



Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov



Stephen A. Owens
Director

DRAFT

Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Phoenix Area on April 16, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts as part of the Natural Events Action Plan for the Phoenix area. On Tuesday, April 15, 2008, in response to the tightening pressure gradient associated with a trough of low pressure and dry cold front situated over Arizona, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast, which called for a low risk of wind-blown dust leading to an exceedance of the 24-hour PM₁₀ health standard in Phoenix for Wednesday, April 16th. While “occasional periods of wind-blown dust” were forecasted for Wednesday April 16th, winds were not expected to remain strong enough through the day to cause an exceedance of the PM₁₀ health standard in Phoenix. The Dust Control Forecasts for other portions of the state, including Yuma, did however call for a moderate risk for exceeding the 24-hour PM₁₀ health standard. The forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

The forecast for April 16th called for strong winds capable of producing wind-blown dust. This potential wind-blown dust event equated to a low but significant risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in Maricopa County. During the late

afternoon to early evening hours of April 16th, strong, gusty westerly winds generated blowing dust which moved into the Phoenix Metro area from the west. All appropriate State Implementation Plan (SIP) control measures were in place during the event demonstrating, per 40 CFR 50.1(j), that the event “is not reasonably controllable or preventable.”

Strong winds were observed throughout portions of Maricopa County and the Phoenix Metro area on April 16, 2008. The initialization of the wind-blown dust event is evident in the Phoenix visible camera images as well as the Arizona Meteorological Network (AZMET) and National Weather Service (NWS) monitors (see Fig. 1). Strong winds gusting to near 30 mph were reported between the 12:00 p.m. and 7:00 p.m. hours at several Phoenix area monitoring locations. In addition, Goodyear Airport reported several hours of blowing dust during the event. This significant event brought elevated ambient concentrations of PM₁₀ to the Phoenix area that exceeded the NAAQS at the West 43rd Ave. monitor operated by Maricopa County. The fact that ambient concentrations exceeded the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event “affects air quality.” The following are the key PM₁₀ monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM ₁₀	1-hr Max PM ₁₀	Max Time	Flag**
PHOENIX METRO AREA					
West 43 rd Ave (MC/TEOM)	04-013-4009*	155	639	1400	A or RJ
Durango Complex (MC/TEOM)	04-013-9812*	85	238	1400	None
Greenwood (MC/TEOM)	04-013-3010*	70	144	1400	None
Higley (MC/TEOM)	04-013-4006*	61	108	2000	None
West Phoenix (MC/TEOM)	04-013-0019*	69	146	2000	None
Central Phoenix (MC/TEOM)	04-013-3002*	123	69	1400	None
JLG Supersite (ADEQ/TEOM)	04-013-9997*	51	83	1800	None
Coyote Lakes (MC/TEOM)	04-013-4014*	62	122	1200	None
South Phoenix (MC/TEOM)	04-013-4003*	105	277	1800	None

* EPA Air Quality System Identification Number

** 24-hr PM₁₀ concentration influenced by natural or exceptional event to be flagged

Type Abbreviations: TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor)

The preliminary findings from this analysis will be presented at a stakeholders meeting on November 19, 2008, in Phoenix, Arizona. Following this stakeholders meeting, ADEQ will finalize this demonstration and solicit public

comment on the final demonstration. Any comments that are received will be forwarded to EPA with this demonstration pursuant to 40 CFR 50.14(c)(3)(i).

NORTH PHOENIX

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	72	13	-	3	7	SW
2	67	16	-	2	4	S
3	67	16	-	2	6	SW
4	63	21	-	2	4	S
5	63	19	-	2	6	S
6	60	20	-	2	6	SW
7	60	21	-	1	5	SW
8	63	21	-	3	8	SW
9	65	20	-	6	11	SW
10	68	18	-	5	9	SW
11	71	16	-	6	12	SW
12	74	14	-	8	14	SW
1	77	12	-	8	18	SW
2	79	8	-	12	23	W
3	79	8	-	11	19	W
4	79	8	-	11	20	W
5	78	8	-	11	20	W
6	77	7	-	12	23	W
7	74	7	-	12	22	W
8	71	7	-	11	21	NW
9	68	9	-	9	19	NW
10	67	9	-	8	17	NW
11	65	10	-	9	18	N
12	63	11	-	6	12	N

CENTRAL PHOENIX

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	74	13	-	4	9	W
2	72	15	-	5	9	W
3	69	16	-	4	7	W
4	64	23	-	1	3	NE
5	60	29	-	2	4	N
6	60	24	-	2	5	W
7	62	20	-	3	6	W
8	66	20	-	3	8	W
9	68	21	-	6	12	W
10	70	19	-	5	11	W
11	73	17	-	5	10	W
12	75	16	-	7	14	W
1	77	13	-	8	17	W
2	79	12	-	10	19	W
3	81	10	-	10	18	W
4	80	9	-	10	21	W
5	79	9	-	11	20	NW
6	78	8	-	10	19	NW
7	74	9	-	11	21	NW
8	71	10	-	8	17	NW
9	69	10	-	9	17	NW
10	66	12	-	7	15	NW
11	65	11	-	8	15	N
12	43	65	-	3	7	E

NWS-Goodyear

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	n/a		n/a	n/a	n/a	
2	n/a		n/a	n/a	n/a	
3	n/a		n/a	n/a	n/a	
4	n/a		n/a	n/a	n/a	
5	n/a		n/a	n/a	n/a	
6	55	40		7	7	W
7	n/a	10		7	7	W
8	66	10		11	11	SW
9	72	20		11	11	SW
10	n/a	20		15	15	SW
11	n/a	10		14	14	SW
12	n/a	10		14	14	W
1	79	10		14	23	W
2	86	20	BLDU	17	29	W
3	86	20	BLDU	23	29	SW
4	88	20	BLDU	23	29	NW
5	86	20	BLDU	21	29	W
6	82	20	BLDU	23	29	W
7	79	20	BLDU	17	26	W
8	72	20		14	17	NW
9	70	20		17	17	NW
10	n/a		n/a	n/a	n/a	
11	n/a		n/a	n/a	n/a	
12	n/a		n/a	n/a	n/a	

Event Contrib. Analysis

Hourly PM₁₀ Conc. (µg/m³)

MONITORS:	Hr	1	2	3
1-West 43rd Ave.	1	29.9		
2-Mon 2	2	49.8		
3-Mon 3	3	29.3		
	4	37.7		
	5	46.7		
	6	88.2		
	7	127		
	8	153		
	9	111		
	10	84.6		
	11	90.7		
	12	118		
24-Hr. Avg PM ₁₀				
with W/O				
Monitor: Event	Event			
1-W43rd	155	75		
> NAAQS	< NAAQS			
Pink=Event Contrib.				
Conclusion: As shown above, the PM ₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).				
	1	265		
	2	338		
	3	639		
	4	540		
	5	279		
	6	131		
	7	254		
	8	109		
	9	90.7		
	10	52.7		
	11	28.2		
	12	34.3		

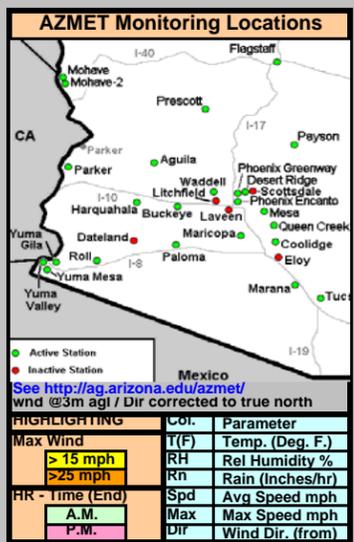
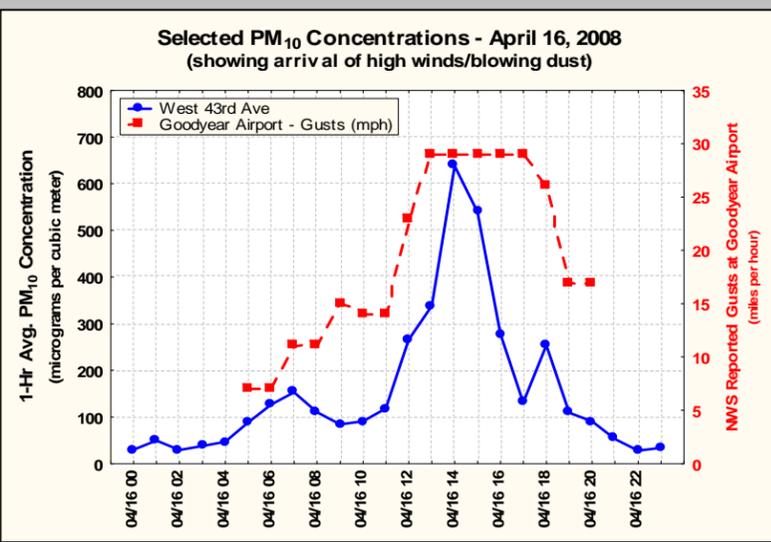


Figure 1. Key Data for Event of April 16, 2008

PHX WINDS	KEY	PM10 PLOT
CEN. AZ WINDS		SAT IMAGES
SO AZ WINDS		PHX VIS. CAMERAS

SUMMARY OF EVENT
Between 1:00 p.m. to 6:00 p.m., skies over the valley became increasingly dusty; winds increased thru the period. At 1:00 p.m., winds were out of the southwest, gusting up to 28 mph at Luke AFB. At 2:00 p.m., winds valley-wide were out of the west between 12 and 23 mph, gusting up to 22 to 32



PARKER

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	67	25	-	13	26	W
2	67	22	-	18	24	NW
3	65	22	-	13	22	W
4	63	19	-	17	26	NW
5	61	19	-	16	21	NW
6	60	20	-	17	25	NW
7	59	20	-	15	22	NW
8	62	21	-	8	13	NW
9	68	17	-	9	20	N
10	71	12	-	18	27	N
11	73	11	-	17	24	N
12	76	11	-	16	23	N
1	76	11	-	19	26	N
2	77	10	-	18	25	N
3	78	10	-	16	21	N
4	79	10	-	17	23	N
5	78	12	-	16	22	N
6	76	13	-	14	20	N
7	70	20	-	7	15	NE
8	64	24	-	7	15	NE
9	58	34	-	2	9	NE
10	57	29	-	3	8	S
11	56	31	-	2	6	S
12	55	26	-	3	7	SE

BUCKEYE

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	68	21	-	3	8	SW
2	65	19	-	4	6	SW
3	61	25	-	4	7	SW
4	56	27	-	5	8	NW
5	55	27	-	2	7	NW
6	51	37	-	1	4	NE
7	53	34	-	2	6	W
8	59	37	-	1	5	S
9	65	33	-	3	6	W
10	70	25	-	3	6	W
11	73	19	-	4	10	W
12	76	18	-	4	10	W
1	77	20	-	10	18	W
2	76	18	-	13	20	W
3	77	17	-	13	21	W
4	78	14	-	14	24	NW
5	76	13	-	14	23	NW
6	76	9	-	16	24	NW
7	73	9	-	16	22	NW
8	70	9	-	16	23	NW
9	68	9	-	17	25	N
10	65	10	-	13	23	NW
11	63	12	-	9	15	NW
12	61	12	-	6	11	N

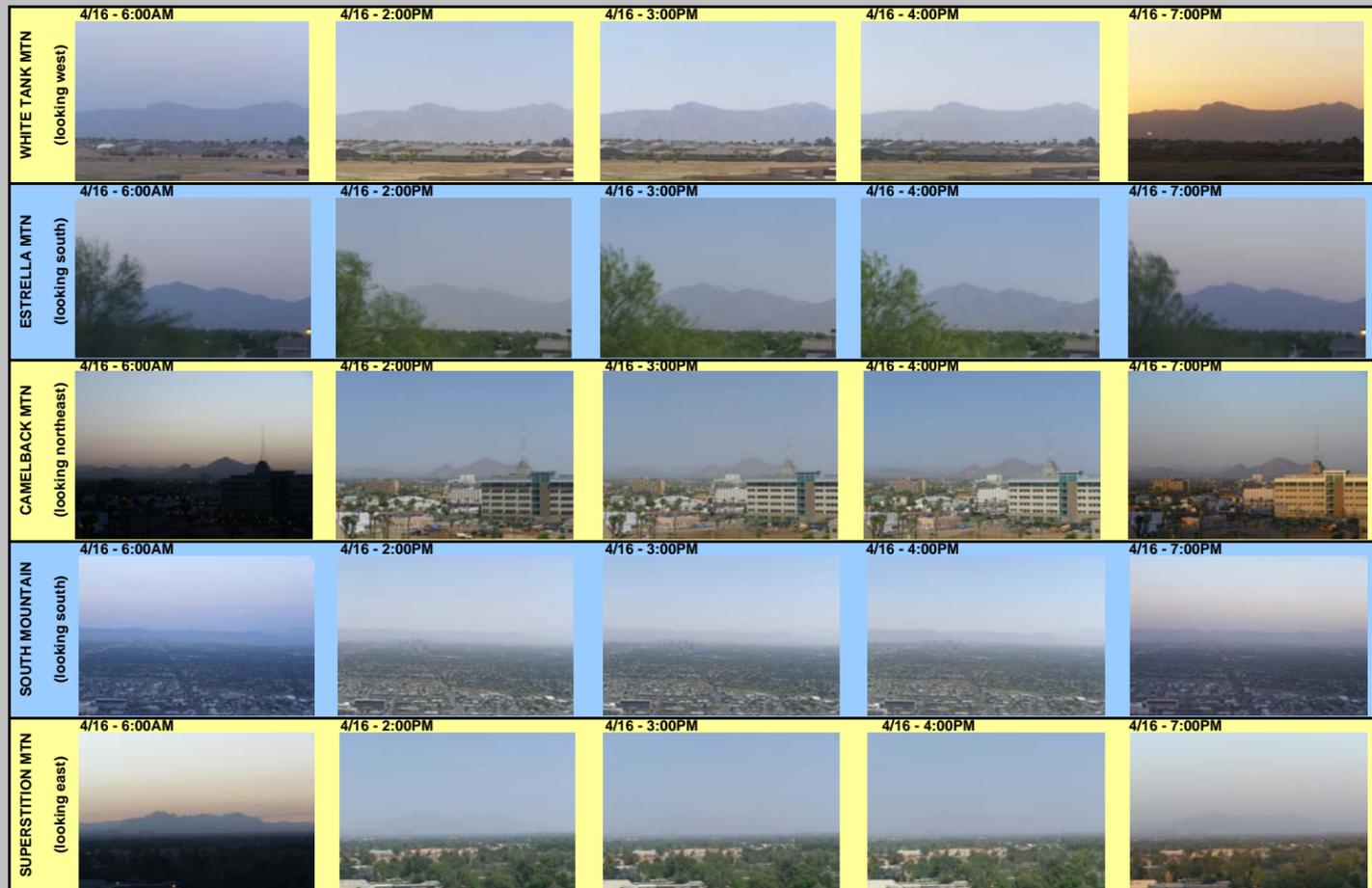
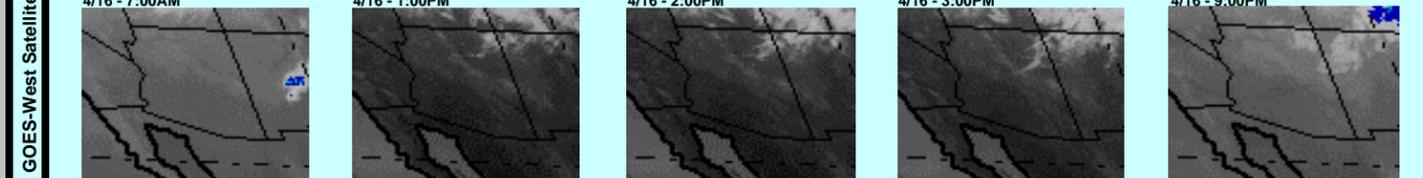
COOLIDGE

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	55	48	-	4	6	SW
2	52	49	-	4	6	S
3	50	55	-	4	6	SW
4	51	52	-	4	6	SW
5	53	38	-	5	6	SW
6	49	51	-	4	7	S
7	47	62	-	3	6	SE
8	59	49	-	2	5	S
9	67	36	-	7	13	SW
10	70	31	-	7	12	W
11	72	27	-	7	13	W
12	74	24	-	9	17	W
1	75	22	-	12	20	W
2	75	19	-	11	19	W
3	76	18	-	11	18	W
4	76	16	-	10	20	W
5	76	13	-	12	20	W
6	75	12	-	12	18	W
7	73	10	-	13	18	W
8	69	11	-	10	19	W
9	67	10	-	11	21	NW
10	66	10	-	13	23	NW
11	64	11	-	13	21	NW
12	60	14	-	8	16	N

Historical Distribution

5-Yr. Dist. of Values (µg/m³)

MONITORS:	Column Index
1-WEST 43RD AVE.	Yr - All Data (5-Yrs)
	Sea - Data for Spring season only (5-Yrs)
Cum. Freq.	Mon 1
Min	5 8
0.5%	9 9
1.0%	11 11
2.5%	15 13
5%	19 19
10%	29 28
25%	44 46
50%	65 63
75%	91 82
90%	121 107
97.5%	157 134
99.0%	192 194
99.5%	227 220
Max	313 313
Flagged Value	155
Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)	



YUMA

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	67	16	-	12	22	NW
2	65	19	-	11	19	NW
3	65	21	-	16	23	NW
4	65	23	-	17	24	NW
5	64	39	-	16	22	NW
6	63	49	-	11	21	NW
7	61	53	-	6	11	NW
8	63	52	-	2	5	S
9	71	23	-	4	11	N
10	73	15	-	10	17	N
11	75	14	-	10	17	N
12	77	13	-	10	15	N
1	79	12	-	10	17	N
2	81	11	-	10	17	N
3	82	12	-	10	19	N
4	83	10	-	10	18	NW
5	83	10	-	12	18	N
6	81	10	-	10	18	N
7	78	11	-	8	14	N
8	74	12	-	7	17	N
9	70	14	-	6	11	N
10	69	16	-	6	10	N
11	66	16	-	3	7	N
12	66	16	-	3	6	N

PALOMA

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	60	30	-	4	6	SW
2	55	41	-	5	7	W
3	54	37	-	7	11	SW
4	55	27	-	7	10	SW
5	53	31	-	6	9	SW
6	49	45	-	4	7	SW
7	49	44	-	4	6	SW
8	60	28	-	7	12	SW
9	67	25				

Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM₁₀ readings from the West 43rd Ave. monitoring site were valid for April 16th. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. Exceedances of the NAAQS were recorded at the West 43rd Ave. monitoring site operated by Maricopa County.

2. Review suspected contributing sources. The NWS and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to what meteorological conditions were in place on April 16th. Strong westerly winds were occurring in the Phoenix area due to a low pressure system approaching from the west with a cold front situated over Arizona. The plot of hourly PM₁₀ concentration data in the upper right corner of Figure 1 confirms the nearly identical timing of elevated PM₁₀ at the West 43rd Ave. monitor and strong wind gusts at Goodyear Airport. While PM₁₀ concentrations also spiked at several other monitors, including Durango, the 24-hour averages remained below that of the NAAQS at these monitors. Finally, blowing dust reported at the Goodyear Airport was coincident with elevated PM₁₀ concentrations measured at West 43rd Ave.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the “Historical Distribution” Table in Figure 1 has been included to demonstrate that the event is associated with a measured concentration in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). The monitor with readings greater than that of the NAAQS on April 16, 2008, which should be flagged, is West 43rd Ave.

4. Examine the meteorological conditions before and during the event. The AzMET meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. As can be seen in Figure

1, wind speeds did not pick up in central Arizona until approximately 12:00 p.m., when several stations reported gusty winds that approached 30 mph. This timing corresponds to the onset of elevated PM₁₀ concentrations recorded at the West 43rd Ave. monitoring site, which remained elevated through the afternoon hours until a time when winds decreased to below 20 mph.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Phoenix area can be attributed to soil emissions that were transported over portions of the Phoenix Metro area in Maricopa County. No source specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on April 16, 2008. Observational reports of blowing dust in portions of the Phoenix Metro area is further proof that the elevated PM₁₀ concentrations were attributed to soil emissions transported due to wind gusts associated with a low pressure system (see attachments). These reports, in addition to the visual evidence of reduced visibility seen in the lower right portion of Figure 1, provide proof that the elevated PM₁₀ concentrations in Phoenix can be attributed to soil emissions.

6. Estimation of Contribution from Source or Event. The primary source appears to be wind-blown dust over central Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the “Event Contrib. Analysis” Table in Figure 1 has been included to demonstrate that there would have been no exceedance or violation but for the event (i.e., the contribution during the event overwhelmed the 24-hour average).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentration in West 43rd Ave. was attributed to a natural event.

Conclusion

Long-range transport of dust from soils. The elevated PM₁₀ event on April 16, 2008, in Maricopa County was the result of the transport of dust and soils from high winds that suspended natural soils and soils from areas where Best Available Control Measures are in place and should be

flagged for air quality planning purposes. The “high wind” flag (A or RJ) should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.