MST, April 1 (Figure 9) shows several suspected bands of dust (circled in red) throughout western Kansas and also in southeast Colorado to the north of Lamar. This radar image coincides in time and location to a local storm report of blowing dust by a NWS employee:

487
NWUS53 KGLD 020108
LSRGLD

PRELIMINARY LOCAL STORM REPORT
NATIONAL WEATHER SERVICE GOODLAND KS
708 PM MDT WED APR 01 2015

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

0705 PM TSTM WND GST 13 N EDSON 39.52N 101.54W
04/01/2015 E60 MPH SHERMAN KS NWS EMPLOYEE

NEAR ZERO VISIBILITY IN BLOWING DUST.

These bands of blowing dust were likely produced by a combination of factors; including the cold front passage described earlier in tandem with strong outflow winds from post-frontal thunderstorms. Also note that the circled radar returns from Figure 9 have a distinct bow echo pattern which is often associated with strong, sometimes damaging, winds that spread outward from the bottom of storms (for additional information on bow echoes from the Storm Prediction Center: http://www.spc.noaa.gov/misc/AbtDerechos/bowechoprot.htm). Considering the extent of the drought in western Kansas and southeast Colorado (Figure 6) along with the relatively low dBZ values on the radar return of Figure 9, it is reasonable to assume that these bow echoes are indeed lofted dust.

By 8:18 PM MST, bow echo signatures started to appear on the Pueblo radar (Figure 10) in close vicinity to Lamar. This radar image correlates well with surface observations in Lamar at approximately the same time. At 8:17 PM MST (Table 1, 1 minute before the radar image of Figure 10) Lamar reported sustained winds of 25 knots (29 mph), gusts to 43 knots (50 mph) with haze and visibility reduced to 1.25 statute miles, suggesting that blowing dust was occurring.

Regional blowing dust was also apparent the following day (April 2, 2015) via satellite imagery. The National Oceanic and Atmospheric Administration (NOAA) Satellite Services Division observed blowing dust at 11:45 AM MST, April 2, 2015, in the Texas Panhandle behind the same cold front that impacted southeast Colorado the previous evening:

> "Further southwest and west, the aerosol is more likely to be blowing dust behind the cold front that is dropping south through the Texas Panhandle." (Source: http://www.ssd.noaa.gov/PS/FIRE/DATA/SMOKE/2015D021754.html)

Radar imagery in conjunction with surface observations and storm reports clearly reveal that a dust storm was taking place in southeast Colorado on April 1, 2015. This collection of data, combined with other evidence in this report, indicates that this dust storm was a natural, regional event and therefore not controllable or preventable.

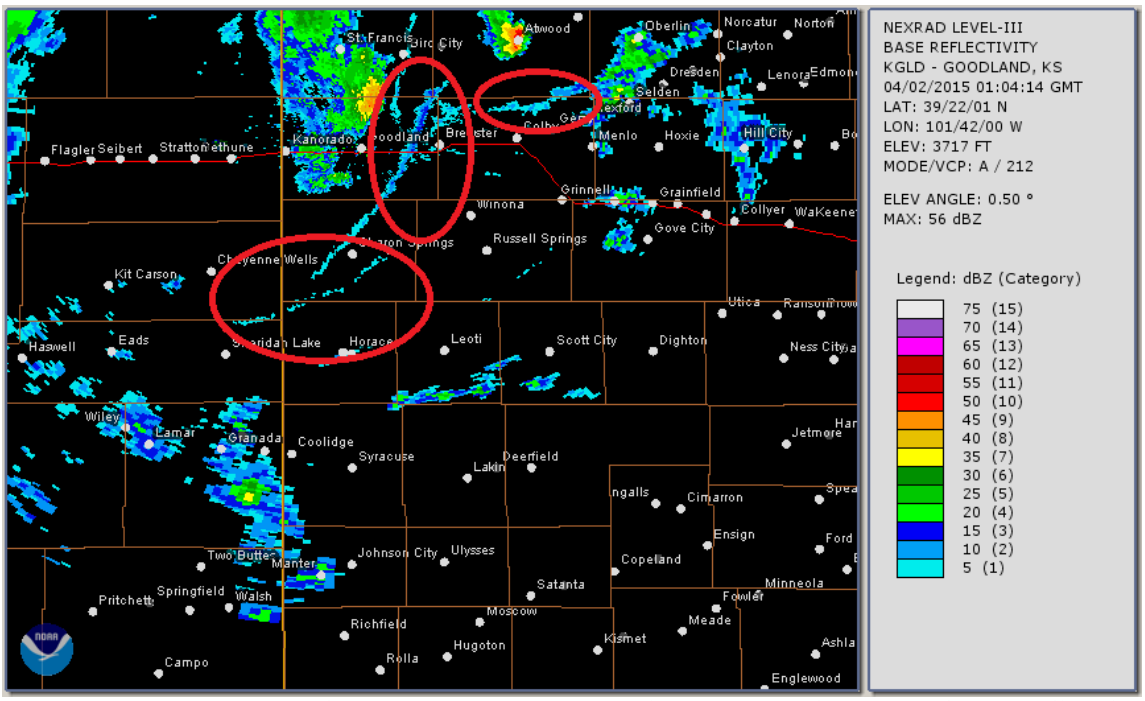


Figure 9: NEXRAD Base Reflectivity image, 0.50º elevation angle, from the Goodland, KS radar at 7:04 PM MST (104Z, April 2), April 1, 2015.
(Source: http://www.ncdc.noaa.gov/nexradinv/)

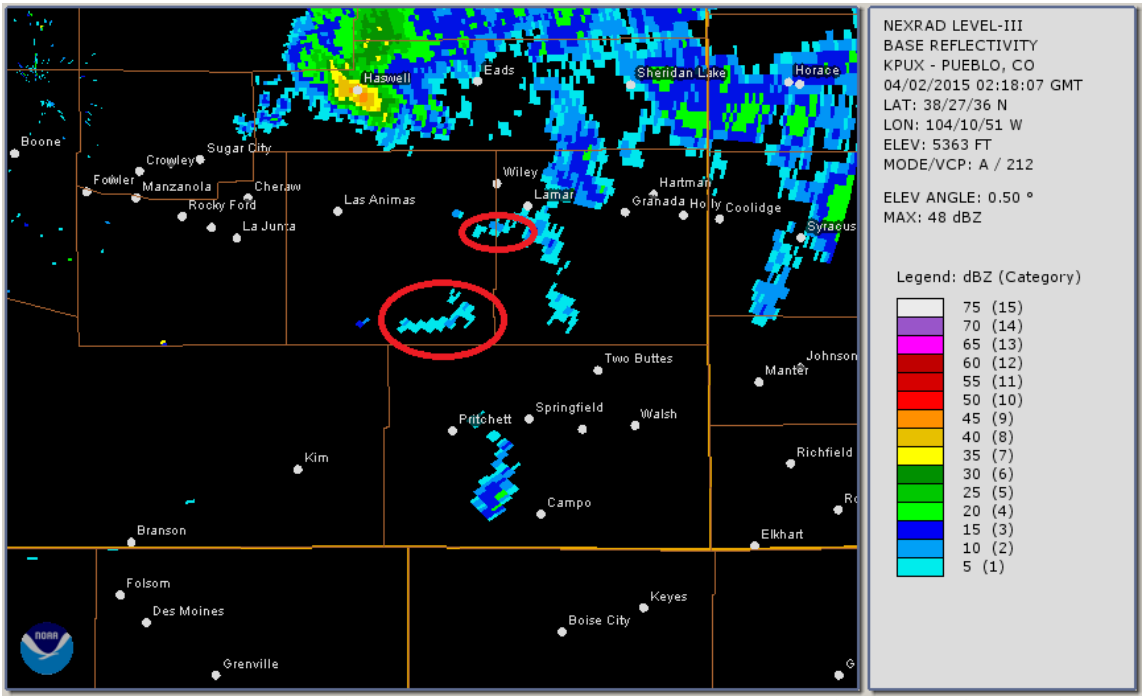


Figure 10: NEXRAD Base Reflectivity image, 0.50º elevation angle, from the Pueblo, CO radar at 8:18 PM MST (218Z, April 2), April 1, 2015.
(Source: http://www.ncdc.noaa.gov/nexradinv/)

2.2 April 2, 2015 Meteorological analysis

On April 2, 2015, a powerful spring storm system caused an exceedance of the twenty-four hour PM_{10} standard in Lamar, Colorado, at the Municipal Building (08-099-0002) monitor with a concentration of 419 $\mu g/m^3$. This highly elevated reading and the location of the monitor is plotted on a map of the Greater Lamar area in Figure 11. The exceedance in Lamar was the result of intense surface winds in the wake of a passing 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 north to northeasterly direction which moved over dry soils in eastern Colorado, producing significant blowing dust.

Figure 11: 24-hour PM_{10} concentration for the Lamar Municipal Building monitor, April 2, 2015.
(Source: 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 5:00 PM MST, April 2, 2015 in Figure 12 and Figure 13, respectively. The 700 mb level is located roughly 3 kilometers above mean sea level (MSL) while the 500 mb level is approximately 6 kilometers 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 April 2 and that it was moving over the southwestern United States. During the spring months, this is a typical scenario for the development of strong thunderstorms with gusty winds in eastern Colorado (see the Technical Support Document for the May 25, 2013 Lamar Exceptional Event and the Lamar Blowing Dust Climatology document at http://www.colorado.gov/airquality/tech_doc_repository.aspx)

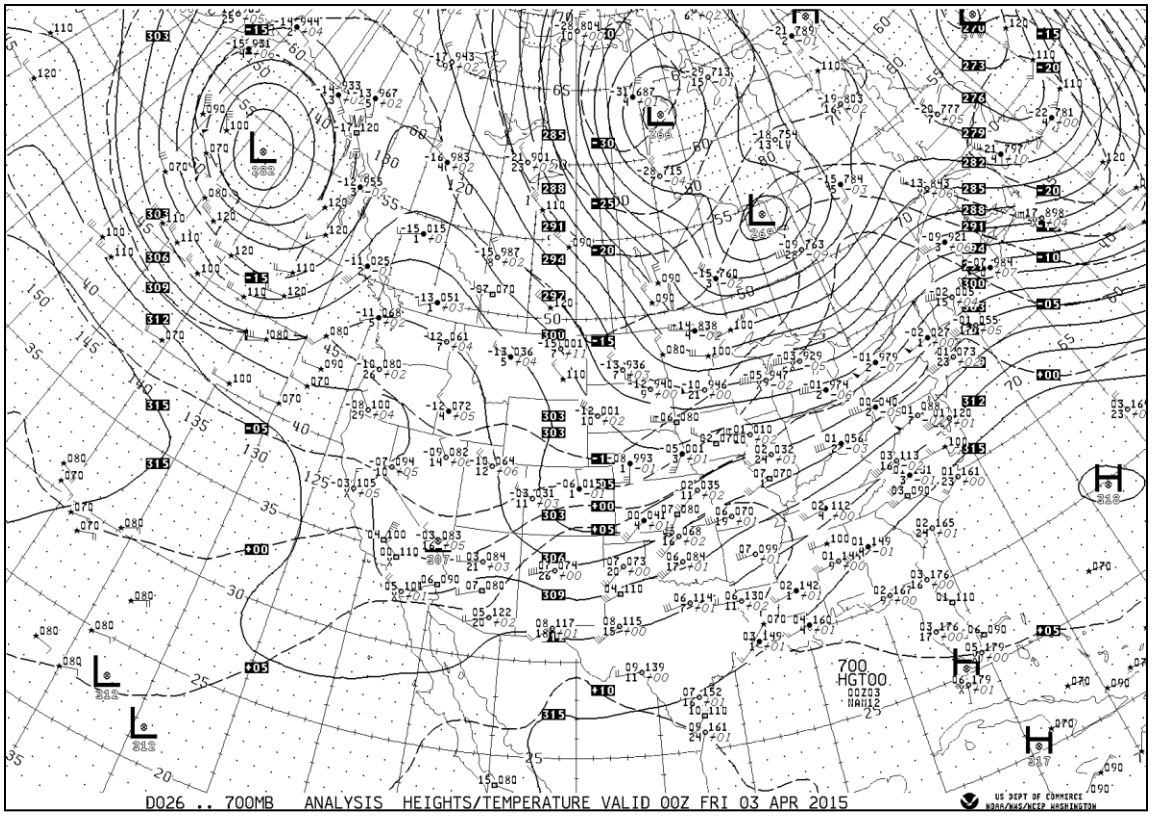


Figure 12: 700 mb (about 3 kilometers above mean sea level) analysis for 0Z April 3, 2015, or 5:00 PM MST April 2, 2015.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

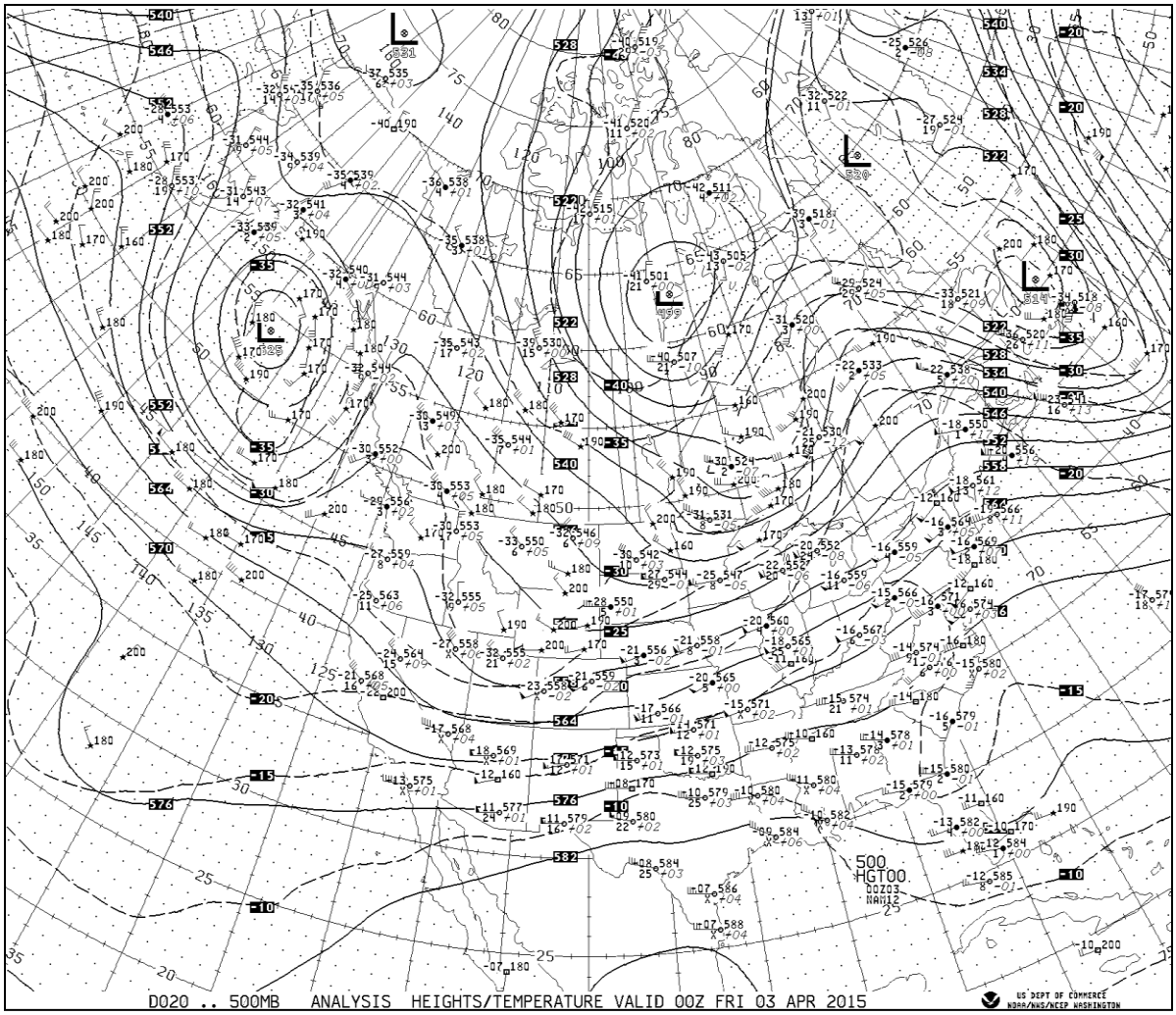


Figure 13: 500 mb (about 6 kilometers above mean sea level) analysis for 0Z April 3, 2015, or 5:00 PM MST April 2, 2015.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The surface weather associated with the storm system of April 2, 2015, is presented in Figure 14 and Figure 15. Significant surface features at 5:00 PM MST, April 2 (0Z April 3, Figure 14) included a warm front departing southeast Colorado with a cold front approaching from the north. In advance of the cold front the wind in southeast Colorado was predominantly out of a south to southeasterly direction and was quite gusty at times. However, the wind increased significantly once the cold front passed (Figure 15). By 8:00 PM MST, a significant amount of "bunching" of isobars was occurring in southeast Colorado behind the cold front (Figure 16). This indicates 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). The increasing pressure gradient was in response to a building ridge of high pressure over the Pacific Northwest interacting with a strong low pressure area over the Oklahoma Panhandle. This chain of events consequently produced extremely gusty north to northeasterly winds across southeast Colorado by the evening of April 2, 2015.

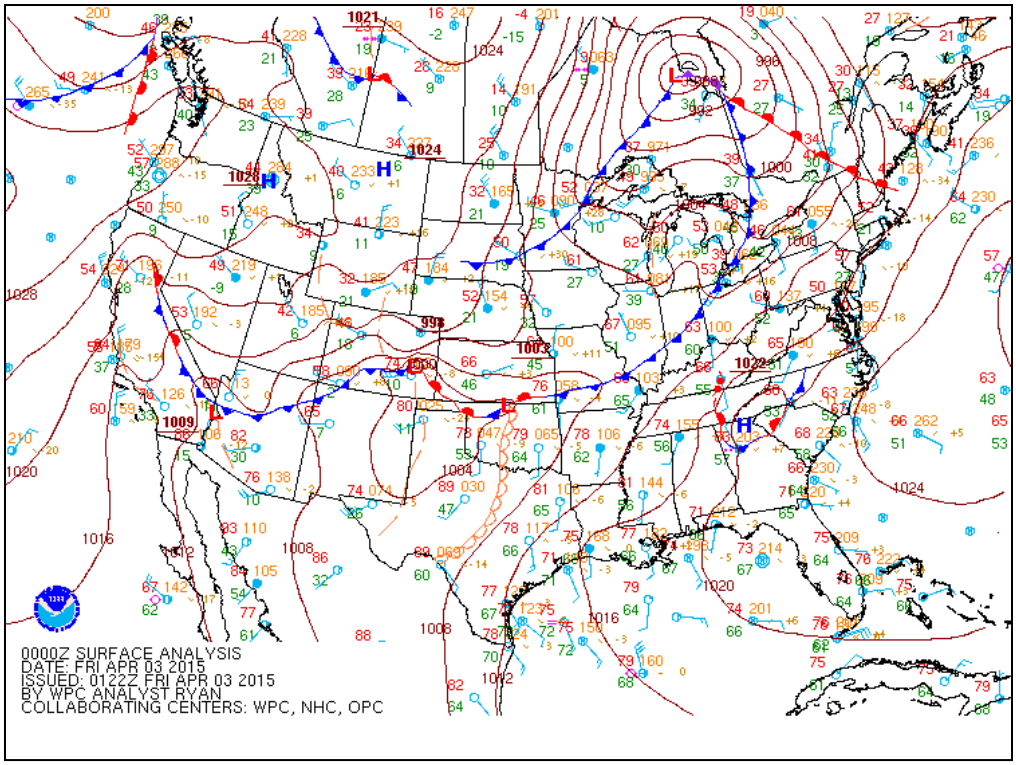


Figure 14: Surface Analysis for 0Z April 3, 2015, or 5:00 PM MST April 2, 2015. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

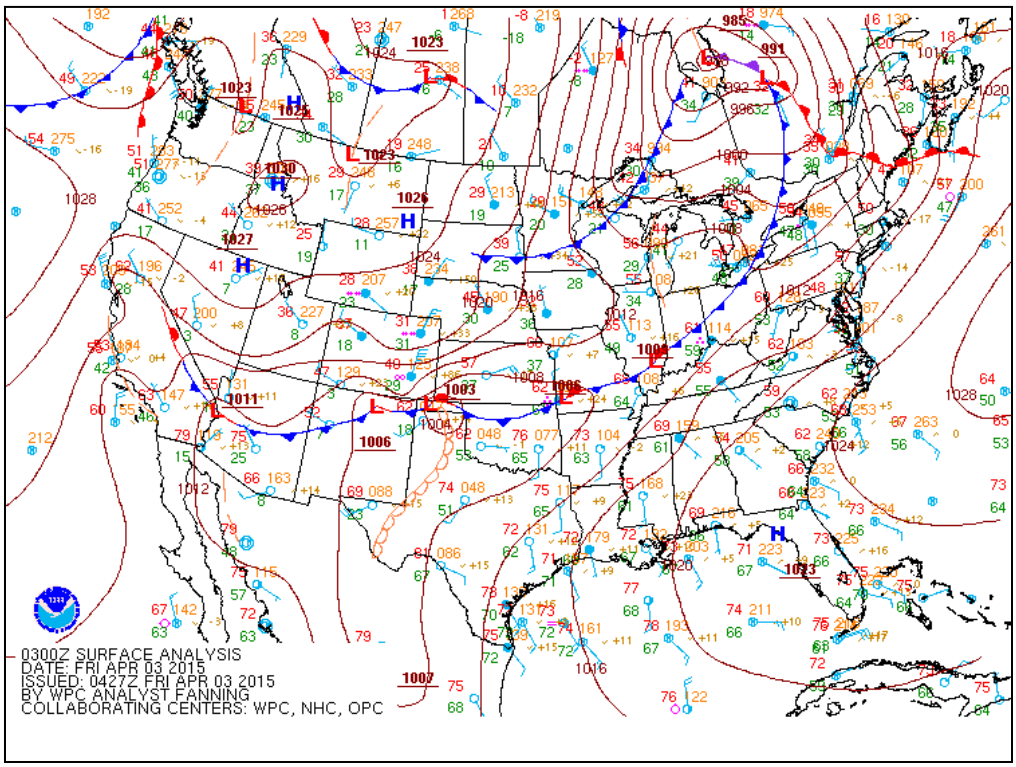


Figure 15: Surface Analysis for 3Z April 3, 2015, or 8:00 PM MST April 2, 2015. (Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

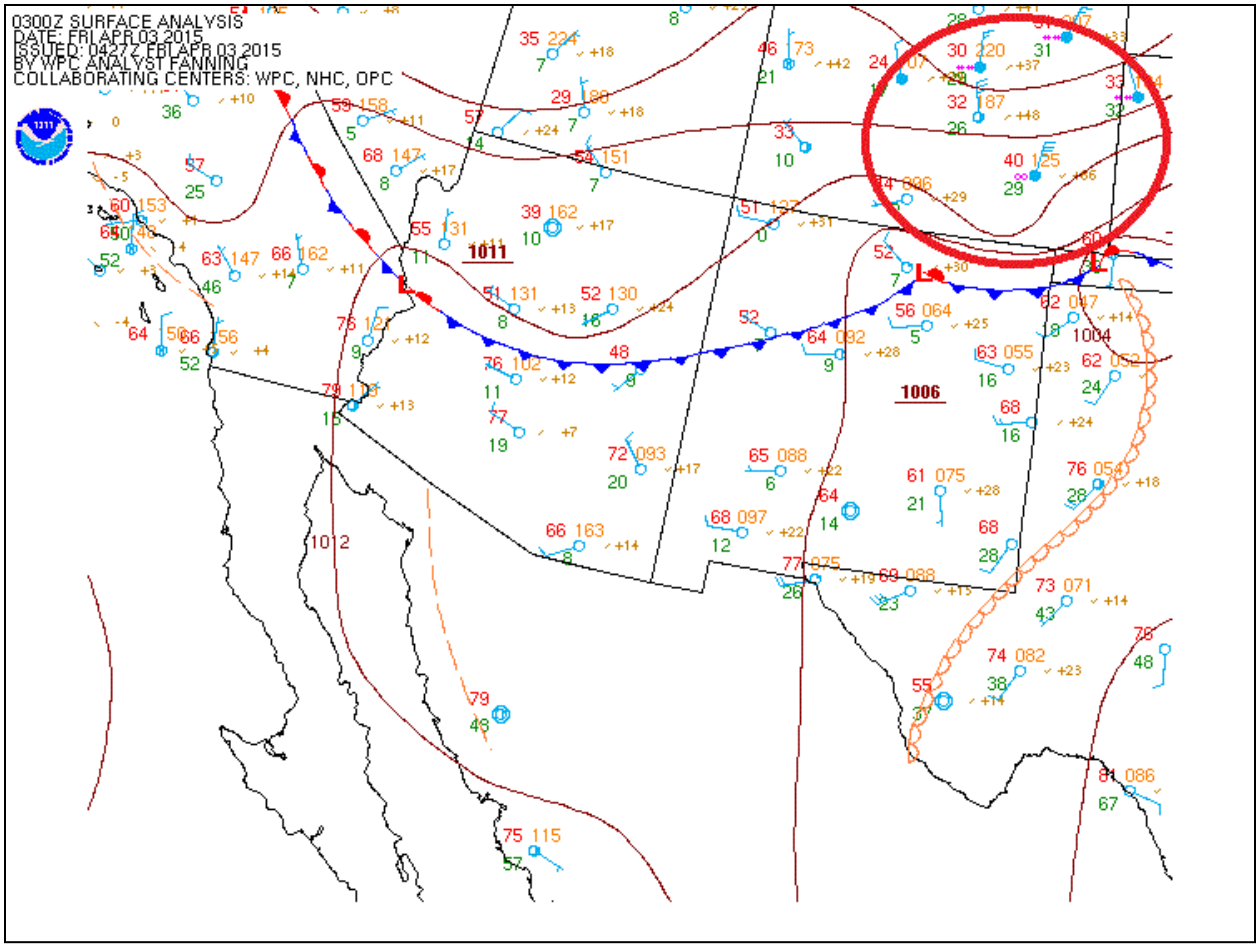


Figure 16: Southwestern United States Regional Surface Analysis for 3Z April 3, 2015, or 8:00 PM MST April 2, 2015.
(Source: http://nomads.ncdc.noaa.gov/ncep/NCEP)

The synoptic weather conditions described above impacted a region that was in the midst of a severe drought (Figure 17). Sustained drought conditions are known to make topsoil susceptible to high winds and produce blowing dust (see the following link from the National Climatic Data Center for more information: https://www.ncdc.noaa.gov/paleo/drought/drght_history.html). Figure 18 shows the total precipitation in inches from March 3, 2015 to April 1, 2015 for Colorado. Note that the entire area surrounding Lamar received less than 0.34 inches of precipitation during the 30-day period leading up to the April 2, 2015 dust event. 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 the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx).

The U.S. Drought Monitor and 30-day precipitation totals indicate that soils in southeast Colorado near Lamar were dry enough on April 2, 2015 to produce blowing dust when winds were at or above the thresholds for blowing dust.

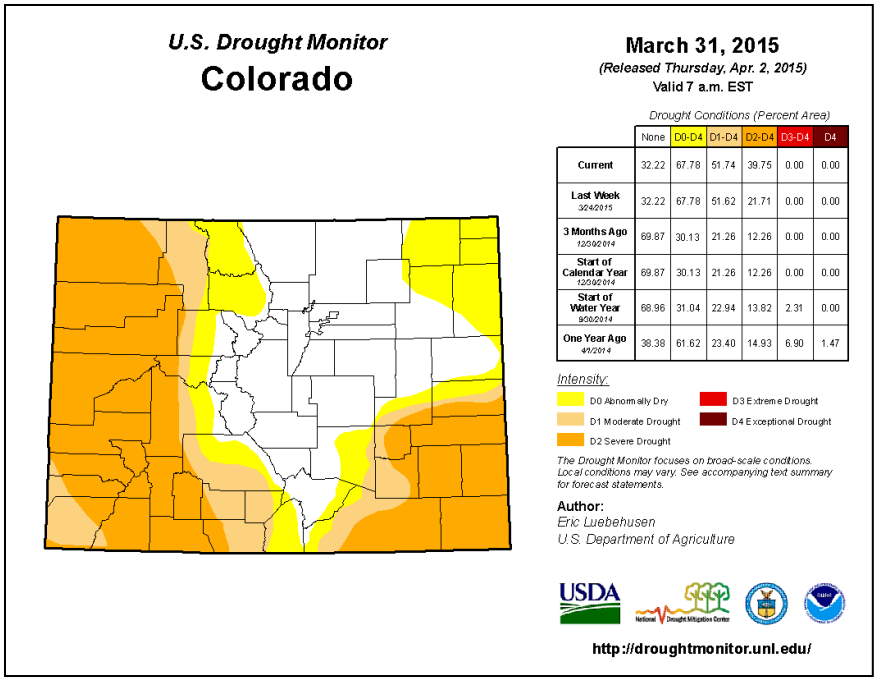


Figure 17: Drought conditions for Colorado at 5:00 AM MST March 31, 2015. (Source: http://droughtmonitor.unl.edu/MapsAndData/MapArchive.aspx)

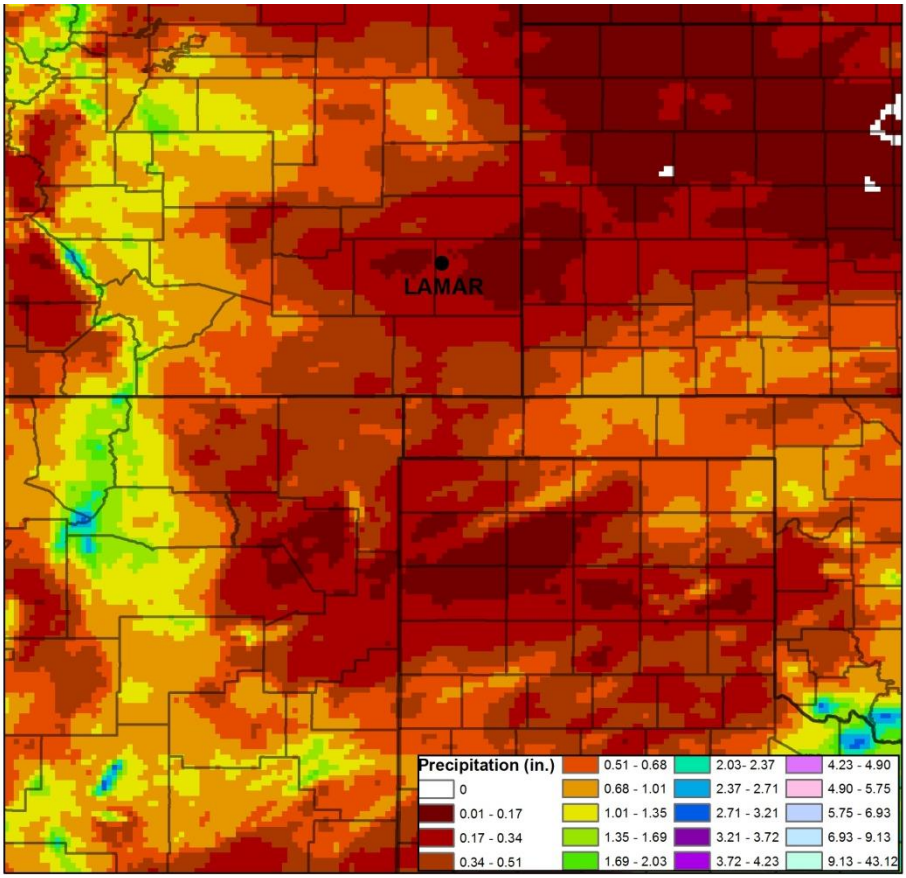


Figure 18: Total precipitation in inches for Colorado, March 3, 2015 – April 1, 2015. (Source: http://prism.nacse.org/recent/)

Based on the developing weather conditions and the drought-stricken soils described above, the blowing dust of April 2, 2015 was anticipated by local agencies. The Colorado Department of Public Health and Environment (CDPHE) along with the National Weather Service (NWS) office in Pueblo issued forecast products and advisories pertaining to blowing dust conditions in southeast Colorado. At 12:00 PM MST on April 2 the CDPHE issued a Blowing Dust Advisory for southeast Colorado, including the Lamar area. Text from that advisory includes:

> "Strong gusty winds will create areas of blowing dust through Thursday evening. Winds and the threat for blowing dust will decrease after about 10 PM."(Source: http://www.colorado.gov/airquality/forecast_archive.aspx?seeddate=04%2f02%2f2015)

And from the Pueblo NWS Area Forecast Discussion at 7:57 PM MST:

> "This front has produced very gusty north winds…much stronger than originally anticipated…and these strong winds have kicked up an (sic) rather large area of dust and reduced visibilities. Therefore…dust advisory has been issued for portions of the SE plains through this evening until midnight." (Source: http://mesonet.agron.iastate.edu/wx/afos/)

Forecasts and analysis issued by local agencies confirm that blowing dust was both anticipated and observed across southeast Colorado on April 2, 2015.

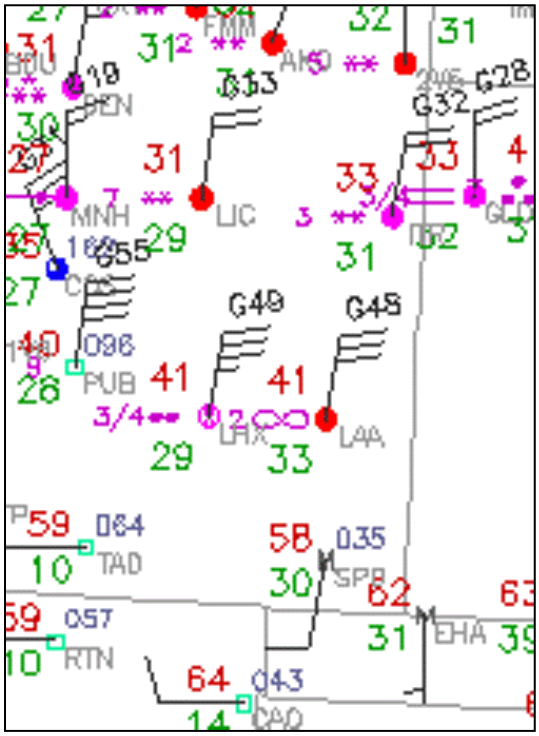
In order to fully evaluate the synoptic meteorological scenario of April 2, 2015, a regional surface weather map is provided showing individual station observations during the height of the event in question. Figure 19(a) presents weather observations for eastern Colorado and adjacent states at 8:46 PM MST on April 2. On the map in Figure 19(a) the station observation for Lamar (LAA) shows winds sustained at 30 knots (35 mph), gusts to 48 knots (55 mph), and a reduced visibility of 1 statute mile with the weather symbol of infinity (∞). 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.erh.noaa.gov/er/box/glossary.htm).

Nearly an hour later at 9:33 PM MST (Figure 19(b)), visibility in Lamar continued to be obscured at 3 statute miles with haze while the wind had actually intensified somewhat (sustained at 40 knots (46 mph) with gusts to 48 knots (55 mph). The Lamar observations at 8:46 PM and 9:33 PM MST are consistent with blowing dust conditions in southeast Colorado (30 mph sustained winds, 40 mph gusts; see the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx). Also note that 50 miles to the west of Lamar, La Junta (LHX) was reporting sustained winds of 25 knots (29 mph), gusts to 37 knots (43 mph), haze and visibility reduced to 3 statute miles (Figure 19(b)). This observation indicates that the dust event of April 2 was likely regional in scale and not solely confined to the Lamar area.

Hourly surface observations, in table form, from Lamar along with La Junta provide supporting evidence that there was an extended period of high winds and haze (blowing dust) in southeast Colorado on April 2. Table 4 lists observations for the PM_{10} exceedance location of Lamar while observations for La Junta can be found in Table 5. Observations that are climatologically consistent with blowing dust conditions (see the Lamar Blowing Dust Climatology available at http://www.colorado.gov/airquality/tech_doc_repository.aspx) are highlighted in yellow. Both of 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 north to northeasterly flow in the wake of a cold front. This data provides clear evidence of blowing dust and winds well above the threshold speeds for blowing dust on April 2, 2015.

a) 

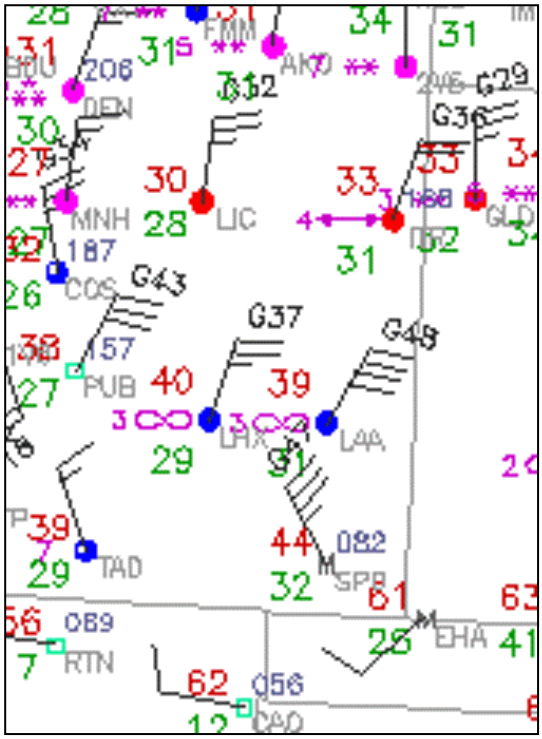
b) 

Figure 19: High Plains regional surface analysis for (a) 8:46 PM MST and (b) 9:33 PM MST, April 2, 2015.
(Source: http://www.mmm.ucar.edu/imagearchive/)

Table 4: Weather observations for Lamar, Colorado, on April 2, 2015
(Source: http://mesowest.utah.edu/)

Time MST April 2, 2015	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
0:53	45	74	4		330		8
1:53	40	83	5		190		8
2:53	38	85	4		240		8
4:53	36	89	7		360		8
5:53	38	85	5		50		7
6:53	43	76	0				7
7:53	48	61	0				7
8:53	53	46	7		160		7
9:53	56	43	10		160		7
10:53	61	36	16	24	140		7
11:53	65	33	18	24	150		7
12:53	68	30	21	31	150		7
13:53	70	28	20	31	170		7
14:53	72	26	28	35	170		7
15:53	72	27	28	36	160		7
16:53	71	28	21	30	140		7
17:53	70	23	22	30	170		7
18:39	64	27	29	39	340	haze	2.5
18:42	60	35	40	50	340	haze	1.25
18:45	55	43	38	50	340	haze	0.75
18:53	48	56	44	59	10	lt rain	0.5
19:05	45	63	45	61	20	haze	0.75
19:15	42	70	44	58	10	haze	1.25
19:31	41	73	37	55	10	haze	2
19:45	41	73	38	50	20	haze	2.5
19:53	40	73	33	50	20	haze	3
20:07	40	73	33	50	20	haze	2.5
20:15	39	72	45	55	30	haze	3
20:53	39		31	43	30	haze	4
21:53	39		31	38	20	haze	6
22:09	39		23	33	20		8
22:53	39		18	30	30		9
23:29	39		16	22	10		9
23:53	38		17	25	20		9

Table 5: Weather observations for La Junta, Colorado, on April 2, 2015 (Source: http://mesowest.utah.edu/)

Time MST April 2, 2015	Temperature Degrees F	Relative Humidity in %	Wind Speed in mph	Wind Gust in mph	Wind Direction in Degrees	Weather	Visibility in miles
11:53	67	31	23	30	160		10
12:53	70	26	24	33	150		10
13:53	71	26	30	38	150		9
14:53	72	23	28	44	160	haze	4
15:24	78	8	30	39	260	haze	3
15:29	79	7	36	44	260	haze	1.75
15:32	78	6				haze	1
15:40	78	6				haze	0.75
15:47	79	6	35	41	260	haze	1.25
15:53	78	6				haze	1
16:04	78	7				haze	0.75
16:15	77	7	30		270	haze	1.25
16:21	77	7	31	39	250	haze	3
16:34	77	7	30	40	260	haze	4
16:53	74	8	27	33	260		10
17:24	62	31				lt rain	
17:30	57	44				lt rain	0.25
17:37	54	49				lt rain	0.25
17:53	51	52				lt rain	0.25
18:42	43	65				lt rain	
18:48	43	61				lt rain	0.25
18:53	42	64	50	62	10	lt rain	0.25
19:03	41	65				lt rain	
19:29	41	62	38	56	10	lt rain	0.75
19:48	39	65	37	55	20	lt rain	1.25
19:53	40	65	43	54	10	haze	1.75
20:06	40	62	40	51	20	haze	2
20:23	40	65	31	43	20	haze	3
20:53	40	62	21	37	10	haze	4
21:03	40	62	21	32	20	haze	5
21:39	40	65	21		10		10
21:53	39	67	22		10		10
22:11	39	67	22		10		10
22:44	38	73	17		10		10
22:53	38	73	18		10		10
23:53	38	76	15		10		10

Radar imagery provides strong supporting evidence that a regional dust storm was taking place on April 2, 2015. The Pueblo Base Velocity radar image at 5:43 PM MST, April 2 (Figure 20) shows suspected areas of dust (circled in red) moving in a southerly direction away from the radar. These bands of blowing dust were likely being produced by the strong pressure gradient in the wake of the cold front passage shown earlier in Figure 16. Also note that the radar returns from Figure 20 have distinct bow echo patterns which are often associated with strong, sometimes damaging, winds (see the following link for the description of a bow echo published by the National Oceanic and Atmospheric Administration: http://www.erh.noaa.gov/er/box/glossary.htm). Considering the extent of the drought in southeast Colorado and the relatively low dBZ values on the radar return, it is reasonable to assume that these bow echoes are indeed lofted dust.

By 6:03 PM MST the bow echo signatures had progressed further southward and were impacting several small towns in southeast Colorado, including Fowler (Figure 21). By viewing a webcam photo from Fowler at precisely the same time as this radar image, we can reasonably ascertain that blowing dust was occurring in southeast Colorado. Figure 22 shows a webcam image from Fowler at 6:03 PM MST which clearly shows a considerable amount of blowing dust obscuring the horizon.

Shortly thereafter, the bow echo signatures disappeared from the Pueblo radar and never fully appeared in close vicinity to Lamar. The likely reason for this is due to the gap in NEXRAD coverage in southeast Colorado, with the lowest radar returns available ranging from 6,000 to 10,000 ft. above ground level (Figure 23). It is possible, if not likely, that the radar beam was overshooting any blowing dust that was located close to the surface in Lamar.

Radar data in conjunction with webcam imagery clearly reveals that a dust storm was taking place throughout southeast Colorado on April 2, 2015. This collection of data, combined with other evidence in this report, indicates that this dust storm was a natural, regional event and therefore not controllable or preventable.

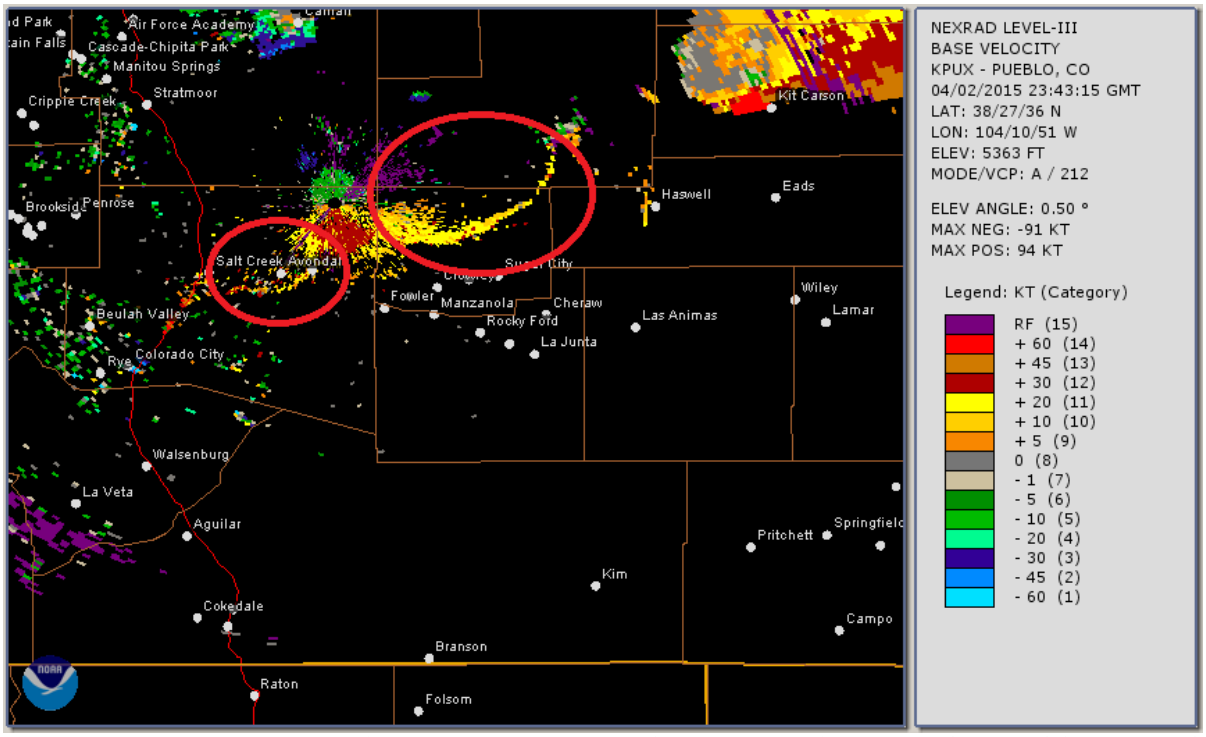


Figure 20: NEXRAD Base Velocity image, 0.50° elevation angle, from the Pueblo, CO radar at 5:43 PM MST (2343Z, April 2), April 2, 2015.
(Source: http://www.ncdc.noaa.gov/nexradinv/)

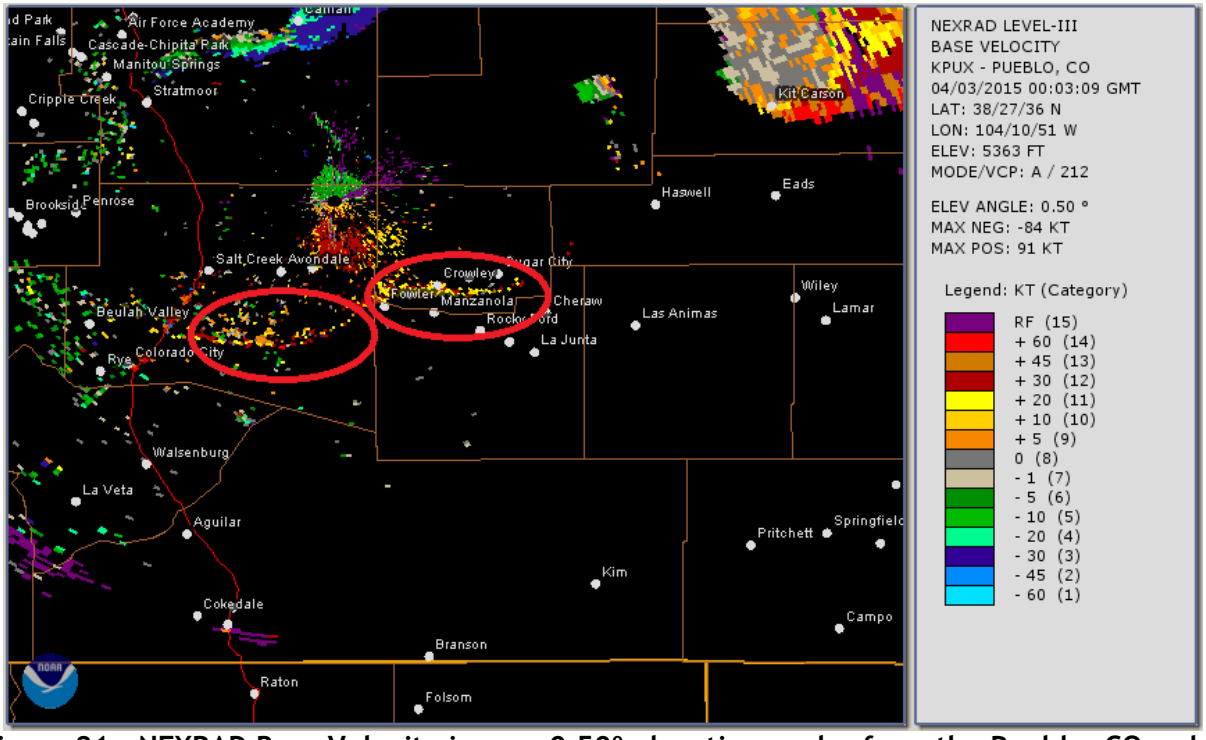


Figure 21: NEXRAD Base Velocity image, 0.50° elevation angle, from the Pueblo, CO radar at 6:03 PM MST (003Z, April 3), April 2, 2015.
(Source: http://www.ncdc.noaa.gov/nexradinv/)

Figure 22: Fowler, CO webcam image at 6:03 PM MST April 2, 2015.
(Source: http://www.wunderground.com/wundermap/)

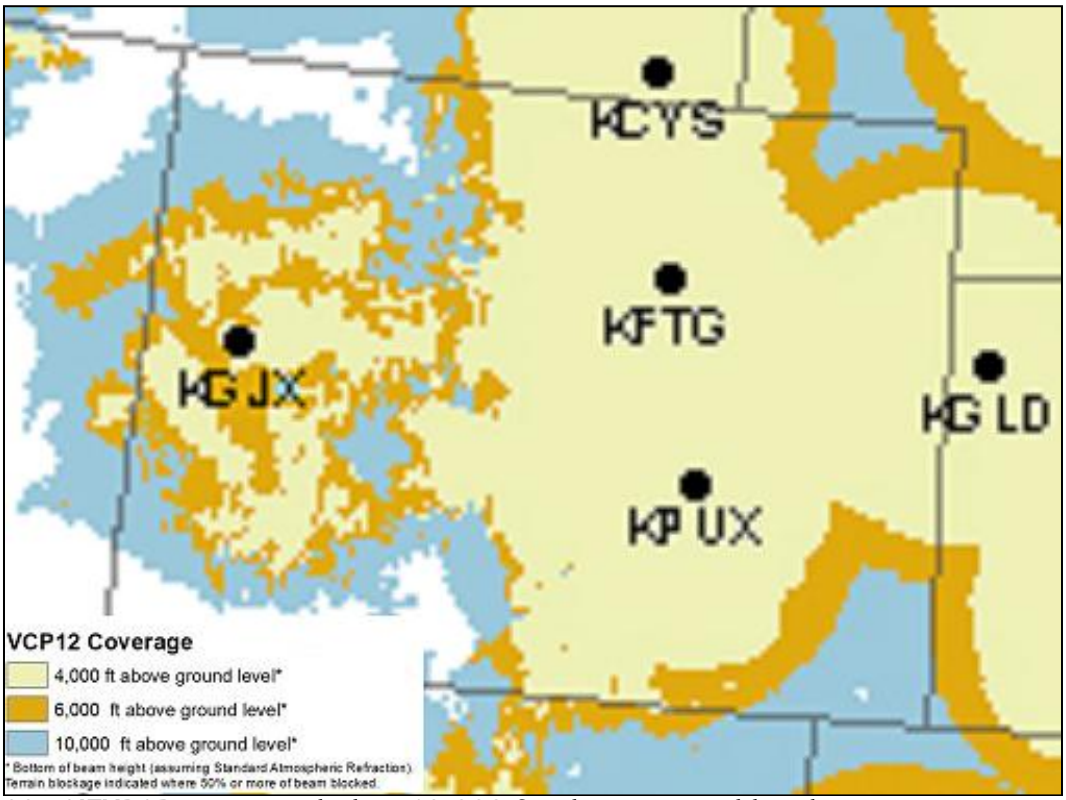


Figure 23: NEXRAD coverage below 10,000 ft. above ground level.
(Source: http://www.roc.noaa.gov/WSR88D/Maps.aspx)

3.0 Evidence - Ambient Air Monitoring Data and Statistics

Multiple intense fronts moved across south eastern Colorado in 2013. Several of these transported blowing dust into Lamar from source regions outside of the monitoring area. Ambient air monitoring data and statistics for each event are discussed further on the following pages.

3.1 April 1, 2015 Monitoring Data and Statistics

On April 1, 2015, a cluster of strong to severe thunderstorms in southeast Colorado with powerful outflow winds caused an exceedance of the twenty-four hour PM_{10} standard in Lamar, Colorado. The thunderstorms were associated with an unstable atmosphere, the disturbance causing strong south to southwest winds and resulting in significant blowing dust in the Lamar area. The strong winds blowing over dry soils affected PM_{10} samples at the only remaining site in Lamar, CO. During this event a sample in excess of 150 $\mu g/m^3$ was recorded at Lamar Municipal (253 $\mu g/m^3$).

3.1.1 Historical Fluctuations of PM_{10} Concentrations in Lamar

This evaluation of PM_{10} monitoring data for sites affected by the April 1, 2015, event was made using valid samples from PM_{10} samplers in Lamar from 2010 through June 2015 (the last available sample at the time of analysis); APCD has been monitoring PM_{10} concentrations in Lamar since 1985. The overall data summary for the affected site is presented in Table 6, with all data values being presented in $\mu g/m^3$.

Table 6: April 1, 2015, Event Data Summary

Evaluation	*Lamar Municipal*
04/01/2015	**253**
Mean	25.7
Median	19
Mode	19
St. Dev	41.3
Var	1705.5
Minimum	2
Maximum	1220
Percentile	99.5%
Count	1875

Lamar Municipal – 08-099-0002
The PM_{10} sample on April 1, 2015, at Lamar Municipal of 253 $\mu g/m^3$ exceeds the 99^{th} percentile value for all evaluation criteria and is the 11th largest sample of the dataset. The ten samples greater than the event sample are all associated with high wind events. There are 1,875 samples in this dataset. The sample of April 1 clearly exceeds the typical samples for this site.

Figure 24 and Figure 25 graphically characterize the Lamar Municipal PM_{10} data. Figure 24 is a simple time series; every sample in this dataset (2010 - 2015) greater than 150 $\mu g/m^3$ 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 $\mu g/m^3$. Of the 1,875 samples in this data set less than 1% are greater than 100 $\mu g/m^3$.

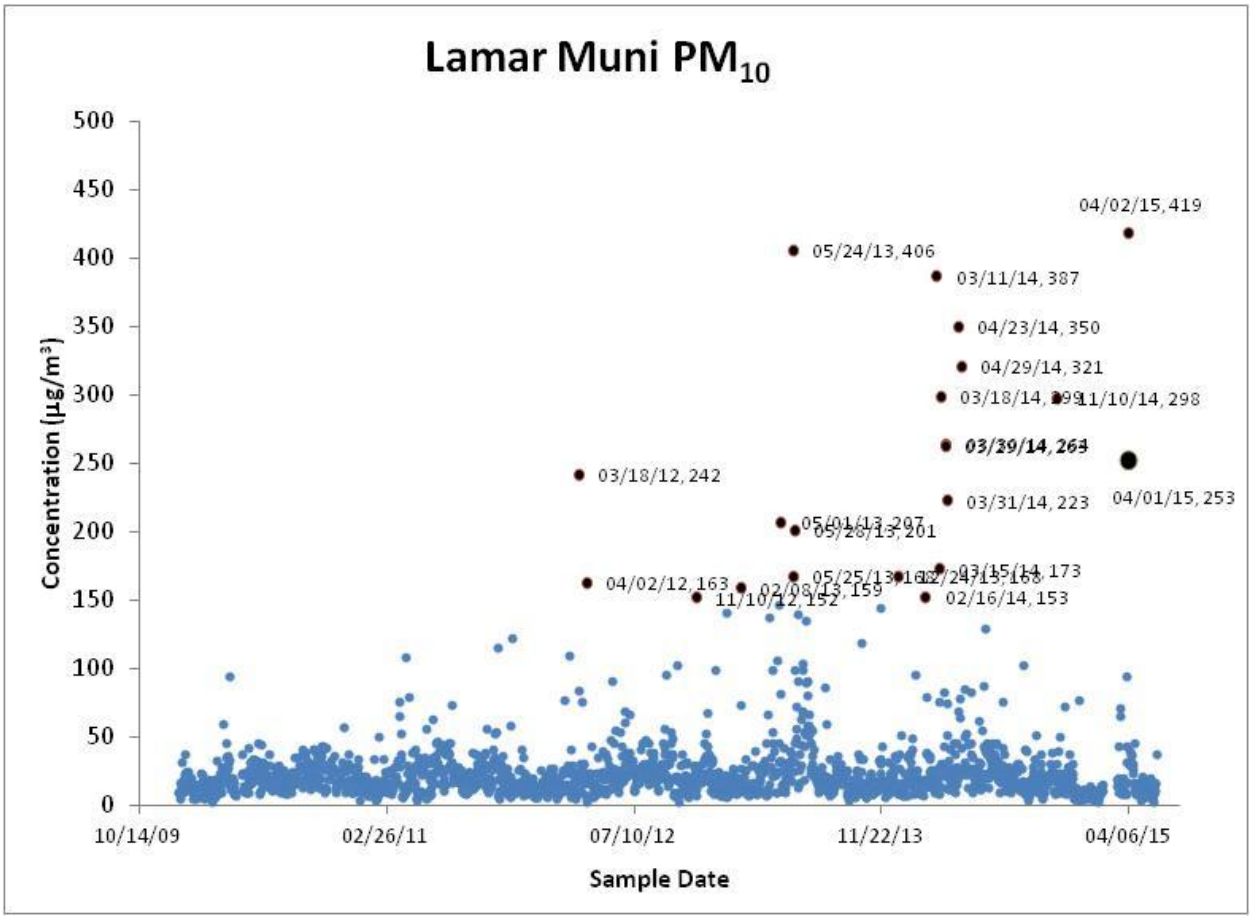


Figure 24: Lamar Municipal PM_{10} Time Series, 2010 - 2015

The monthly box-whisker plot in Figure 25 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 April 1, 2015. Although these high values affect the variability and central tendency (average) of the dataset they are not representative of what is typical at the site.

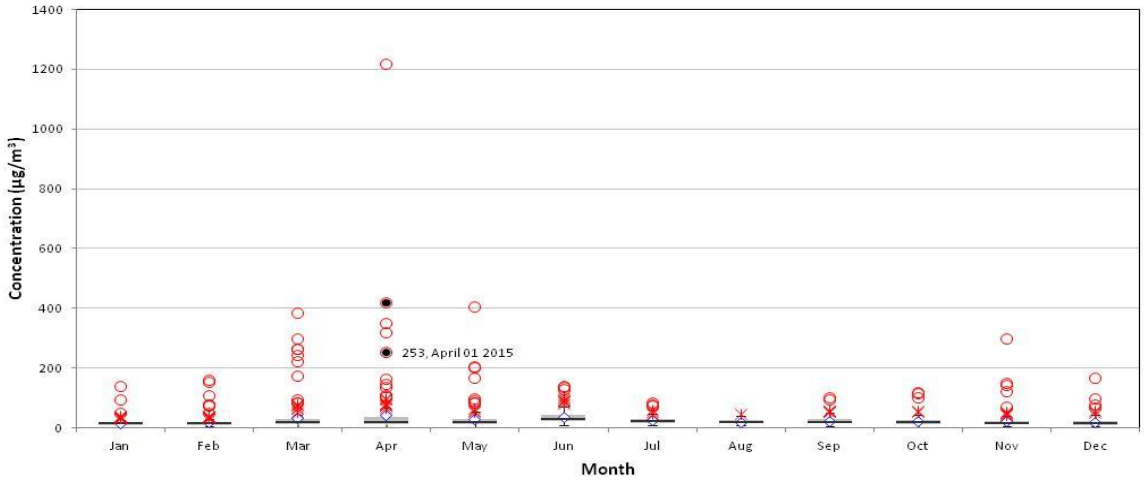


Figure 25: Lamar Municipal PM_{10} Box-Whisker Plot, 2010 - 2015

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The April mean (41.9 $\mu g/m^3$) is greater than the April median value (20.5 $\mu g/m^3$) and is greater than 80% of all samples in any April. 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 25 suggests that typical, day to day PM_{10} concentrations exposures for the months of June and September are highest among all months. The sample of April 1, 2015, clearly exceeds the typical data at this site.

3.1.2 Wind Speed Correlations

Wind speeds in southeast Colorado increased late morning of April 1, 2015, and stayed elevated throughout the night of April 2, 2015, gusting to speeds in excess of 40 mph with sustained hourly averages exceeding 25 mph. The two charts in Figure 26 display wind speed (mph) as a function of date from meteorological sites within the Lamar area for a number of days before and after the event.

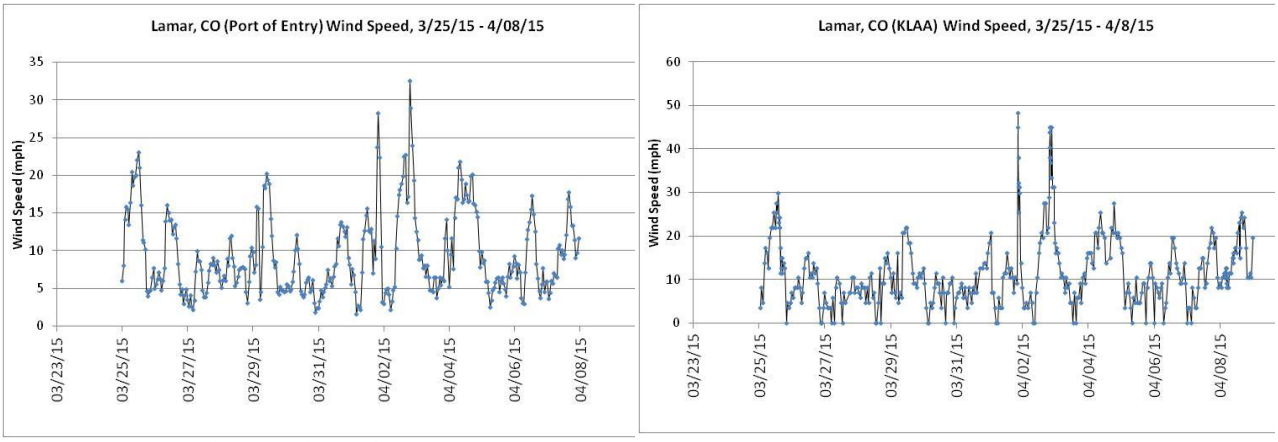


Figure 26: Wind Speed (mph), Lamar, CO, 03/25/2015 – 04/08/2015

Figure 27 plots PM_{10} concentrations from the affected sites for the period for seven days prior to and following the sample of April 1, 2015.

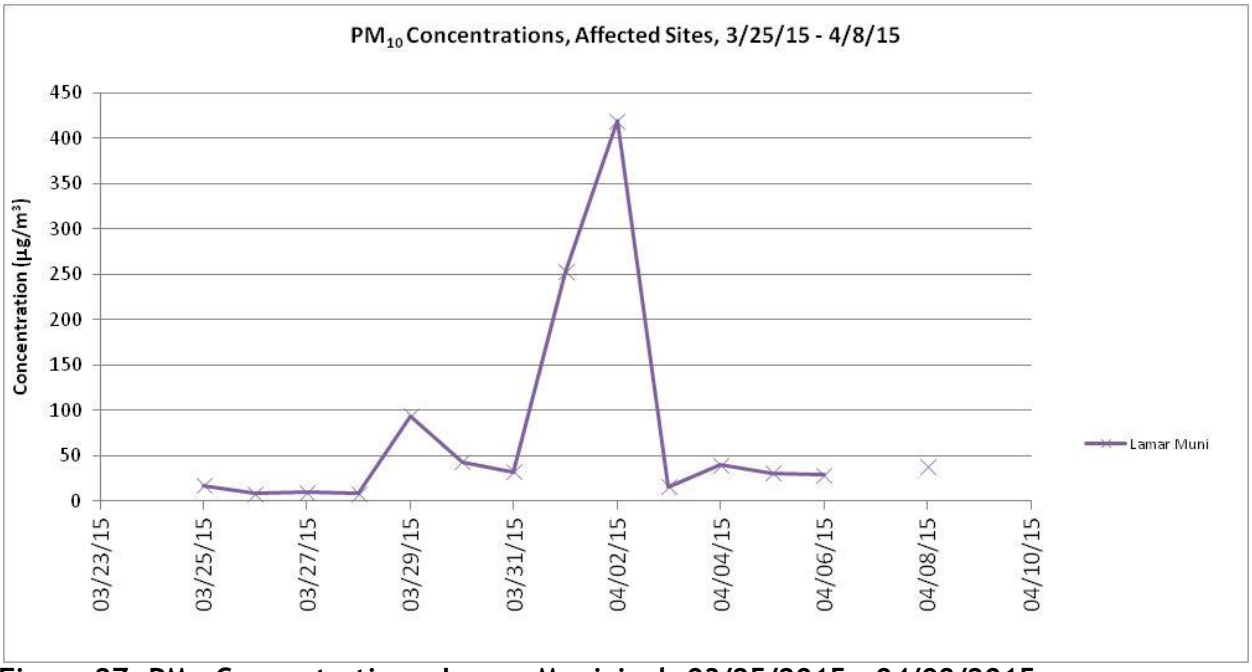


Figure 27: PM_{10} Concentrations, Lamar Municipal, 03/25/2015 – 04/08/2015

Figure 27 mimics the plots for wind speed, suggesting an association between the high winds and PM_{10} concentrations at the affected site, even to the extent the wind continued to blow through the early hours of April 1, 2015 contributing to that day's high sample of 253 $\mu g/m^3$ (exceeding the 99th percentile for the entire data set). Although the samples were affected to differing degrees by the high winds (possibly reflecting the variation in contribution from local sources) the elevated concentrations are clearly associated with the elevated wind speeds. The relationship between the two data sets would suggest that the regional high winds had an effect on PM_{10} samples in Lamar on April 1.

3.1.3 Percentiles

Monthly percentile plots in Figure 28 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 90th percentile value at Lamar Muni and the monthly median is 0.65. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the monthly median values increases sharply.

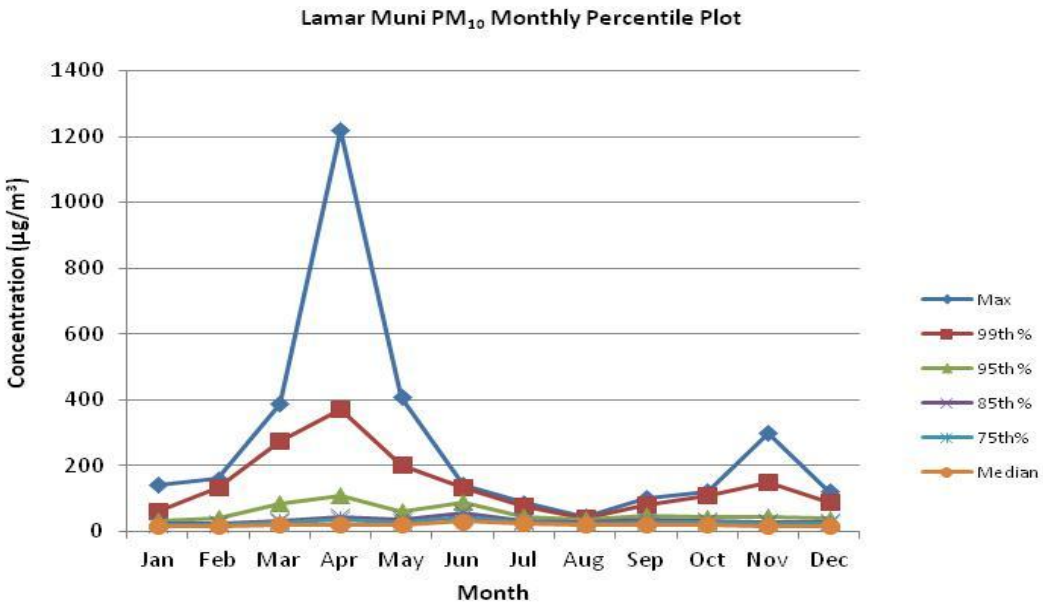


Figure 28: Monthly PM_{10} Percentile Plots, 2010 - 2015

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 set of concern, a conservative estimate of the percentile value that is reflective of typical, day to day variation is the 75th percentile value. Nearly all of the variation in the monthly 75th percentile values of this data set can be explained by the variation in monthly medians; for Lamar Municipal, the correlation between the median and monthly 75th percentile values is $r^2 = 0.9$. A reasonable estimate of the contribution to the event from local sources for this data set may be the monthly 85th percentile values the correlation between the median and the monthly 85th percentile values is $r^2 = 0.80$. If these percentile values are taken as an estimate of event PM_{10} 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 7identifies various percentile values that are representative of the maximum contribution due to local sources from all May data (2009 – 2014). 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 85th percentile as the minimum (reasonable) event contribution estimate and the difference between the actual sample value and the 75th percentile as the maximum (conservative) event contribution estimate. This column represents the range of estimated contribution to the April 1, 2015, Lamar Municipal sample due to the high wind event.

Table 7: Estimated Maximum Event PM_{10} Contribution, Lamar Municipal, 2009 – 2014

Site	Event Day Concentration ($\mu g/m^3$)	April Median ($\mu g/m^3$)	April Average ($\mu g/m^3$)	April 75th % ($\mu g/m^3$)	April 85th % ($\mu g/m^3$)	Est. Conc. Above Typical ($\mu g/m^3$)
Lamar Municipal	253	20.5	41.9	35	45	**208 – 218**

Clearly, there would have been no exceedance but for the additional contribution to the PM_{10} sample provided by the event.

3.2 April 2, 2015 Monitoring Data and Statistics

On April 2, 2015, a powerful spring storm in southeast Colorado caused an exceedance of the twenty-four hour PM_{10} standard in Lamar, Colorado. The passing cold front resulted in intense surface winds resulting in significant blowing dust in the Lamar area. The strong winds blowing over dry soils affected PM_{10} samples at the only remaining site in Lamar, CO. During this event a sample in excess of 150 $\mu g/m^3$ was recorded at Lamar Municipal (Lamar Muni, 419 $\mu g/m^3$).

3.2.1 Historical Fluctuations of PM_{10} Concentrations in Lamar

This evaluation of PM_{10} monitoring data for sites affected by the April 2, 2015, event was made using valid samples from PM_{10} samplers in Lamar from 2010 through June 2015 (the last available sample at the time of analysis); APCD has been monitoring PM_{10} concentrations in Lamar since 1985. The overall data summary for the affected site is presented in Table 8, with all data values being presented in $\mu g/m^3$.

Table 8: April 2, 2015, Event Data Summary

Evaluation	*Lamar Municipal*
04/02/2015	**419**
Mean	25.7
Median	19
Mode	19
St. Dev	41.3
Var	1705.5
Minimum	2
Maximum	1220
Percentile	99.5%
Count	1875

Lamar Municipal – 08-099-0002
The PM_{10} sample on April 2, 2015, at Lamar Municipal of 419 $\mu g/m^3$ exceeds the 99^{th} percentile value for all evaluation criteria and is the 2nd largest sample of the dataset. The only sample greater than the event sample is associated with a high wind event. There are

1,875 samples in this dataset. The sample of April 2 clearly exceeds the typical samples for this site.

Figure 29 and Figure 30 graphically characterize the Lamar Municipal PM_{10} data. Figure 29 is a simple time series; every sample in this dataset (2010 - 2015) greater than 150 $\mu g/m^3$ 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 $\mu g/m^3$. Of the 1,875 samples in this data set less than 1% are greater than 100 $\mu g/m^3$.

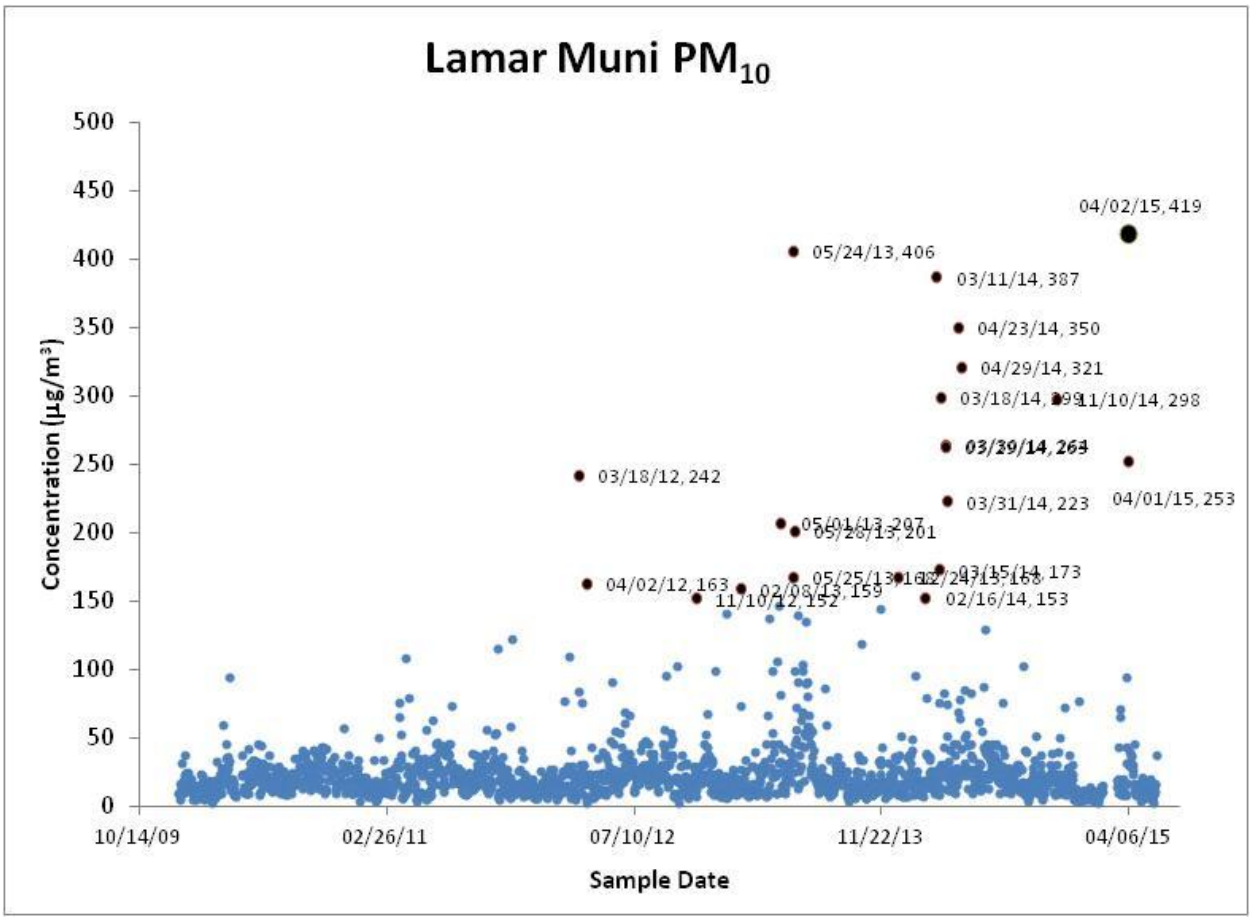


Figure 29: Lamar Muni PM_{10} Time Series, 2010 - 2015

The monthly box-whisker plot in Figure 30 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 April 2, 2015. Although these high values affect the variability and central tendency (average) of the dataset they are not representative of what is typical at the site.

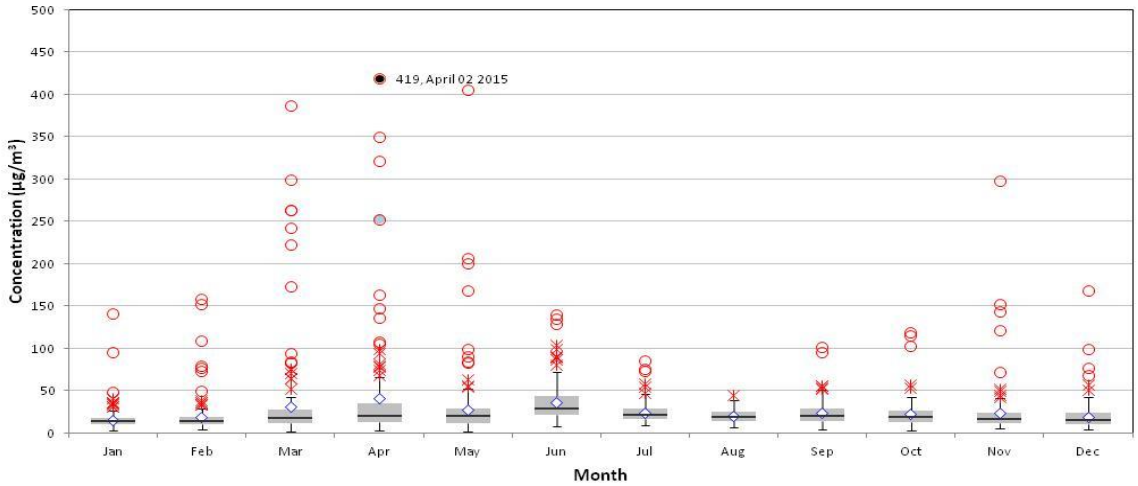


Figure 30: Lamar Muni PM_{10} Box-Whisker Plot, 2010 - 2015

Note the degree to which the data in the months of fall through spring, beginning in October and extending through May, are skewed. The April mean (41.9 $\mu g/m^3$) is greater than the April median value (20.5 $\mu g/m^3$) and is greater than 80% of all samples in any April. 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 30 suggests that typical, day to day PM_{10} concentrations exposures for the months of June and September are highest among all months. The sample of April 2, 2015, clearly exceeds the typical data at this site.

3.2.2 Wind Speed Correlations

Wind speeds in southeast Colorado increased late morning of April 2 and stayed elevated throughout the night of April 2, gusting to speeds in excess of 40 mph with sustained hourly averages exceeding 25 mph. The following two charts in Figure 31 display wind speed (mph) as a function of date from meteorological sites within the affected area for a number of days before and after the event.

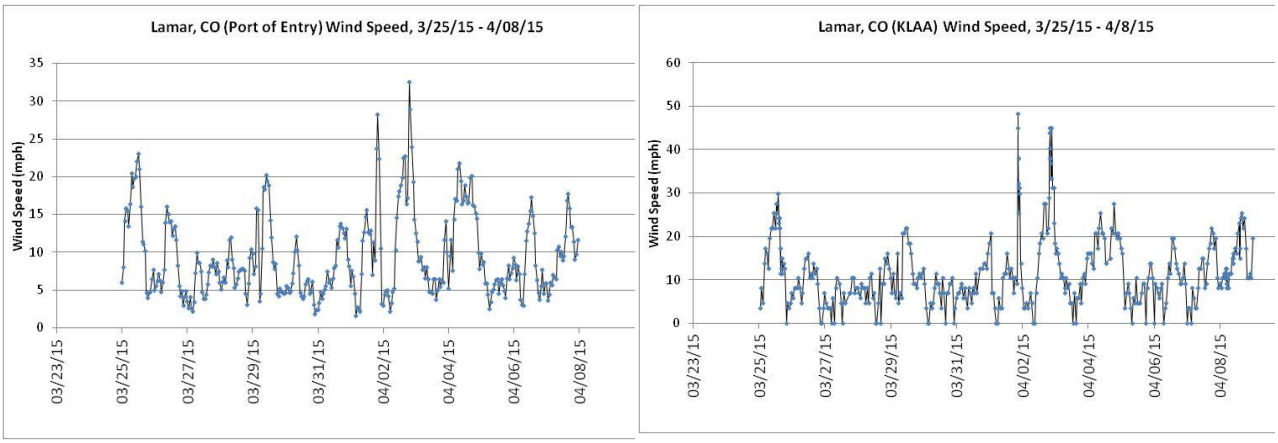


Figure 31: Wind Speed (mph), Lamar, CO, 03/25/2015 – 04/08/2015

Figure 32 plots PM_{10} concentrations from the affected sites for the period for seven days prior to and following the sample of April 2, 2015.

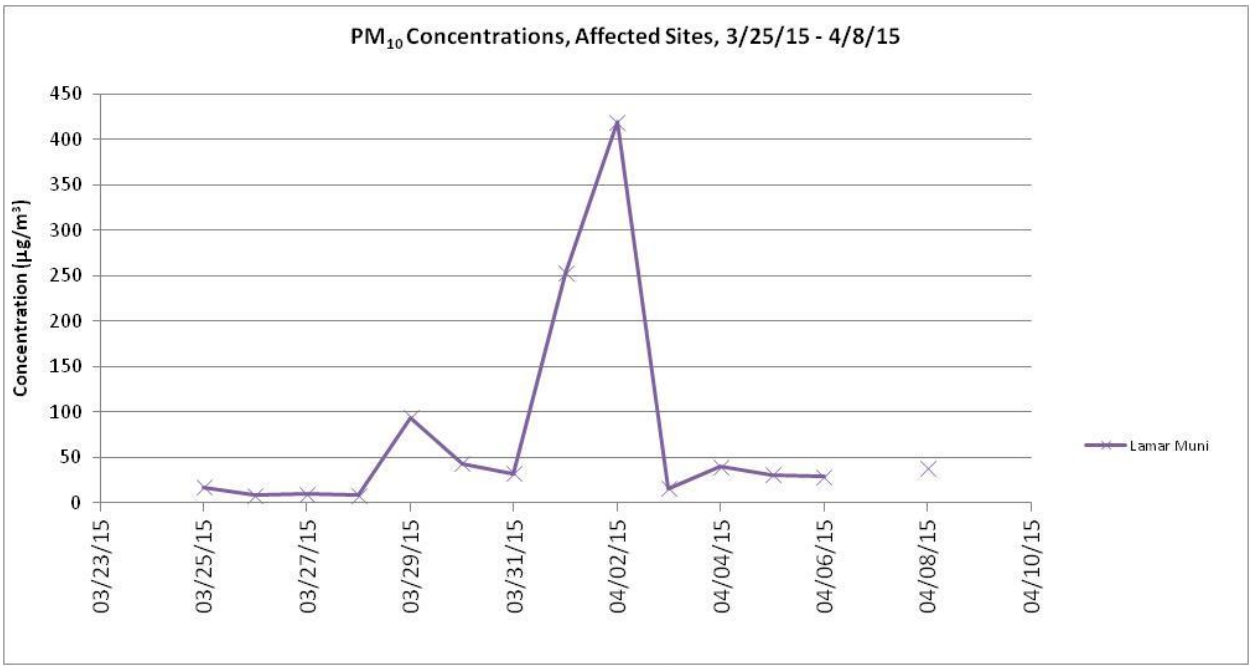


Figure 32: PM_{10} Concentrations, Lamar Municipal, 03/25/2015 – 04/08/2015

Figure 32 mimics the plots for wind speed, suggesting an association between the high winds and PM_{10} concentrations at the affected site, even to the extent the wind continued to blow through the early hours of April 2, 2015, contributing to that day's high sample of 419 $\mu g/m^3$ (exceeding the 99th percentile for the entire data set). Although the samples were affected to differing degrees by the high winds (possibly reflecting the variation in contribution from local sources) the elevated concentrations are clearly associated with the elevated wind speeds. The relationship between the two data sets would suggest that the regional high winds had an effect on PM_{10} samples in Lamar on April 2.

3.2.3 Percentiles

Monthly percentile plots in Figure 33 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 90th percentile value at Lamar Muni and the monthly median is 0.65. As the percentile value decreases (i.e. 85%, 75%, etc) the correlation between those values and the monthly median values increases sharply.

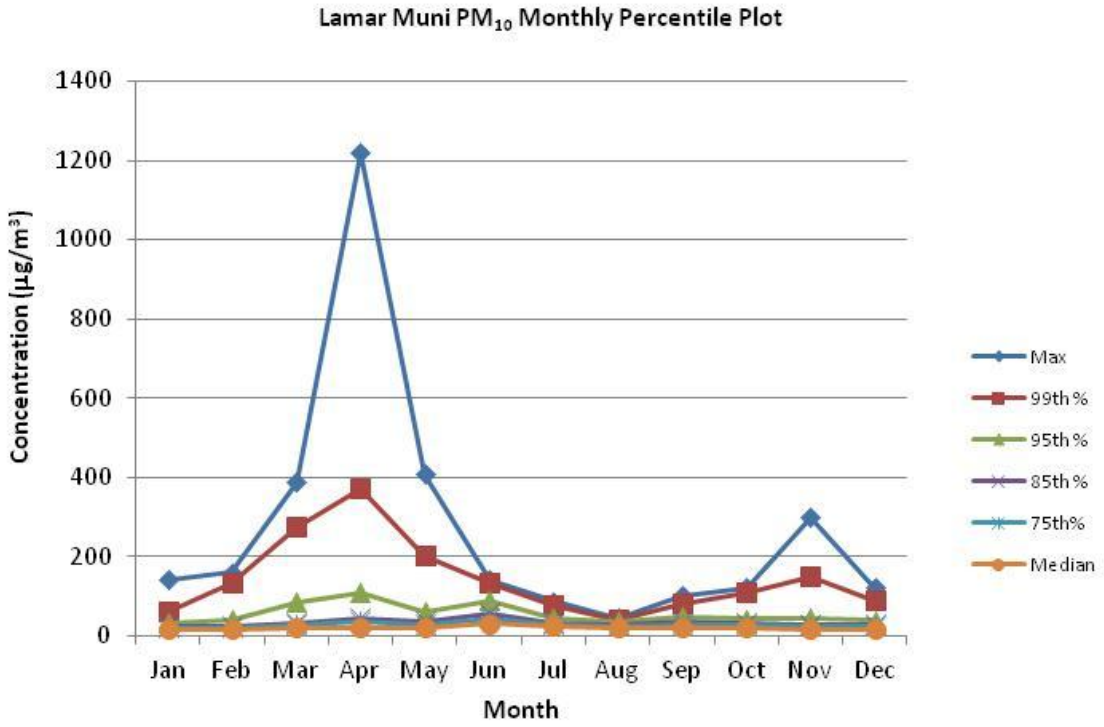


Figure 33: Monthly PM_{10} Percentile Plots, 2010 - 2015

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 set of concern (Lamar Muni) a conservative estimate of the percentile value that is reflective of typical, day to day variation is the 75th percentile value. Nearly all of the variation in the monthly 75th percentile values of this data set can be explained by the variation in monthly medians; for Lamar Muni these the correlation between the median and monthly 75th percentile values is r^2 = 0.9. A reasonable estimate of the contribution to the event from local sources for this data set may be the monthly 85th percentile values the correlation between the median and the monthly 85th percentile values is r^2 = 0.80. If these percentile values are taken as an estimate of event PM_{10} 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.

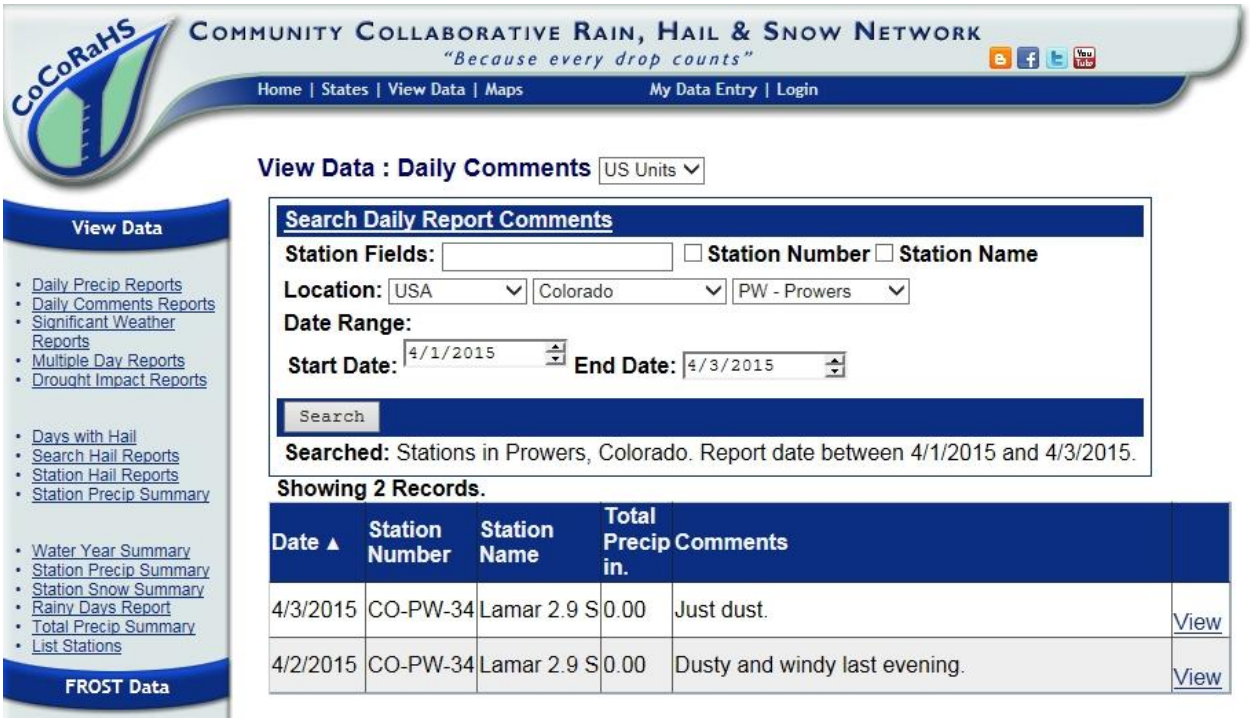
Table 9 identifies various percentile values that are representative of the maximum contribution due to local sources from all May data (2009 – 2014). In Table 9, the range estimate in the 'Est. Conc. Above Typical' column is derived using the difference between the actual sample value and the 85th percentile as the minimum (reasonable) event contribution estimate and the difference between the actual sample value and the 75th percentile as the maximum (conservative) event contribution estimate. This column represents the range of estimated contribution to the April 2, 2015, Lamar Municipal sample due to the high wind event.

Table 9: Estimated Maximum Event PM_{10} Contribution, Lamar Municipal, 2009 - 2014

Site	Event Day Concentration ($\mu g/m^3$)	April Median ($\mu g/m^3$)	April Average ($\mu g/m^3$)	April 75th % ($\mu g/m^3$)	April 85th % ($\mu g/m^3$)	Est. Conc. Above Typical ($\mu g/m^3$)
Lamar Municipal	419	20.5	41.9	35	45	**374 – 384**

Clearly, there would have been no exceedance but for the additional contribution to the PM_{10} sample provided by the event.

4.0 News and Credible Evidence



COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK

"Because every drop counts"

Home | States | View Data | Maps | My Data Entry | Login

View Data : Daily Comments US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
- Significant Weather Reports
- Multiple Day Reports
- Drought Impact Reports
- Days with Hail
- Search Hail Reports
- Station Hail Reports
- Station Precip Summary
- Water Year Summary
- Station Precip Summary
- Station Snow Summary
- Rainy Days Report
- Total Precip Summary
- List Stations

FROST Data

Search Daily Report Comments

Station Fields: ☐ Station Number ☐ Station Name

Location: USA | Colorado | PW - Prowers

Date Range:

Start Date: 4/1/2015 **End Date:** 4/3/2015

Search

Searched: Stations in Prowers, Colorado. Report date between 4/1/2015 and 4/3/2015.

Showing 2 Records.

Date ▲	Station Number	Station Name	Total Precip in.	Comments	
4/3/2015	CO-PW-34	Lamar 2.9 S	0.00	Just dust.	View
4/2/2015	CO-PW-34	Lamar 2.9 S	0.00	Dusty and windy last evening.	View

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 by gusts from the regional dust storms that 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 surrounding areas. The following sections will describe in detail the regulations and programs in place designed to control PM_{10} in each affected community. These sections will demonstrate that the events were 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 regions for the associated dust that occurred during the April 2015 events in Lamar originated outside of the monitored areas.

The APCD conducted thorough analyses and outreach with local governments to confirm that no unusual anthropogenic PM_{10}-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 April 2015 events. This information shall confirm that no unusual anthropogenic actions occurred in the local areas of Lamar during this time.

5.1 Regulatory Measures - State

The APCDs regulations on PM_{10} emissions are summarized in Table 10.

Table 10: 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	Applicable sections include but are not limited to: 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) 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 economically reasonable in order to minimize fugitive particulate emissions.(Section III.D.2.b) 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) 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))
Colorado Department of Public Health and Environment Regulation 3- Stationary Source Permitting and Air Pollutant Emission Notice Requirements	Construction Permit required if a land development project exceeds 25 acres and spans longer than 6 months in duration (Section II.D.1.j) All sources with uncontrolled actual PM_{10} emissions equal to or exceeding five (5) tons per year, must obtain a permit. 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_{10}.
Colorado Department of Public Health and Environment Regulation 4- New Wood Stoves and the Use of Certain Woodburning Appliances During High Pollution Days	Regulates wood stoves, conventional fireplaces and woodburning on high pollution days. 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) Section III regulates pellet stoves. Section IV regulates masonry heaters. Section VII limits the use of stoves on high pollution days.
Colorado Department of Public Health	Implements federal standards of performance for

and Environment Regulation 6- Standards of Performance for New Stationary Sources	new stationary sources including ones that have particulate matter emissions. (Section I)
Colorado Department of Public Health and Environment Regulation 9- Open Burning, Prescribed Fire, and Permitting	Prohibits open burning throughout the state unless a permit has been obtained from the appropriate air 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_{10} 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_{10} 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_{10} 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 most recently updated NEAP for High Wind Events in Lamar, Colorado was completed 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 2012 Revised Natural Events Action Plan For High Wind Events, Lamar, Colorado at 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 10 will limit emissions from any new source that may, in the future, locate in the area.

The EPA approval of the original PM_{10} 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_{10} 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_{10} 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_{10} 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. In 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. The City's Planning Commission has 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 10.

City of Lamar

The City of Lamar has been very proactive in addressing potential PM_{10} 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. In October 2013, the Public Works Director stated that most of the trees were 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. In October 2013, the Public Works Director stated that the drip system was 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_{10} 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. In October 2013, the Public Works Director stated 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 stated 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_{10}. 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_{10}:

- 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 City 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_{10} 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_{10} 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 Figure 35 as Site F. 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 PM_{10} 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. In October 2013, the Public Works Director stated that gravel was 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.

<u>Prowers County</u>

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), siting, 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 siting 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_{10} problems for the area. Figure 34 through Figure 49 illustrate potential areas of local soil disturbance that have been evaluated by the APCD for the Lamar Municipal PM_{10} monitor (08-099-0002).

5.3 Potential Areas of Local Soil Disturbance North of Lamar

Figure 34: North of Lamar Municipal PM_{10} monitor and wind direction. (Google Earth 2012)

Figure 35: Relative positions of Lamar Municipal PM_{10} Monitor and potential disturbed soil (~1 mile distance). (Google Earth 2012)

Site A in Figure 35 is owned by "Heath & Son & Turpin Trucking", a company that repairs large trucks and shared with "HVH Transportation Inc", a freight service trucking company. This site consists of well maintained gravel. 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.

Site B in Figure 35 is shared by a few businesses. All businesses have restricted access by fences surrounding the property. "Cowboy Corral Storage" at 102 North 4th Street 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 in October 2013. The storage company has a small gravel parking lot with access being restricted by a security fence as shown in Figure 36. The lot is also shared with the "Prowers 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 37. 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 36: Site B - Cowboy Corral Storage (Google Image 2012)

Figure 37: Site B - Feed Storage Company (Google Image 2012)

Site C in Figure 35 is at about 201 N 2nd Street. The gravel parking lot on site is owned by "Heath & Son & Turpin Trucking" and is shown in Figure 38. The lot is used to store trucks

when not in use. This site consists of well maintained gravel. 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, and is in an economic recession to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Figure 38: Site C - Heath & Son & Turpin Trucking Storage Lot (Google Image 2012)

Site D in Figure 35 is the "Lamar Water Department". Also on site D 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 and is in an economic recession to be technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this site.

Site E in Figure 35 is the power plant. "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 with 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_{10} 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 during the 2015 events 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.

Site F in Figure 35 is the Burlington Northern Santa Fe railroad. On either side of the rail road tracks is gravel as shown in Figure 39. 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 39: Site F - Railroad tracks with gravel on each side (Google Image 2012)

Site G in Figure 35 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 inspections 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 H in Figure 35 is located at about 356 South 4th 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 40. A large part of site H

is a free public gravel parking lot for the Prowers County Jail and the Prowers County Municipal Court as shown in Figure 41. The lot is maintained by the County. The parking lot is chip sealed and covered in crushed gravel. As shown in Figure 40, site H 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 40: Site H - Century Link Fleet Storage Lot (Google Image 2012)

Figure 41: Site H - Parking lot for the Prowers County Jail and the Prowers County Municipal Court (Google Image 2012)

Site I in Figure 35 is located to the north of the Lamar PM_{10} monitor on the northeast corner of Washington St and 4th St. Site I is at 310 E Washington Street. The site used to be "Big R Warehouse" but is currently owned by Prowers County and is rented out to the Colorado State Patrol for office space. The lot is covered in gravel for dust suppression, drainage, and erosion control. Within the lot, vehicle speeds are restricted to 5 mph. Access to the lot is restricted by a chain link fence. The lot is watered on an as needed basis. Site I, as shown in Figure 42, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel 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.

Figure 42: Site I - 310 E. Washington St. (Google Image 2012)

Site J in Figure 35 is "Ranco", a heavy duty construction trailer manufacturing company located at 700 Crystal St. All of the property owned by Ranco is covered in pavement, gravel, or natural vegetation. The company informed CDPHE that there are no unnatural, disturbed, areas of dirt on the property that could contribute to the issue of blowing 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.

Site K in Figure 35 is Valley Glass, located at 201 east Washington Street. Valley Glass does commercial and residential glass work including storefronts, windows, siding and railings. The property has restricted access and a well maintained gravel parking area, as shown in Figure 43. 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.

Figure 43: Site K - Valley Glass, 201 E. Washington St. (Google Image 2012)

Figure 44: Relative positions of Lamar Municipal PM_{10} Monitor and potential disturbed soil (~2 mile distance). (Google Earth 2012)

Site L in Figure 44 is "All-Rite Paving and Redi-Mix Inc" at 200 Speculator Ave. This is a concrete batch plant with a permit from CDPHE (#12PR1396). However, this facility is considered APEN exempt and emits less than 1 ton per year of PM_{10}. This facility has a particulate matter baghouse collection efficiency of 99%. Water spray and magnesium chloride is used on storage piles and all unpaved roads as needed. The unpaved roads at site L are covered with gravel and the vehicle speed is restricted to 10 mph at all times. The

transfer of aggregate to storage bins and trucks is entirely conducted in enclosed areas. All aggregate is washed prior to storage in order to reduce dust emissions. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions 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.

Site M in Figure 44 is mined by "Carder Inc" for sand and gravel, primarily for road construction. This site has a permit from CDPHE (#99PR0180F) and emits approximately 15 tons per year of PM_{10}. This is a wet mining operation so it produces minimal fugitive dust. The dust control measures that are part of the permit include watering the disturbed area as needed, re-vegetation within one year of disturbance, compacting of piles, mining moist materials, vehicles cannot exceed 10 mph on site at all times, and temporary roads are covered with gravel and watered as needed. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions, compaction, re-vegetation, watering, and extraction limitation, to be technologically feasible and economically reasonable for a facility of this size in order to minimize fugitive particulate emissions for this site.

Site N in Figure 44 are rotating crop fields located south and west of U.S. Highway 287/U.S. Highway 50. As shown in Figure 45 and Figure 46, the crops in these fields are rotated from year to year, allowing fields to lay fallow between plantings.

Figure 45: Site N - Rotating crop fields, 6/2005. (Google Earth 2005)

Figure 46: Site N - Rotating crop fields, 8/2011. (Google Earth 2011)

Site O in Figure 44 is s mined by “All-Rite Paving and Redi-Mix Inc” at 1 Valco Road. This is a concrete batch plant with a permit from CDPHE, (#85PR108). However, this facility is considered APEN exempt and emits less than 1 ton per year of PM_{10} This facility has a PM baghouse collection efficiency of 99%. Visible emissions from this source shall not exceed 20% opacity. Water sprays and magnesium chloride are used on storage piles and all unpaved roads as needed. The unpaved roads at site O are covered with gravel and the vehicle speed is restricted to 10 mph at all times. The transfer of aggregate to storage bins and trucks is entirely conducted in enclosed areas. All aggregate is washed prior to storage in order to reduce dust emissions. Access to the site is restricted by a fence. The APCD considers the enforceable conditions of the permit, including identified continuous controls such as gravel roads with miles per hour restrictions 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. Additionally, the City of Lamar took over the concrete plant in the spring of 2013 and is in the process of reseeding it and turning the site into a park for fishing and wildlife with motorized vehicles being prohibited. The City of Lamar and the Division of Wildlife are partners in this effort.

Site P in Figure 44 is “Ranchers Supply Co., Inc.” at 400 Crystal Street. The company started in 1961 and their products include used trucks, construction equipment, military vehicles, new and used trailers and other government surplus items. The property is used for inventory storage. To control fugitive dust emissions, onsite vehicle speeds are restricted to 10 mph. The owner states that 90% of the lot is covered in well maintained gravel. The site is watered down on an as needed basis to mitigate dust to protect assets and for pollution prevention. Also, all of the large equipment also acts as a wind block. Access to the site is restricted by a security fence. Site P, as shown in Figure 47, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel to be the appropriate available and practical method that is technologically feasible and economically reasonable in order to minimize fugitive particulate emissions for this storage site.

Figure 47: Site P - Ranchers Supply Co., Inc. (Google Image 2012)

Site Q in Figure 44 is “Ranco”, a heavy duty construction trailer manufacturing company located at 700 Crystal Street. All of the property owned by Ranco is pavement, gravel, or natural vegetation. The company informed APCD that there are no unnatural, disturbed, areas of dirt on the property that could contribute to the issue of blowing 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.

Site R in Figure 44 is "C.F. Maier Composites Inc" at 500 East Crystal Street. This 57,000 square foot facility has been operating since 1990 and specializes in highly difficult fiber reinforced composites and OEM component application. C.F. Maier offers product design, development, prototype and full production of reinforced composite parts for high stress or high impact uses. The company has a paved parking lot. The rest of the lot is covered in natural vegetation. There is a short (200 ft.) well maintained gravel road that leads up to the loading dock that gets used on average one a day. Site R, as shown in Figure 44, has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted maintained gravel and natural vegetation 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.

Site S in Figure 44 is on the northeast corner of Washington Street and 4th Street at 201 E. Washington Street. The site used to be "Big R Warehouse" but is currently owned by Prowers County and is rented out to the Colorado State Patrol for office space. The lot is covered in gravel for dust suppression, drainage, and erosion control. Within the lot, vehicle speeds are restricted to 5 mph. Access to the lot is restricted by a chain link fence. The lot is watered on an as needed basis. As shown in Figure 44, Site S has reasonable dust control measures in place with regard to AQCC Regulation 1 requirements (Section III.D.1(a)). The APCD considers restricted vehicle speeds in combination with maintained gravel 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.

Site T in Figure 44 is Lamar Feed and Grain – White Stone Farms located at 110 Anderson Street. The facility consists of a grain receiving pit, a grain shipping truck loadout station, grain storage, a grain cleaning scalper, and grain handling and milling systems. In November 2000, APCD issued the initial permit for this source (00PR0431) and at the time of this event, Lamar Feed and Grain, LLC was operating under the Final Approval permit issued on 7/21/2006. The permit includes the following point and fugitive dust control measures:

- Total PM, PM_{10} and $PM_{2.5}$ annual emissions limitations.
- Visible emissions cannot exceed 20%.
- All equipment must be maintained and operated in a manner consistent with good air pollution control practices for minimizing emissions.
- The feed mill must be equipped with a mineral oil spray system for the control of PM emissions.

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 U in Figure 44 is Dragon ESP, located at 700 East Crystal Street. This equipment manufacturing facility commenced operation in 1993 and was combined with the Ranco Trailers facility in 2011. The APCD issued a joint permit for these facilities (08PR0603) on 12/21/2011 which consist of paint booths and abrasive blasting units. The permit includes the following point and fugitive dust control measures:

- Permitted annual TSP, PM_{10} and $PM_{2.5}$ emission limits
- High Volume Low Pressure paint spray guns or other APCD-approved surface coating method must be used to meet PM emission limits

- Paint spray booths shall be equipped with exhaust filters or paint arresters to control PM emissions and shall be maintained per manufacturer's recommendations
- Blasting operations shall be done in a complete enclosure with baghouse filters to control PM emissions and blasting shall be done with doors closed. The baghouse shall be maintained per manufacturer's recommendation.
- Visible emissions shall not exceed 20% during normal operations
- Source must follow the APCD approved O&M plan

The facility was last inspected on 11/9/2011 and was found to be in compliance with all the permitted conditions. 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 V in Figure 44 is restricted access property that lies south of State Highway 196 and north of the Arkansas River, East of Highway 287. The land is naturally vegetated and undisturbed as shown in Figure 48. Figure 48 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.

Figure 48: Site V (Google Image 2012)

Site W in Figure 49 is the Robins Redi-Mix Concrete Batch Plant located at 7355 State Highway 196, approximately 4.5 miles north of the Lamar Municipal PM_{10} site. This batch plant opened in the spring of 2010 and consists of a dry truck mix plant that utilizes a cement and a dry ash silo each of which are operated with pneumatic conveyors and bag houses for the control of emissions. According to Robins Redi-Mix, the bag houses control 98% of the emissions. In April 2010, APCD issued a permit exempt letter for this source (10PR1310.XP). The permit includes the following point and fugitive dust control measures:

- Uncontrolled total PM cannot exceed 10 tpy and uncontrolled PM_{10} cannot exceed 5 tpy.
- Visible emissions cannot exceed 20%.

In addition to these permitted requirements, the source reported in their application that they moisten materials throughout their processes and prior to transferring on an as needed basis and have placed gravel on the road to minimize emissions. 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.

Figure 49: Site W - Robins Redi-Mix Concrete Batch Plant, 7355 State Highway 196 Lamar (Google Earth 2012)

The APCD conducted thorough assessments to determine if the potential soil disturbances shown in Figure 34 through Figure 49 were present during the 2015 exceedances in Lamar. During the course of these assessments, the APCD discovered that these sites were either reasonably controlled or considered to be natural sources during the 2015, high wind events. Therefore, these sites were not significant contributors to fugitive dust in the Lamar area during the April 2015, high wind events.

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 1,048,576 acres of land area – 1,021,915 acres (or 97.5%) of which is land in farms.[2] For comparison, Baca County to the south is 91.9% land in farms, Bent County to the west is 75.0% land in farms, and Kiowa County to the north is 98.4% land in farms. It should be noted that cropland percentage in Bent County is lower than other Southeast Colorado counties at 11%. Figure 50 illustrates the counties of Southeast Colorado. Of the farm land acreage in Prowers County, cropland accounts for approximately half of the total (480,487 acres) and is approximately 46% 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 was classified as being in severe drought in November 2010 and remained so until July 2012 when the county was reclassified as being in an exceptional drought. Prowers County returned to being in a severe drought in October 2014 and remains in this classification. The majority 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.

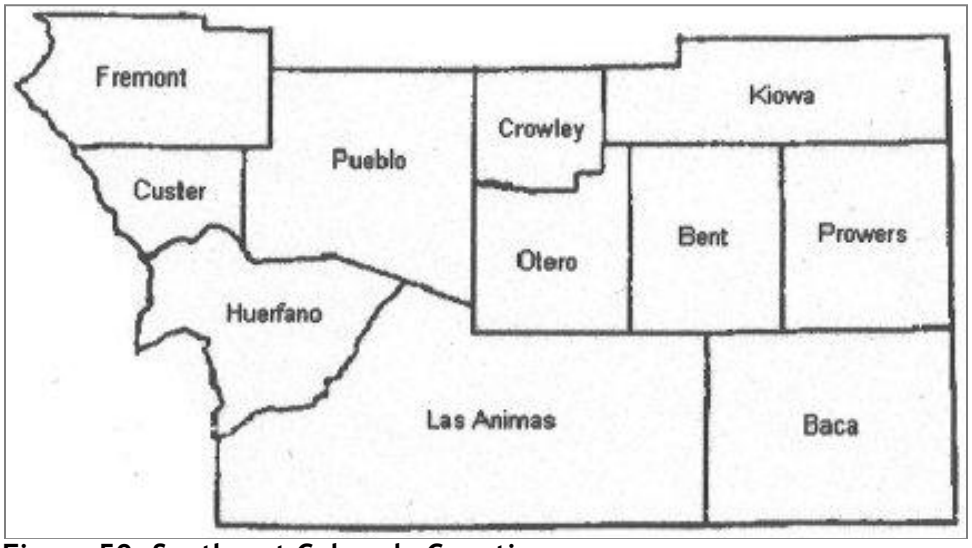


Figure 50: Southeast Colorado Counties

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

[2] 2012 Census of Agriculture. Volume 1, Chapter 2: County Level Data. U.S. Dept. Of Agriculture, National Agricultural Statistics Service.

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 155,611 acres of Prowers County cropland, or 32% 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.

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_{10} values from the Lamar Muni (08-099-0002) monitor on April 1st and 2nd, 2015.

Elevated 24-hour PM_{10} concentrations were recorded at the Lamar Municipal Building monitor on April 1st and 2nd, 2015. Both of the noted twenty-four-hour PM_{10} concentrations were above the 90th percentile concentrations for their locations (see Section 3) and exceeded the 99th percentile value of any evaluation criteria. The statistical and meteorological data clearly show that but for these high wind blowing dust events, Lamar would not have exceeded the 24-hour NAAQS on April 1st and 2nd, 2015. Since at least 2005, there has not been an exceedance that was not associated with high winds carrying PM_{10} dust from distant sources in these areas. This is evidence that the event was associated with measured concentrations in excess of normal historical fluctuations including background.

The PM_{10} exceedances in Lamar would not have occurred if not for the following: (a) dry soil conditions over source regions with 30-day precipitation totals below the threshold identified as a precondition for blowing dust; and (b) meteorological conditions that caused strong surface winds over the area of concern.

Surface weather observations provide strong evidence that a dust storm took place on April 1st and 2nd, 2015. The meteorological conditions during this event caused regional surface winds over 30 mph with gusts exceeding 40 mph. 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 the Lamar, Colorado, Blowing Dust Climatology at http://www.colorado.gov/airquality/tech_doc_repository.aspx). These PM_{10} exceedances were due to an exceptional event associated with regional windstorm-caused emissions from erodible soil sources over a large source area outside of the monitored areas. These sources are not reasonably controllable during significant windstorms under abnormally dry or moderate drought conditions.

Both wind speeds and soil moisture in surrounding areas 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 outside the monitored areas.

As demonstrated in this report, the PM_{10} exceedances in Lamar on April 1st and April 2nd, 2015 would not have occurred “but for” the large regional dust storms that occurred on those dates.

7.0 References

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.