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Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM₁₀) Concentration Events in the Phoenix and Yuma Areas on November 9, 2008

Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma and Phoenix areas as part of their Natural Events Action Plans. On Friday, November 7, 2008, in response to a deepening upper level trough of low pressure passing north of Arizona causing a tightening pressure gradient over the State, ADEQ air quality forecasters issued both the Maricopa County Dust Control Action Forecast and Yuma Wind Forecast each of which called for a moderate risk of wind-blown dust for Sunday, Nov 9th. Both forecasts mentioned the possibility of sustained 20 mph west or southwesterly winds with even stronger gusts possible. When forecast data were reanalyzed during the morning of Sunday, November 9th, a same day PM₁₀ Health Watch was issued for the Phoenix Metro area. This potential wind event equated to a significant risk of exceeding the PM₁₀ National Ambient Air Quality Standards (NAAQS) in both Yuma and Maricopa Counties. The forecasts/advisories satisfy the requirement in 40 CFR 51.930(a)(1).

Strong winds did occur and were observed in both the Phoenix Metro and Yuma areas on November 9, 2008. Beginning in the early afternoon and continuing throughout the early evening hours, strong west and southwesterly winds in Phoenix and strong westerly winds in Yuma generated areas of blowing dust in both Yuma and Maricopa Counties. 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.” A discussion of commonly employed Best Available Control Measures (BACM) for dust in Maricopa and Yuma counties can be found in “High Wind Exceptional Events and Control Measures for PM₁₀ Areas” (see “References”).

The initialization of a wind-blown dust event is evident in the Phoenix visible camera images as well as the Arizona Meteorological Network (AzMET), Maricopa County (MC), ADEQ, and National Weather Service (NWS) monitors (see Fig. 1). Yuma radar data obtained from the National Climatic Data Center (NCDC) also showed areas of blowing dust in southeastern California and southwestern Arizona. These radar data indicate that some (though not all) of the dust that affected the Yuma area likely originated in southeastern California and was transported into southwestern Arizona. This significant wind event brought elevated ambient concentrations of PM₁₀ to the Phoenix and Yuma areas that exceeded the NAAQS at the Yuma Courthouse, West 43rd Ave., Durango, and South Phoenix monitors. 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**
YUMA AREA					
Yuma Courthouse (ADEQ/TEOM)	04-027-0004*	252.4	1391	1300	RJ
PHOENIX METRO AREA					
West 43 rd Ave (MC/TEOM)	04-013-4009*	248.1	1832	1500	RJ
Durango Complex (MC/TEOM)	04-013-9812*	169.8	961	1500	RJ
South Phoenix (MC/TEOM)	04-013-4003*	230.4	1657	1500	RJ
Greenwood (MC/TEOM)	04-013-3010*	133.8	760	1500	None
Higley (MC/TEOM)	04-013-4006*	133.2	421	1600	None
Central Phoenix (MC/TEOM)	04-013-3002*	133.4	725	1500	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 were presented at a stakeholder’s meeting on March 19, 2009, in Phoenix, Arizona. Following the stakeholders meetings, ADEQ supplemented and finalized the analysis and a public

comment period was held from October 15, 2009 through November 13, 2009. This finalized document and any comments received are being submitted to EPA to satisfy the requirements in 40 CFR 50.14(c)(3)(i).

NWS-Luke Air Force Base

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	51	10		3	3	N
2	53	10		0	0	N
3	48	10		7	7	N
4	50	10		5	5	NW
5	50	10		3	3	NW
6	51	10		0	0	N
7	50	10		6	6	N
8	53	10		3	3	SW
9	54	10		0	0	N
10	60	10		3	3	E
11	64	10		3	3	N
12	67	10		5	5	S
1	72	10		5	5	SW
2	74	10		3	3	SW
3	72	9	TSRA	5	5	W
4	73	2	HZ	30	40	SW
5	69	8		23	31	W
6	67	10		17	29	W
7	62	10		11	11	NW
8	62	10		11	11	NW
9	60	10		0	0	N
10	60	10		6	6	S
11	59	10		5	5	W
12	56	10		5	5	S

16659 (112.14Wx33.41N) MC - WEST FORTY THIR

Hr	T(F)	PM	Spd	Max	Dir
1	54	66	4	6	W
2	52	69	3	5	W
3	50	66	1	3	W
4	50	73	2	4	SW
5	50	60	2	4	W
6	50	56	2	5	W
7	49	61	3	6	W
8	50	53	2	7	W
9	52	64	2	9	W
10	57	72	4	7	W
11	64	61	1	8	SW
12	70	42	2	9	NW
1	74	28	2	6	SW
2	75	25	2	9	N
3	76	502	7	32	SW
4	75	1832	20	40	W
5	72	970	18	34	W
6	68	595	17	32	W
7	66	353	16	30	W
8	63	195	5	21	NW
9	62	160	6	15	W
10	60	159	4	12	SW
11	58	155	3	7	SW
12	56	231	1	6	S

Event Contrib. Analysis Hourly PM₁₀ Conc. (µg/m³)

MONITORS:	Hr	1	2	3
1-South Phx	1	73	66.4	64.2
2-West 43rd	2	89.4	65.9	67.4
3-Durango	3	74.7	66.7	78.8
24-Hr. Avg PM ₁₀	4	70.6	73.3	40.4
5	52.6	60.9	65.7	
6	46	56.1	70.2	
7	70.6	61.1	56.2	
8	87.7	53.5	72.4	
9	104	64.2	78.8	
10	112	72.4	55.2	
11	68.3	61	47.8	
12	40	42.7	39.6	
Conclusion: As shown above, the PM ₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).	1	31.1	28.2	34.1
2	35.6	25.3	26.6	
3	49	502.7	177	
4	1657	1832	961	
5	952	970.2	727	
6	566	595.4	404	
7	377	353.4	305	
8	215	195.8	135	
9	168	160.2	129	
10	199	159.7	121	
11	166	155	129	
12	231	231.9	193	

Event Contrib. Analysis Hourly PM₁₀ Conc. (µg/m³)

MONITORS:	Hr	1
4-Yuma CH	1	48.5
2	22.1	
3	22.2	
4	30.8	
5	29.5	
6	14.1	
7	11.5	
8	14.4	
9	14.5	
10	17	
11	109	
12	497	
Conclusion: As shown above, the PM ₁₀ concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).	1	852
2	1391	
3	1366	
4	472	
5	461	
6	229	
7	217	
8	102	
9	53.5	
10	38	
11	27.4	
12	19.1	

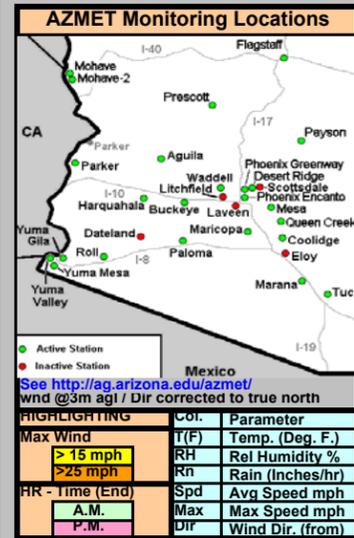
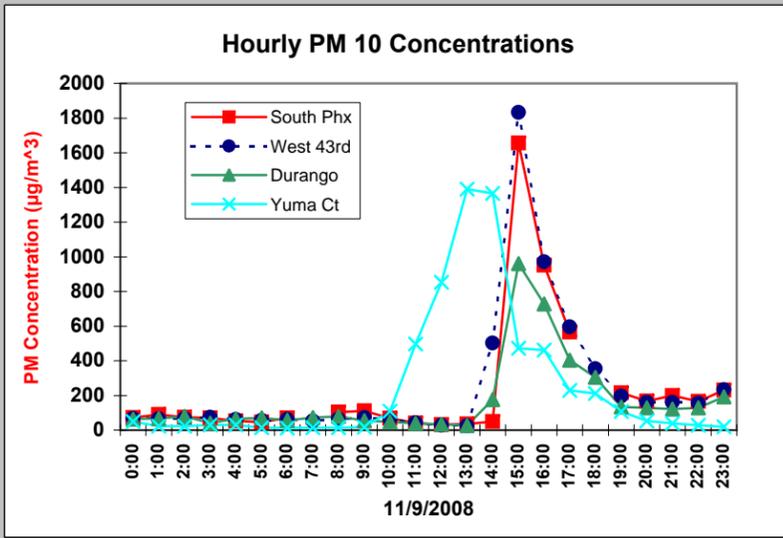


Figure 1. Key Data for Event of November 9, 2008

WIND & PM10 DATA	ECA HIST	KEY DIST	PM10 Wx IMAGERY
14.5			PHX VIS. CAMERAS

SUMMARY OF EVENT
 Between 1:00 pm and 6:00 pm, dense blowing dust, gusty winds, and a few isolated thunderstorms were observed throughout the Valley. Chandler and Williams Gateway Airport reported southerly gusts up to 29 mph. Visibility was only 9 statute miles at 2:21 pm at Luke AFB.



16375 (112.12Wx33.43N) MC - DURANGO COMPLEX

Hr	T(F)	RH	PM	Spd	Max	Dir
1	61	22	64	2	7	E
2	58	24	67	2	5	E
3	55	33	78	2	6	E
4	58	20	40	4	9	E
5	55	25	65	3	7	SE
6	52	31	70	0	3	W
7	54	28	56	0	6	NE
8	53	29	72	1	5	SW
9	53	33	78	1	6	S
10	59	23	85	2	5	W
11	64	17	47	2	8	SE
12	70	13	39	3	10	SE
1	72	12	34	2	9	SW
2	74	12	26	2	11	NW
3	75	18	176	5	26	SW
4	75	25	960	18	36	W
5	71	17	727	17	32	W
6	68	25	403	16	33	W
7	66	28	304	14	31	W
8	63	35	134	3	21	NW
9	62	39	128	1	4	W
10	60	39	121	2	6	SW
11	59	40	128	2	6	S
12	56	41	192	2	4	S

16377 (112.08Wx33.40N) MC - SOUTH PHOENIX

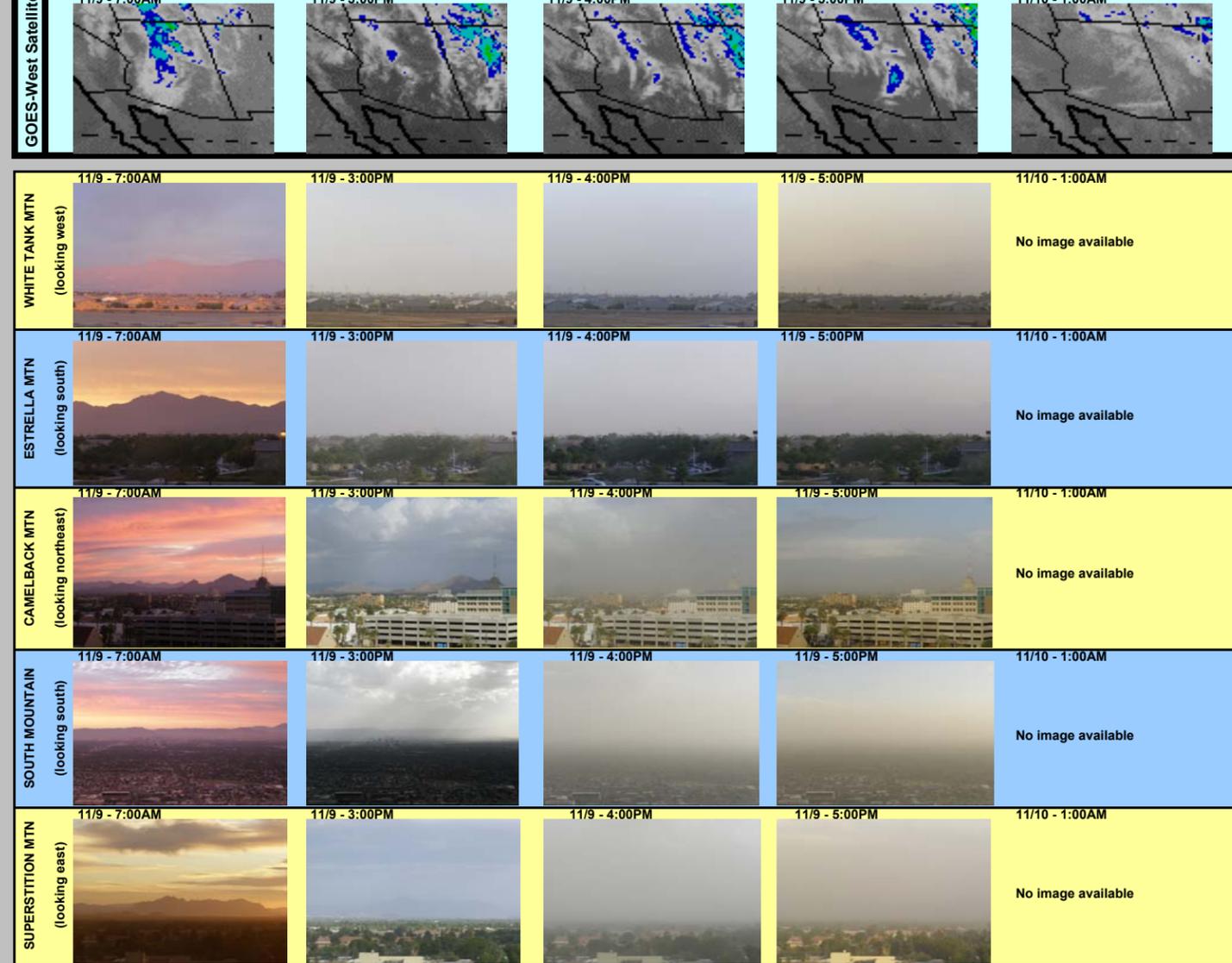
Hr	T(F)	PM	Spd	Max	Dir
1	58	73	1	5	S
2	52	89	1	3	S
3	52	70	1	3	E
4	52	70	1	5	E
5	52	52	2	5	SE
6	52	46	0	3	NE
7	50	70	1	4	SW
8	50	104	0	4	SW
9	52	111	2	7	W
10	64	68	0	8	S
11	70	40	5	11	SE
1	74	31	3	10	S
2	75	38	4	12	NW
3	75	49	2	11	W
4	75	1666	12	32	W
5	72	951	13	33	W
6	68	566	12	27	W
7	66	11	28	W	
8	64	214	6	17	NW
9	63	168	5	16	W
10	60	199	2	9	W
11	58	165	2	5	SW
12	56	230	1	3	W

Historical Distribution 5-Yr. Dist. of Values (µg/m³)

MONITORS:	Column Index
1-South Phoenix	Yr - All Data (5-Yrs)
2-West 43rd Ave	Sea - Data for Autumn season only (5-Yrs)
3-Durango	
Cum. Freq.	Mon 1 Yr Sea Mon 2 Yr Sea Mon 3 Yr Sea
Min	7 13 5 7 5 8
0.5%	7 16 9 11 9 11
1.0%	10 16 11 15 10 13
2.5%	13 19 15 16 15 20
5%	18 20 19 25 19 24
10%	24 29 29 33 26 30
25%	36 37 44 49 39 45
50%	49 54 65 74 56 66
75%	64 67 91 99 78 92
90%	85 83 121 125 109 114
95%	94 87 139 149 123 126
97.5%	126 90 157 154 144 139
99.0%	147 100 192 166 181 153
99.5%	164 105 227 174 200 161
Max	171 131 313 175 253 189
Flagged Value	230 248 169
Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)	

Historical Distribution 5-Yr. Dist. of Values (µg/m³)

MONITORS:	Column Index
4-Yuma CH	Yr - All Data (5-Yrs)
Cum. Freq.	Mon 4 Yr Sea
Min	8 12
0.5%	12 13
1.0%	14 15
2.5%	16 20
5%	19 22
10%	23 26
25%	31 34
50%	42 46
75%	57 58
90%	77 73
95%	96 86
97.5%	127 94
99.0%	186 131
99.5%	211 204
Max	349 320
Flagged Value	252
Conclusion: Flagged Value is exceptional in nature (ie greater than 95% of all data)	



NWS-Yuma MCAS

Hr	T(F)	VR	Dust	Spd	Gust	Dir
1	60	10		0	0	N
2	59	10		8	8	SE
3	61	10		11	11	SE
4	63	10		15	15	SE
5	64	10		14	14	S
6	64	10		14	14	S
7	63	10		14	14	S
8	62	10		6	6	S
9	64	10		5	5	SE
10	67	10		6	6	SW
11	71	10		9	9	W
12	73	5	HZ	18	24	W
1	74	3	HZ	28	33	W
2	73	1	HZ	33	44	W
3	73	0.50	HZ	29	47	W
4	71	8		22	31	W
5	67	6	HZ	22	34	W
6	65	7		18	24	W
7	63	10		22	29	W
8	62	10		16	25	W
9	61	10		15	23	W
10	60	10		10	10	W
11	57	10		8	8	W
12	57	10		0	0	N

AZMET - YUMA

Hr	T(F)	RH	Rn	Spd	Max	Dir
1	57	56	-	2	3	NE
2	56	59	-	2	4	NE
3	57	46	-	2	4	NE
4	58	43	-	2	6	NE
5	59	64	-	1	5	NE
6	59	77	-	1	4	NE
7	59	86	-	2	6	W
8	59	87	-	4	7	SW
9	62	85	-	4	11	SE
10	65	75	-	4	9	SW
11	69	40	-	12	24	W
12	71	31	-	17	27	NW
1	72	29	-	22	33	W
2	72	27	-	25	37	NW
3	72	25	-	24	35	W
4	70	29	-	23	35	NW
5	67	35	-	22	33	W
6	65	39	-	17	26	W
7	63	44	-	16	26	W
8	61	47	-	14	25	W
9	60	51	-	13	20	NW
10	59	53	-	13	19	NW
11	59	54	-	11	15	NW
12	58	55	-	7	12	NW

128530 (114.71Wx32.71N) ADEQ - YUMA AGRICEN

Hr	T(F)	RH	Spd	Max	Dir
1	57	59	2	4	NE
2	56	64	4	5	NE
3	57	51	3	6	E
4	58	47	4	7	NE
5	59	64	2	6	NE
6	61	78	3	6	E
7	60	86	3	7	SW
8	60	86	6	10	SW
9	62	85	5	14	E
10	66	74	5	11	S
11	70	37	14	30	W
12	71	31	17	32	W
1	71	28	22	36	W
2	72	26	26	44	W
3	72	24	23	37	W
4	70	28	25	38	W
5	68	34	21	35	W
6	66	38	17	31	W
7	64	42	15		

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 Yuma Courthouse, West 43rd Ave., Durango, and South Phoenix monitoring sites were valid for November 9th. Audits of the analyzers revealed operations were within acceptable tolerance.

2. Review suspected contributing sources. The NWS, MC, ADEQ, 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 November 9, 2008. Strong west and southwesterly winds were occurring in the Phoenix and Yuma areas due to a passing low-pressure system and tightening pressure gradient over Arizona. PM₁₀ concentrations spiked at the Yuma Courthouse monitor and numerous Phoenix area monitors throughout the afternoon and evening hours as gusty winds increased out of the west. The plot of hourly PM₁₀ concentration data in the upper right corner of Figure 1 confirms the nearly identical timing of the elevated PM₁₀ concentrations recorded at West 43rd Ave., Durango, South Phoenix, and Yuma Courthouse. The Phoenix visibility network images provide visual evidence of large amounts of suspended dust throughout the Phoenix Metro area. While similar images are not available for the Yuma area, Yuma radar data help visualize the transport of dust and soils across southeastern California and southwestern Arizona (see attachment).

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 measured concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95th percentile). Additionally, the winds associated with the elevated PM₁₀ concentrations may be characterized as unusual as described in “Impact of Exceptional Events’ ‘Unusual Winds’ on PM₁₀ Concentrations” (see “References”).

4. Examine the meteorological conditions before and during the event. The 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 and southern Arizona until the afternoon, when several stations began reporting wind gusts of 15-20 mph or greater. As winds continued to increase through the afternoon, the onset of elevated PM₁₀ concentrations began at the four flagged monitoring sites, each of which continued to show higher PM₁₀ values as winds increased. PM₁₀ values at South Phoenix and West 43rd Ave. remained high even after the winds had died down, likely due to suspension and transport of PM₁₀ in the lower atmosphere.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM₁₀ concentrations in the Phoenix and Yuma areas can be attributed to soil emissions that were transported over portions of Maricopa County and Yuma 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 November 9, 2008. Visual evidence of reduced visibility during the afternoon hours throughout portions of the Phoenix Metro area can be seen in the images located in the lower right portion of Figure 1. These images provide proof that the elevated PM₁₀ concentrations in and around Phoenix were coincident with strong gusty winds and can be attributed to soil emissions. Haze and reduced visibilities were observed and reported by Luke AFB weather spotters during the afternoon and evening hours of November 9th. In addition, visibility was reduced to 0.5 miles and haze was reported by trained weather spotters at the Yuma MCAS. These observations provide further proof that the elevated PM₁₀ concentrations recorded by the Yuma and Phoenix area monitors were the result of a wind-blown dust event.

6. Estimation of Contribution from Source or Event. 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 was included to demonstrate that there would have been no exceedances but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

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 concentrations at Yuma Courthouse, West 43rd Ave., Durango, and South Phoenix were attributed to a natural event.

Conclusion

Transport of dust from soils by high winds. The region wide elevated PM₁₀ event on November 9, 2008, in Yuma and Maricopa Counties was the result of transported dust and soils from 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” (RJ) flag 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.

ATTACHMENTS AND REFERENCES
FOR EXCEPTIONAL EVENTS ANALYSIS

The following are supplemental materials helpful in understanding the exceptional event summarized in the main report. In addition, the reader is referred to the following references.

REFERENCES

Arizona Department of Environmental Quality (ADEQ), *Air Quality Exceptional and Natural Events Policy*, Policy Number 2009.002 (April 28, 1999; revised January 10, 2006 and June 22, 2007).

Arizona Department of Environmental Quality (ADEQ), *Technical Criteria Document for Determination of Natural Exceptional Events for Particulate Matter Equal to or Less Than Ten Microns in Aerodynamic Diameter (PM₁₀)* (May 31, 2000).

Arizona Department of Environmental Quality (ADEQ), *Technical Criteria Document for Determination of Natural and Exceptional Events* (December 12, 2005).

Arizona Department of Environmental Quality (ADEQ), *Impact of Exceptional Events 'Unusual Winds' on PM₁₀ Concentrations* (October 14, 2009).

Arizona Department of Environmental Quality (ADEQ), *High Wind Exceptional Events and Control Measures for PM₁₀ Areas* (October 14, 2009).

Environmental Protection Agency (EPA), *The Treatment of Data Influenced by Exceptional Events (Exceptional Event Rule)*, 73 FR 70597; 40 CFR Parts 50 and 51 (November 21, 2008).



**MARICOPA COUNTY
DUST CONTROL ACTION FORECAST
ISSUED FRIDAY, NOVEMBER 7, 2008**

Three-day weather outlook:

High pressure remains over the forecast area through Saturday. By Sunday, however, a trough of low pressure crashes into Utah, increasing the pressure gradient over Arizona. This means that gusty conditions are possible across the deserts Sunday afternoon. The trough exits the region by next Tuesday. Afternoon desert temperatures will be in the low 80s on Saturday and Sunday, dropping to the mid 70s on Monday. The risk of exceeding the 24-hr PM-10 health standard in Phoenix will be "Moderate" on Sunday, returning to "Low" by Monday.

R I S K F A C T O R S

	<u>WINDS</u>	+	<u>STAGNATION</u>	=	<u>RISK LEVEL</u>
Day #1: Sat 11/08/2008	Southwest winds 5 to 10 mph are expected during the afternoon.		Somewhat stagnant conditions are expected early with improvement by the afternoon.		LOW
Day #2: Sun 11/09/2008	Southwest winds 10 to 20 mph are expected with stronger gusts possible during the afternoon.		Little to no stagnation is expected.		MODERATE
Day #3: Mon 11/10/2008	Northwest winds 5 to 10 mph are likely during the afternoon.		Somewhat stagnant conditions are expected early with improvement by the afternoon.		LOW

To review the complete air quality forecast for the Phoenix metropolitan area visit www.azdeq.gov or call 602-771-2367 for recorded forecast information.



Janet Napolitano, Governor
 Stephen A. Owens, ADEQ Director

**YUMA AND VICINITY
 DUST CONTROL ACTION FORECAST
 ISSUED FRIDAY, NOVEMBER 7, 2008**

Three-day weather outlook:

High pressure remains over the forecast area through Saturday. By Sunday, however, a trough of low pressure crashes into Utah, increasing the pressure gradient over Arizona. This means that gusty conditions are possible across the deserts Sunday afternoon. The trough exits the region by next Tuesday. Afternoon desert temperatures will be in the low 80s on Saturday and Sunday, dropping to the mid 70s on Monday. The risk of wind-blown dust in Yuma will be "Moderate" on Sunday, returning to "Low" by Monday.

WINDS

WIND BLOWN DUST RISK

Day #1: Sat 11/08/2008

No significant winds are expected.

LOW

Day #2: Sun 11/09/2008

West winds 15 to 20 mph are expected with stronger gusts possible during the afternoon.

MODERATE

Day #3: Mon 11/10/2008

No significant winds are expected.

LOW

PM-10 & PM-2.5 (PARTICLES)

Description – The term “particulate matter” (PM) includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 10 micrometers in diameter tend to pose the greatest health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter are referred to as “fine” particles and are responsible for many visibility degradations (brown cloud). Particles with diameters between 2.5 and 10 micrometers are referred to as “coarse”.

Sources – Fine = All types of combustion (motor vehicles, power plants, wood burning, etc.) and some industrial processes. Coarse = crushing or grinding operations and dust from paved or unpaved roads.

Potential health impacts – PM can increase susceptibility to respiratory infections and can aggravate existing respiratory diseases, such as asthma and chronic bronchitis.

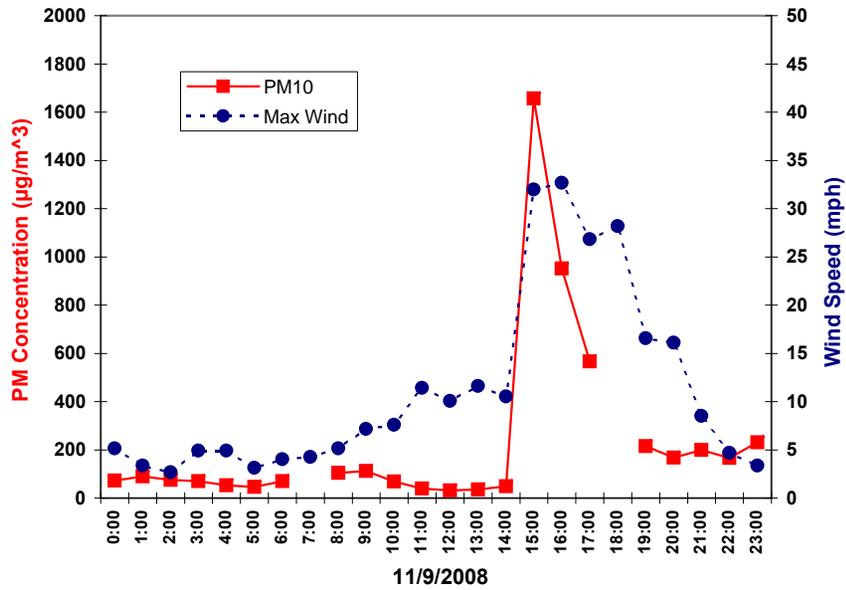
Units of measurement – Micrograms per cubic meter (ug/m3)

Averaging interval – 24 hours (midnight to midnight).

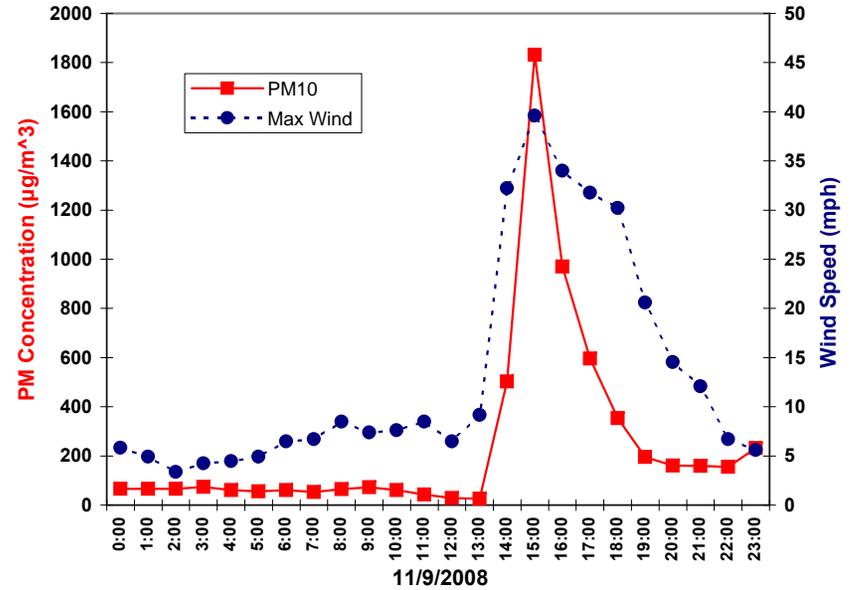
Reduction tips – Stabilize loose soils, minimize travel on dirt roads, utilize tarps on haul trucks, limit use of leaf-blowers, and on high-wind days reduce outdoor activities.

11/09/2008 - ADDITIONAL GRAPHS

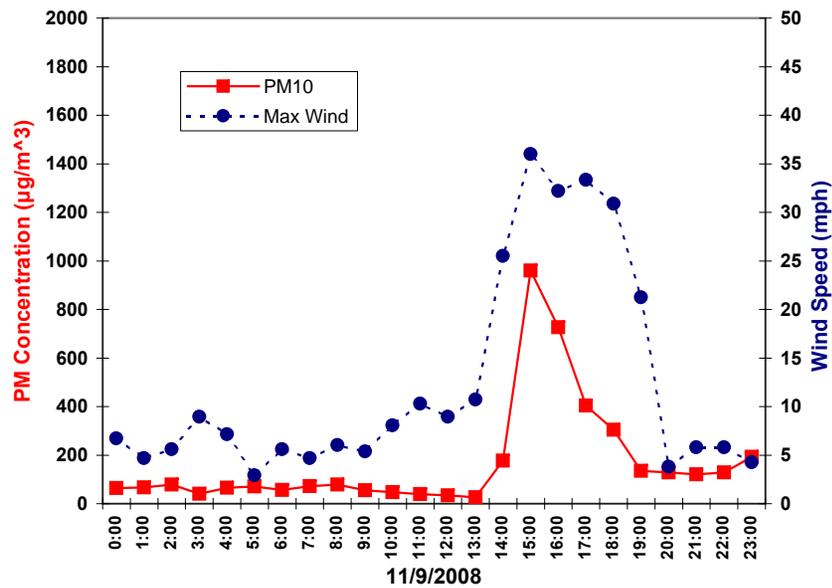
South Phoenix - PM 10 vs. Wind Speed



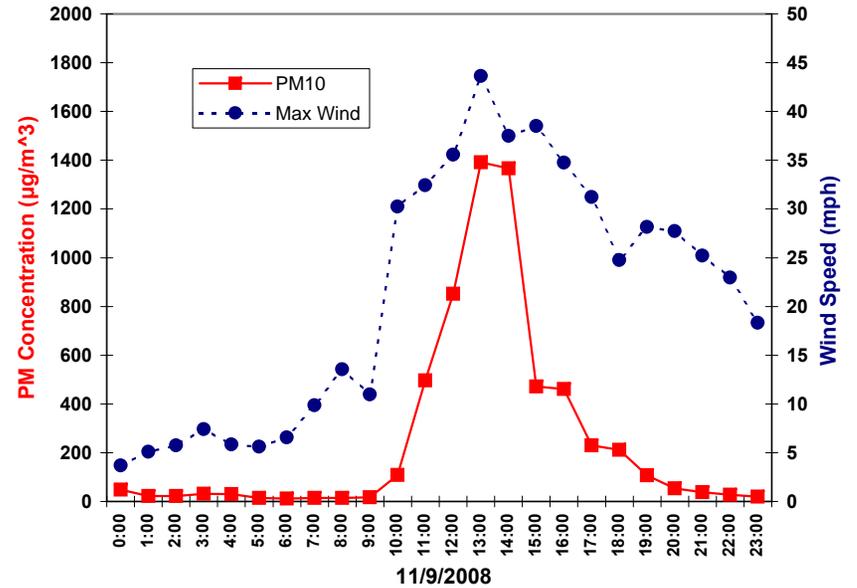
West 43rd - PM 10 vs. Wind Speed



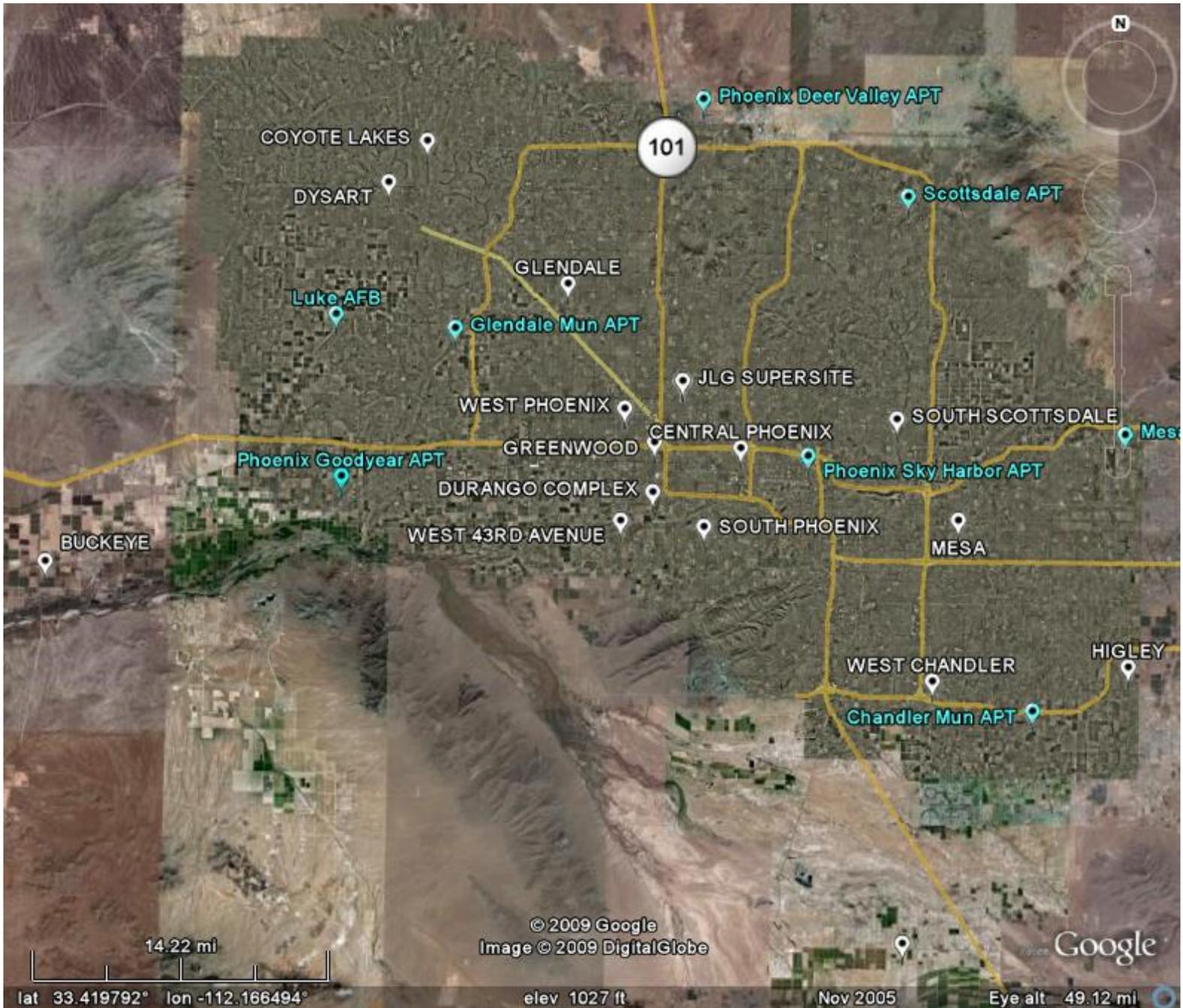
Durango - PM 10 vs. Wind Speed



Yuma - PM 10 vs. Wind Speed

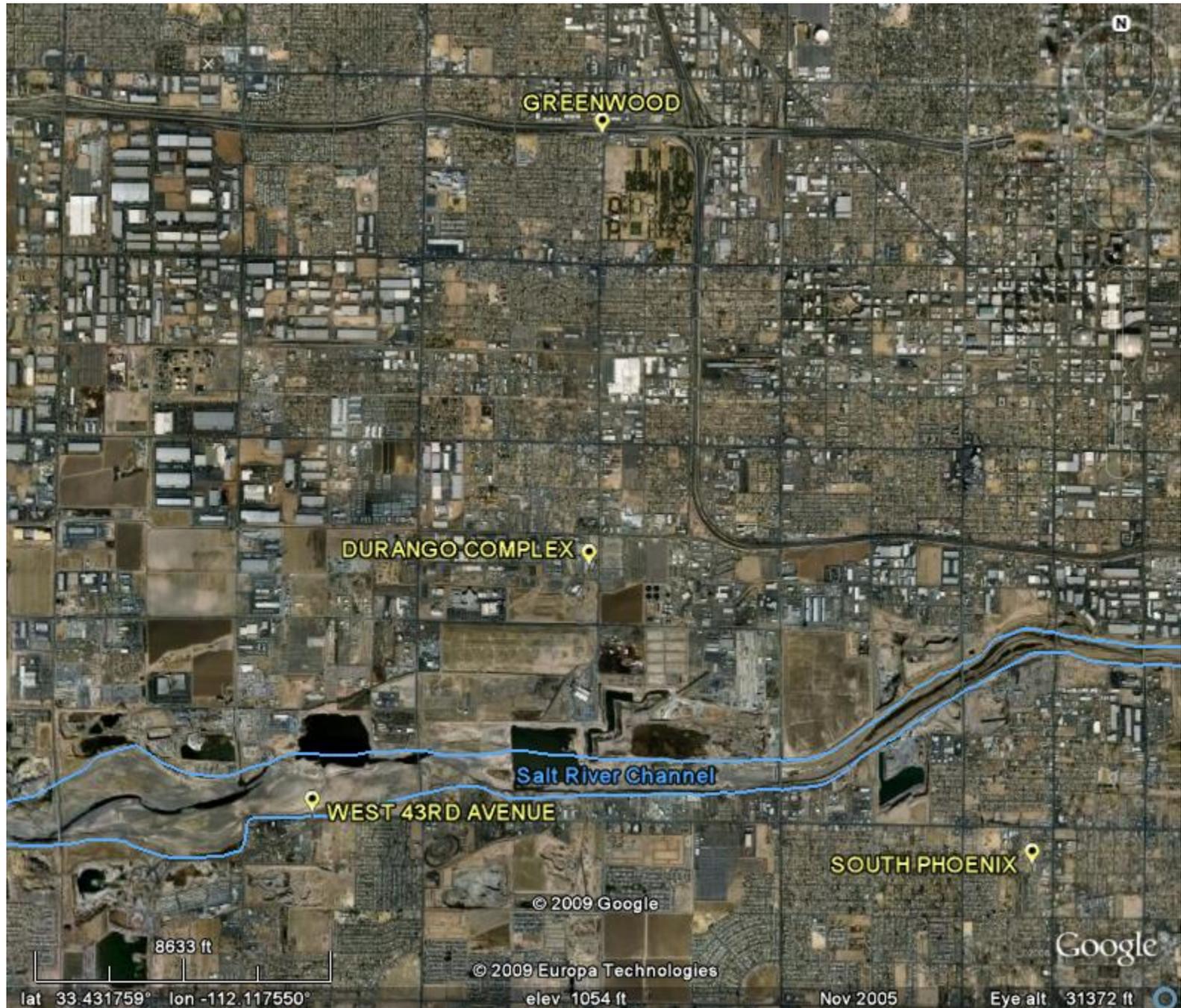


Phoenix Area PM₁₀ and Meteorological Monitors



Source: US EPA, ADEQ, & Google Earth

Salt River Area PM₁₀ and Meteorological Monitors



Source: US EPA, ADEQ, & Google Earth

Yuma Area PM₁₀ and Meteorological Monitors



Source: US EPA, ADEQ, & Google Earth

November 9th 2008 Radar and Satellite Data

Radar data obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center in conjunction with MODIS satellite photography obtained from NASA's Rapid Response System allows for a visual reassessment of the event. These data were downloaded as KMZ files and displayed using Google Earth software. The overlay of the products clearly shows that much of the suspended dust originated in southeastern California and was transported to the east. It can be seen that large sources of dust appear to come from the Imperial Sand Dunes of southern California (also known as the Algodones Dunes) and other similar dunes or open desert areas to the southwest of the Salton Sea. Another common source of blowing dust appears to be an area of open desert to the south / southeast of Yuma. While some of the radar images are obscured by noise, the dust sources are still clearly visible.

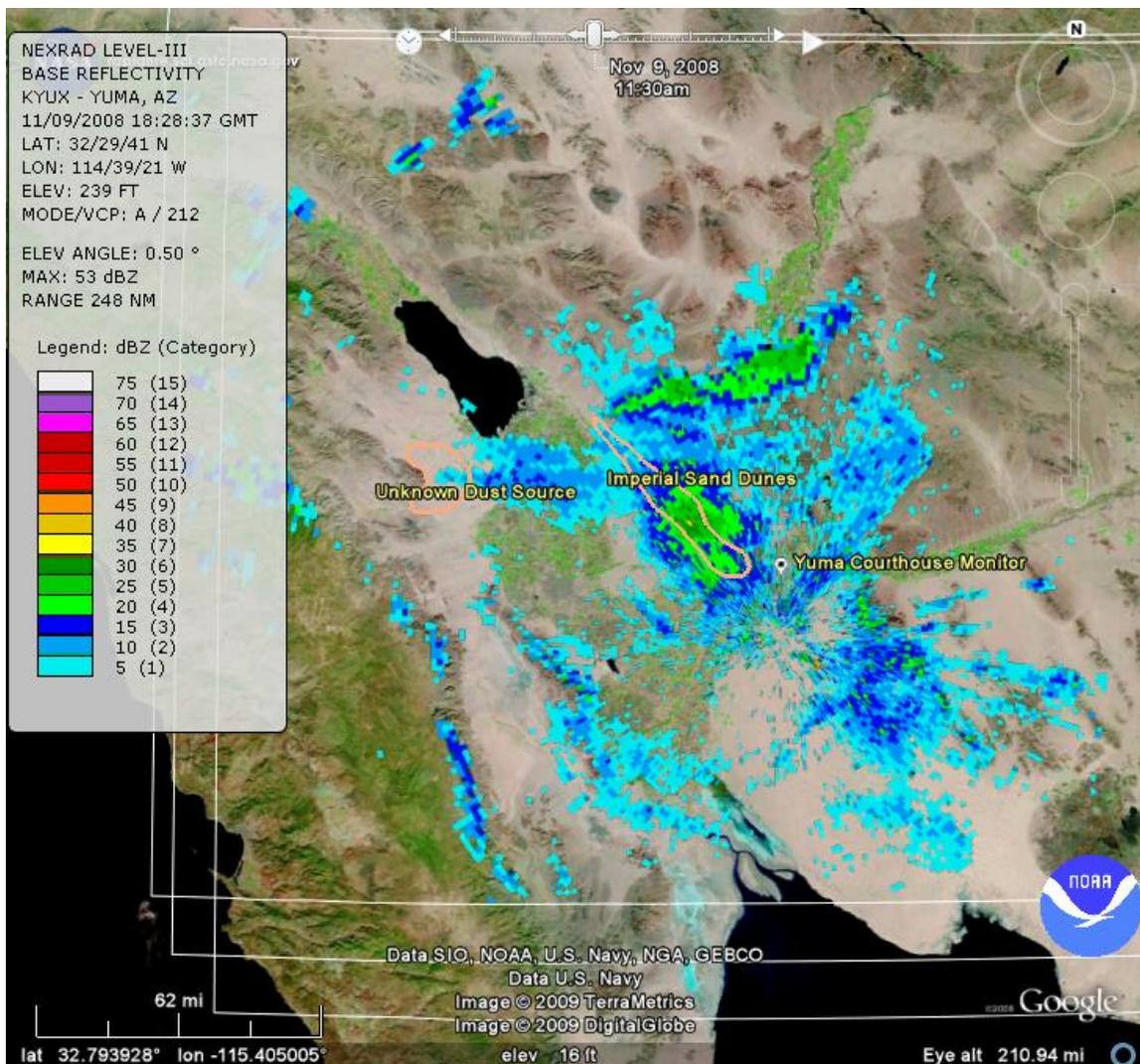


Figure 1 - Radar data and MODIS satellite imagery show that major sources of blowing dust are the Imperial Sand Dunes just west / northwest of Yuma and an area located to the southwest of the Salton Sea. These radar data contain a different color scheme compared to previous events because the radar was in precipitation mode during this event.

The MODIS satellite data are from the Terra satellite with 250 meter resolution and use bands 7, 2, and 1 to accentuate vegetation. The green areas seen near Yuma and southeast California are agricultural lands. Lighter tan areas are indicative of open desert while darker brown areas indicate areas of higher elevation or differing soil type (compared to that of the open desert). The suspected PM sources are outlined in the image below.

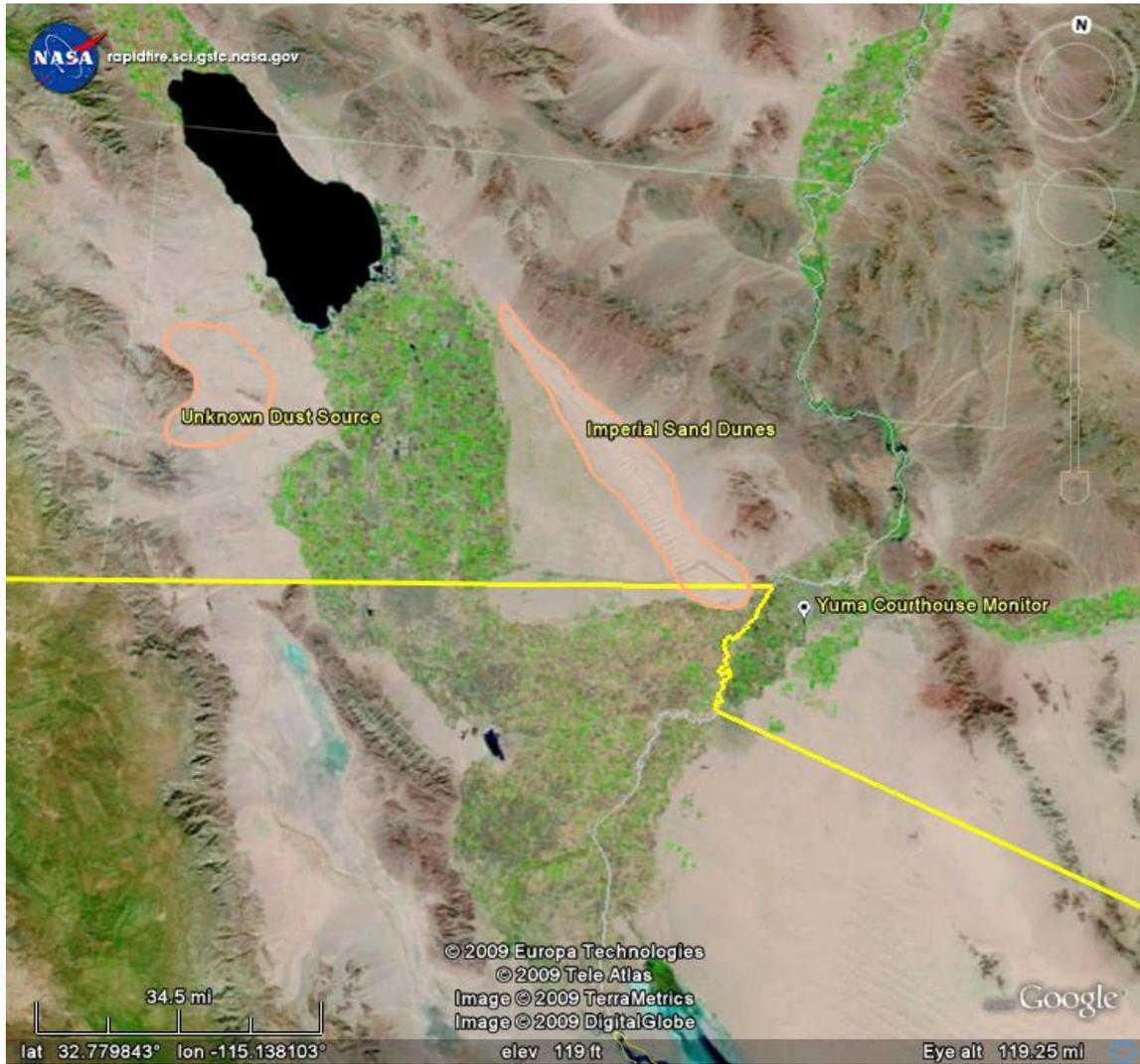


Figure 2 - Image courtesy of MODIS Rapid Response Project at NASA/GSFC displayed using Google Earth software.