

**Analysis of PM<sub>10</sub> Exceedances Caused by High Winds  
July 2000 – March 2001  
Doña Ana County, New Mexico**

**Gail Cooke  
Brad Musick  
Air Quality Bureau  
New Mexico Environment Department  
P.O. Box 26110  
Santa Fe, NM 87502**

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## **Introduction**

In a memorandum dated May 30, 1996, Mary D. Nichols of the Environmental Protection Agency (EPA) set forth the agency's policy for violations of the PM<sub>10</sub> ambient air quality standard which are caused by natural events such as high winds. This policy allows for ambient air quality monitoring data affected by natural events to be excluded from determinations of attainment status, if certain requirements are met.

One requirement is that the state or local air quality agency provide adequate documentation to show that the exceedances were caused by natural events and are therefore to be noted as such in the EPA Aerometric Information Retrieval System (AIRS). The state or local air quality agency must also document that Best Available Control Measures (BACM) were required for anthropogenic sources of wind-generated dust, and that the sources were in compliance with BACM requirements at the time of the event. The purpose of this report is to meet these requirements for documentation of PM<sub>10</sub> exceedances which occurred during the period July 2000 through March 2001.

## **Documentation of High Wind as the Cause of the Exceedances**

PM<sub>10</sub> monitoring sites in Doña Ana County are listed in Table 1. A list of the exceedances documented in this report as having been caused by high wind is given in Table 2.

The Las Cruces site (AIRS number 35-013-1006) and the Roadrunner site (AIRS number 35-013-0018) are not listed in Table 2 because they did not record any exceedances during the period covered by this report. The Las Cruces site is the only site in the county which uses only a Wedding-type monitor instead of a continuous TEOM-type monitor, and monitoring is usually on an every-sixth-day schedule.

Where necessary and where feasible, hourly and 24-hr average PM<sub>10</sub> values have been corrected for errors caused by short-term saturation of the data logger recording system. Short-term periods of high PM<sub>10</sub> concentration sometimes exceed the maximum recordable value of the data logger which stores and reports the data from TEOM-type monitors. The monitor's own recording system, which is independent of the data logger, has a capacity for greater short-term values and is not affected by this problem. When hourly and daily averages were found to be derived from data affected by this problem, corrected averages were calculated by substituting hourly average data from the monitor's own recording system for the affected hourly data. This correction could not be made for Holman Road on February 8, 2001, because data from the monitor recording system were not available. Therefore, for this site and date, the value from the data logger has been reported as the best available estimate of the true value.

Features of Doña Ana County's natural environment that are conducive to wind erosion and windblown dust generation when high winds occur are: aridity, sparse vegetation

cover, and large areas of highly wind-erodible soil. These factors were discussed in detail in previous documentation (Aaboe, 1997).

In our documentation of earlier exceedances, a variety of evidence was presented to support the conclusion that PM<sub>10</sub> exceedances were caused by high winds: wind roses, newspaper reports, time-lapse video photography, and time series plots of hourly PM<sub>10</sub> concentration and wind speed (Aaboe, 1997). In this report, we present what we believe is the most compelling evidence, which is the co-occurrence in time of high winds and high PM<sub>10</sub> concentrations as demonstrated by time series plots of PM<sub>10</sub> and wind speed as hourly average and peak gust (see Appendix 1).

The common pattern observed in the time series plots (Appendix 1) is an abrupt rise in PM<sub>10</sub> concentrations when wind speed rises above some threshold value, and an equally abrupt fall in PM<sub>10</sub> when wind speed falls below the apparent threshold. Maximum hourly PM<sub>10</sub> concentration usually occurs in the same hour as maximum wind speed.

Plots of hourly values of PM<sub>10</sub> concentration and wind speed are also supportive of a causal relationship (Appendix 2). Depending on site and day, the apparent threshold hourly average wind speed may vary from about 6 meters per second to 12 meters per second or more. When wind speeds are below the apparent threshold for a given site and day, PM<sub>10</sub> concentrations are generally low (<100 micrograms per cubic meter) and vary more or less independently of wind speed.

A minimum threshold of about 6 meters per second (for hourly average wind speed) is in agreement with other studies (Saxton et al., 2000). The apparent wind threshold for dust emission varies because it is affected by many environmental factors, including vegetation cover, soil moisture content, soil particle size distribution, soil structure (crusts and clods), surface roughness. Dust-emitting potential varies over the landscape, so even a shift in wind direction may result in changes in PM<sub>10</sub> concentration at a monitoring site. The number and variability of factors affecting the threshold (and dust emission at a given wind speed) make it impractical to determine a wind speed which will always distinguish exceedances due to high wind events from those with other causes.

## **References**

- Aaboe, Erik. 1997. Analysis of PM<sub>10</sub> Exceedances, January 1995 – March 1997, Doña Ana County, New Mexico. Report published by Air Quality Bureau, New Mexico Environment Department.
- Saxton, K., D. Chandler, L. Stetler, B. Lamb, C. Claiborn, and B.-H. Lee. 2000. Wind erosion and fugitive dust fluxes on agricultural lands in the Pacific northwest. Transactions of the ASAE 43:623-630.

Table 1. PM<sub>10</sub> monitoring sites in Doña Ana County; only Wedding monitor at Las Cruces, all others with continuous (TEOM) monitor.

Site Name	Start	End	AIRS Number	Lat (d-m-s)	Long (d-m-s)
Roadrunner	3/1/88	...	35-013-0018	32-20-30.64	106-45-37.07
Holman*	10/25/95	...	35-013-0019	32-25-29.69	106-40-26.62
Chaparral*	2/20/96	...	35-013-0020	32-02-27.48	106.24-33.09
Anthony	3/1/88	...	35-013-0016	32-00-11.54	106-35-57.67
Sunland Park*	2/21/89	...	35-013-0017	31-47-49.91	106-33-24.17
La Union**	1/1/79	...	35-013-0008	31-55-06.03	106-37-58.99
West Mesa*	6/1/00	...	35-013-0024	32-16-39.9	106-51-49.68
Las Cruces	11/18/89	...	35-013-1006	32-19-08	106-46-16

\* meteorological monitoring at these sites

\*\* no PM<sub>10</sub> monitoring, meteorological monitoring data is used for comparison with Anthony PM<sub>10</sub>

Table 2. PM<sub>10</sub> exceedances documented in this report as resulting from high wind. Values are 24-hour average PM<sub>10</sub> concentrations in micrograms per cubic meter.

DATE	SITE				
	Holman	West Mesa	Chaparral	Anthony	Sunland Park
2000					
15-Dec			166		
18-Dec			270		
2001					
12-Jan			221		
8-Feb	362*	211	595	316	500
23-Feb				201	182

\*Lower than true value because includes parts of four hours in which maximum recordable value was exceeded; correction by substitution of monitor recorder values could not be made because these values were not retrievable.

## **APPENDIX 1**

### **Time Series Plots of PM<sub>10</sub> and Wind Speed**

## **APPENDIX 2**

### **Plots of Hourly Average PM<sub>10</sub> in Relation to Wind Speed**