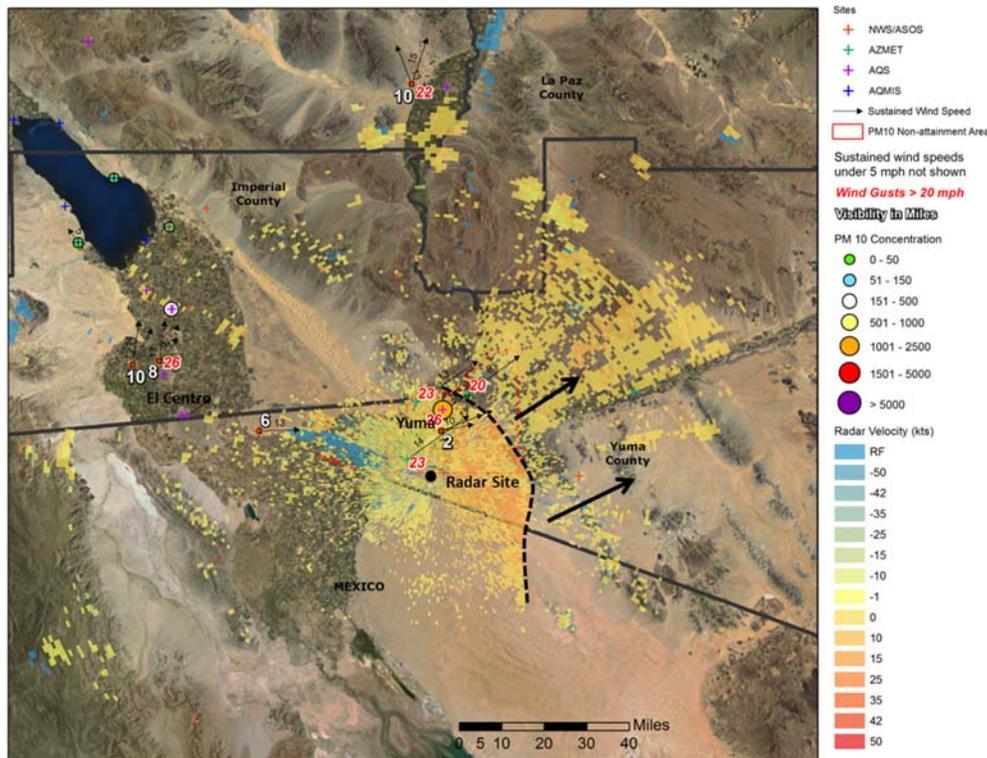




Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

State of Arizona Exceptional Event Documentation for the Event of August 12–13, 2012, for the Yuma County PM₁₀ Nonattainment Area



Final Report Prepared for

Arizona Department of Environmental Quality
Phoenix, AZ

June 2013

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State of Arizona Exceptional Event Documentation for the Event of August 12–13, 2012, for the Yuma County PM₁₀ Nonattainment Area

Final Report
STI-913084-5678-FR

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1. Introduction

On August 12 and 13, 2012, the Yuma Supersite monitor recorded 24-hr average PM₁₀ concentrations of 214 and 185 µg/m³, respectively. These values are in exceedance of the National Ambient Air Quality Standard (NAAQS) of 150 µg/m³ for 24-hr PM₁₀. This report demonstrates that these exceedances were caused by naturally occurring windblown dust, were not reasonably controllable or preventable, were historically unusual, and would not have occurred “but for” the windblown dust and, therefore, the event is an exceptional event as defined by the U.S. Environmental Protection Agency’s (EPA) Exceptional Events Rule (EER).

1.1 Report Contents

Section 2 of this assessment contains a conceptual model of the thunderstorm-driven, windblown dust event that occurred on August 12 and 13, 2012, providing a background narrative of the exceptional event and an overall explanation that the event affected air quality. Section 2 also provides evidence that the event was a natural event.

Section 3 of this assessment establishes a clear causal connection between the natural event on August 12 and 13, 2012, and the exceedances of the 24-hr PM₁₀ standard at the Yuma Supersite monitoring station. The evidence in this section also confirms that the event in question both affected air quality and was the result of natural events.

Section 4 of this assessment contains data summaries and time-series graphs that help illustrate that the event of August 12 and 13, 2012, produced PM₁₀ concentrations in excess of normal historical fluctuations.

Section 5 of this assessment details the existing dust control measures and demonstrates that despite the presence and enforcement of these controls, the event of August 12 and 13, 2012, was not reasonably controllable or preventable.

Section 6 of this assessment builds upon the demonstration, showing a clear causal connection between the natural event and the exceedances, and concludes that the exceedances of the 24-hr PM₁₀ standard on August 12 and 13, 2012, would not have occurred but for the event.

Appendix A contains time-series graphs and data tables to supplement Section 3. **Appendix B** contains air quality forecasts issued by the Arizona Department of Environmental Quality (ADEQ) and weather statements and warnings issued by the National Weather Service (NWS).

1.2 Exceptional Event Rule Requirements

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

1.2.1 Public Notification That the Event Was Occurring (40 CFR 50.14(c)(1)(i))

ADEQ issued Dust Control Action Forecasts for the Greater Yuma area advising citizens of the potential for thunderstorm-driven dust events during the August 12-13, 2012, time frame. More information on ADEQ's forecasting program can be found in Section 5.2 of this report. The forecast products that were issued during the period August 12-13, 2012, are included in Appendix B.

1.2.2 Place Informal Flag on Data in AQS (40 CFR 50.14(c)(2)(ii))

ADEQ and other operating air quality agencies in Arizona submit data into the EPA's Air Quality System (AQS), the official repository of ambient air quality data. This data submittal to AQS includes particulate matter (PM) data from both filter-based and continuous monitors operated in Arizona.

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

If ADEQ and/or other operating air quality agencies have determined that the potential exists for a monitor's reading(s) to have been influenced by an exceptional event, a preliminary flag is submitted for the measurement in AQS. The data are not official until they undergo more thorough quality assurance and quality control, leading to certification by May 1 of the year following the calendar year in which the data were collected (40 CFR 58.15(a)(2)). The presence of the flag can be confirmed in AQS.

1.2.3 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))

ADEQ held informal conversations with EPA during September, 2012, to discuss all the days in calendar year 2012 that ADEQ intended to analyze under the EER. The PM₁₀ exceedances that occurred at the Yuma Supersite monitor on August 12 and 13, 2012, in the Yuma PM₁₀ Nonattainment Area were included in the discussions. This assessment report serves as demonstration supporting the flagging of these data.

1.2.4 Document That the Public Comment Process Was Followed for Event Documentation (40 CFR 50.14(c)(3)(iv))

ADEQ posted this assessment report on the ADEQ webpage and placed a hard copy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on July 15, 2013. A copy of the public notice certification, along with any comments received, will be submitted to EPA, consistent with the requirements of 40 CFR 50.14(c)(3)(iv).

1.2.5 Submit Demonstration Supporting Exceptional Event Flag (40 CFR 50.14(a)(1-2))

At the close of the public comment period, and after ADEQ has had the opportunity to consider any comments submitted on this document, ADEQ will submit this document, the comments received, and ADEQ's responses to those comments to EPA Region 9 headquarters in San Francisco, California. The deadline for the submittal of this package is September 30, 2015.

1.2.6 Documentation Requirements (40 CFR 50.14(c)(3)(iii))

The EER states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

1. The event satisfies the criteria set forth in 40 CFR 50.1(j) that
 - a. the event affected air quality,
 - b. the event was not reasonably controllable or preventable, and
 - c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
2. There is a clear causal relationship between the measurement(s) under consideration and the event;
3. The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
4. There would have been no exceedance or violation but for the event.

2. Conceptual Model

This section provides a narrative background and summarizes the meteorological and air quality conditions in place on August 12 and 13, 2012, in Yuma. Elements described in this section include

- A description and map of geographic setting of the air quality and meteorological monitors.
- A description of Yuma's climate.
- An overall description of meteorological and air quality conditions on the event day.

2.1 Geographic Setting and Monitor Locations

Yuma is located in the Sonoran Desert and Lower Colorado River Valley in extreme southwestern Arizona at an elevation of 138 feet above sea level. The Yuma Metropolitan Statistical Area is defined as Yuma County, which reported a population of 195,751 in the 2010 census. Yuma County is bordered by Imperial County, California, to the north and northwest and by Mexico to the west and south (**Figure 2-1**). Yuma lies just west of the confluence of the Colorado and Gila Rivers. Most of Yuma is located in the Colorado River Floodplain, commonly known as the Yuma Valley. The Yuma Valley follows the course of the Colorado River southward to the Sea of Cortez. Part of Yuma is built on the Yuma Mesa, a prominent land feature extending to the east of Yuma. The Gila Mountains, located roughly 15 to 20 miles east and southeast of Yuma, have a peak elevation of 3,156 feet. Directly west-northwest of Yuma in Imperial County, California, are the Algodones Dunes, an elongated, extensive region of open sand dunes (**Figure 2-2**). West-northwesterly winds can transport dust and sand from these dunes into the Yuma region. North of the sand dunes are the Chocolate Mountains, which rise to over 2,000 feet in elevation and may contribute to channeling effects that enhance wind speeds locally over the Algodones Dunes.

The air quality and meteorological monitors used in this analysis are shown in Figure 2-1. AQS monitors measure air quality and meteorological data; Arizona Meteorological Network (AZMET) and NWS monitors measure meteorological data only. The PM₁₀ exceedances on August 12 and 13, 2012, were recorded at the Yuma Supersite monitor, which is located in central Yuma and has been operational since January 1, 2010. The Yuma Courthouse monitor shown in Figure 2-1 is inactive but measured PM₁₀ prior to January 1, 2010. Data from the Yuma Courthouse monitor were used to supplement the Yuma Supersite data record for the Historical Norm section of this demonstration. Three AZMET sites are in operation in the Yuma area, located northeast, west, and southwest of the city. A NWS monitor operates at the Yuma Marine Corps Air Station (MCAS). Additional air quality and meteorological monitors with data relevant to this dust storm event are located in adjacent southeastern California and northwestern Mexico (**Figure 2-3**).

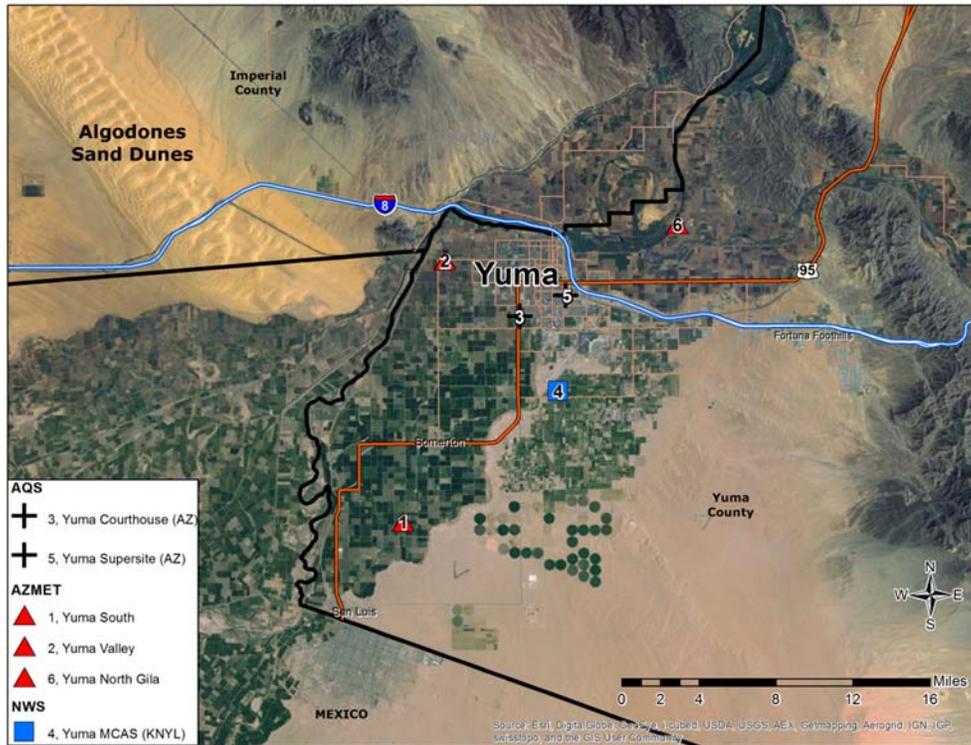


Figure 2-1. Air quality and meteorological monitors in the immediate Yuma region.



Figure 2-2. The Algodones sand dunes in Imperial County, with the Chocolate Mountains in the background.

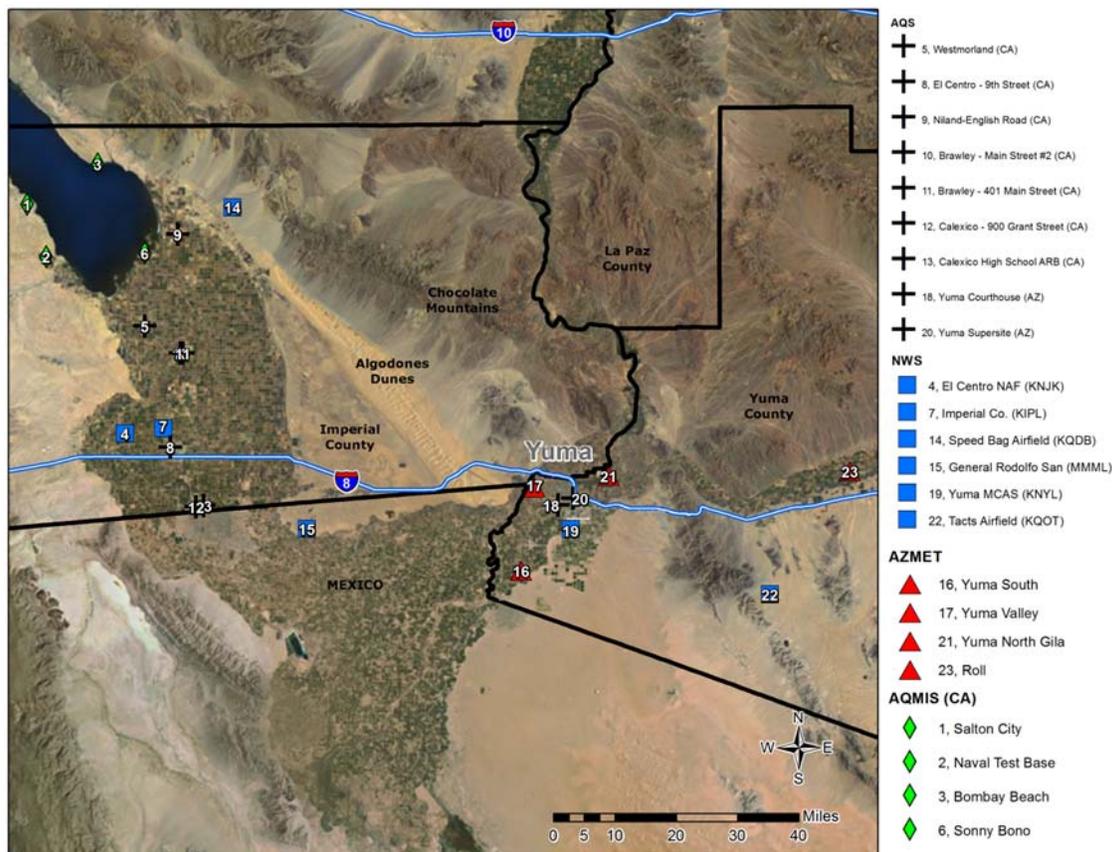


Figure 2-3. Air quality and meteorological monitors and relevant geographical features in the broader region around Yuma.

2.2 Climate, Monsoon, and Thunderstorms

Yuma is one of the hottest cities in the United States, with average high temperatures around 107°F in July and around 70°F in January (**Figure 2-4**). Yuma receives roughly 90% of possible sunshine each year. Yuma is one of the driest cities in the United States, with an average annual rainfall of just over 3 inches. The bulk of this rain usually falls during the December–March and July–August time periods. During the December–March period, winter storms originating from the Pacific Ocean can produce significant rains in southwestern Arizona. During the July–August time period, monsoonal moisture originating from the Gulf of California, Gulf of Mexico, and thunderstorm complexes over the Sierra Madre Occidental Mountains in Mexico move northward into Arizona.

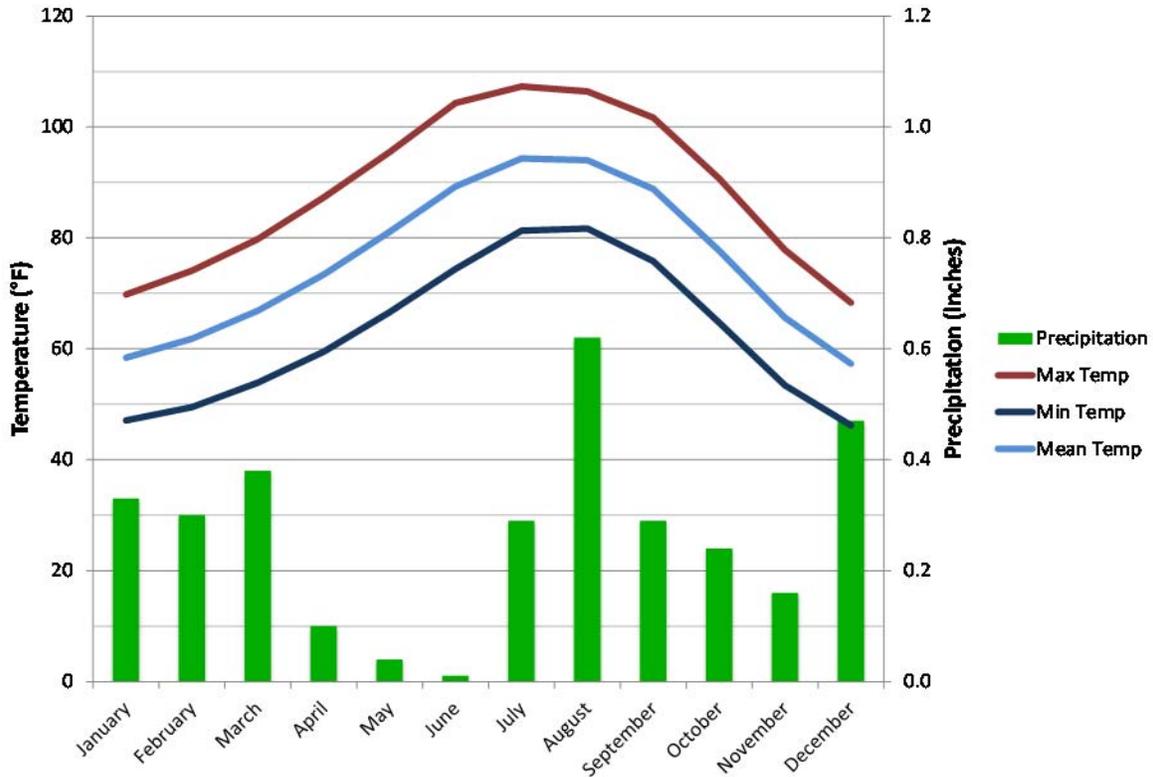
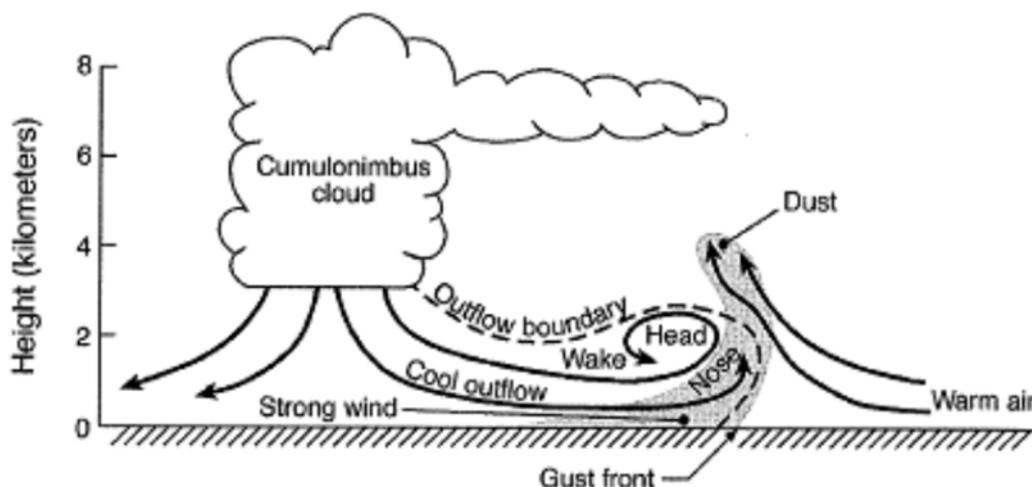


Figure 2-4. Average monthly temperatures and precipitation at Yuma MCAS, 1981-2010.

The influx of moisture associated with the monsoon, combined with strong solar heating, can result in unstable atmospheric conditions favorable for the development of thunderstorms. Heavy precipitation associated with thunderstorms, and the eventual collapse or dissipation of thunderstorms, can generate downbursts. Downbursts are the rapid descent of rain-cooled air in a thunderstorm. Upon reaching the surface, this air rapidly disperses horizontally away from the storm as outflow boundaries (also called gust fronts; see **Figure 2-5**). The high winds associated with outflow boundaries can efficiently loft dust into the air and transport the dust over long distances, resulting in dust storms (also called haboobs) with high PM₁₀ concentrations and low visibilities.

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Cross-section schematic of a haboob caused by the cool outflow from a thunderstorm, with the leading edge that is propagating ahead of the storm called an outflow boundary. The strong, gusty winds that prevail at the boundary are defined as a gust front. The leading edge of the cool air is called the nose, and the upward-protruding part of the features is referred to as the head. Behind the roll in the windfield at the leading edge is a turbulent wake. The rapidly moving cool air and the gustiness at the gust front raise dust (shaded) high into the atmosphere.

Figure 2-5. Cross-section of a thunderstorm creating an outflow boundary and haboob.¹

Dust storms associated with these thunderstorms typically occur in the early part of the monsoon season (July) before rains moisten the soil and limit potential lofting of soil into the air. However, depending on the amount and frequency of precipitation received during the monsoon season, extremely hot temperatures can dry the surface soils very quickly; thus, dust storms can occur at any time during the year. Specific PM₁₀ source regions are difficult to determine during thunderstorm-driven dust storms because the thunderstorm outflow can carry dust over long distances that encompass many possible sources of dust. Instead, we consider general PM₁₀ source regions, which are typically identified by the locations of the thunderstorms that are believed to have generated the dust-laden outflow winds.

2.3 Event Day Summary

On the evening of August 12, 2012, strong winds generated by thunderstorms over northwestern Mexico and southeastern California transported dust into southwestern Arizona, impacting the Yuma area (**Figure 2-6**). High PM₁₀ concentrations continued in Yuma into the early morning hours of August 13. Then, on the evening of August 13, thunderstorms redeveloped over far northwestern Mexico and southeastern California. These storms

¹ Image source: Warner, T.T. (2004). *Desert meteorology*: Cambridge University Press, ISBN-10: 0521817986, ISBN-13: 978-0521817981, February 9.)

generated strong winds that carried dust into the Yuma area. The windblown dust events resulted in 24-hr average PM₁₀ concentrations at the Yuma Supersite monitor of 214 µg/m³ on August 12 and 185 µg/m³ on August 13 (**Tables 2-1 and 2-2**). These values are in exceedance of the NAAQS. The hourly and 24-hr average PM₁₀ concentrations measured at the Yuma Supersite monitor were in excess of normal historical fluctuations. The dust was naturally occurring and likely originated over undeveloped lands of far northwestern Mexico and southeastern California, outside the city of Yuma, and wind gusts in excess of 25 mph during these events overwhelmed reasonable dust control measures. PM₁₀ monitors in Imperial County also recorded high PM₁₀ concentrations on both August 12 and 13, illustrating the regional nature of these thunderstorm-driven dust events.

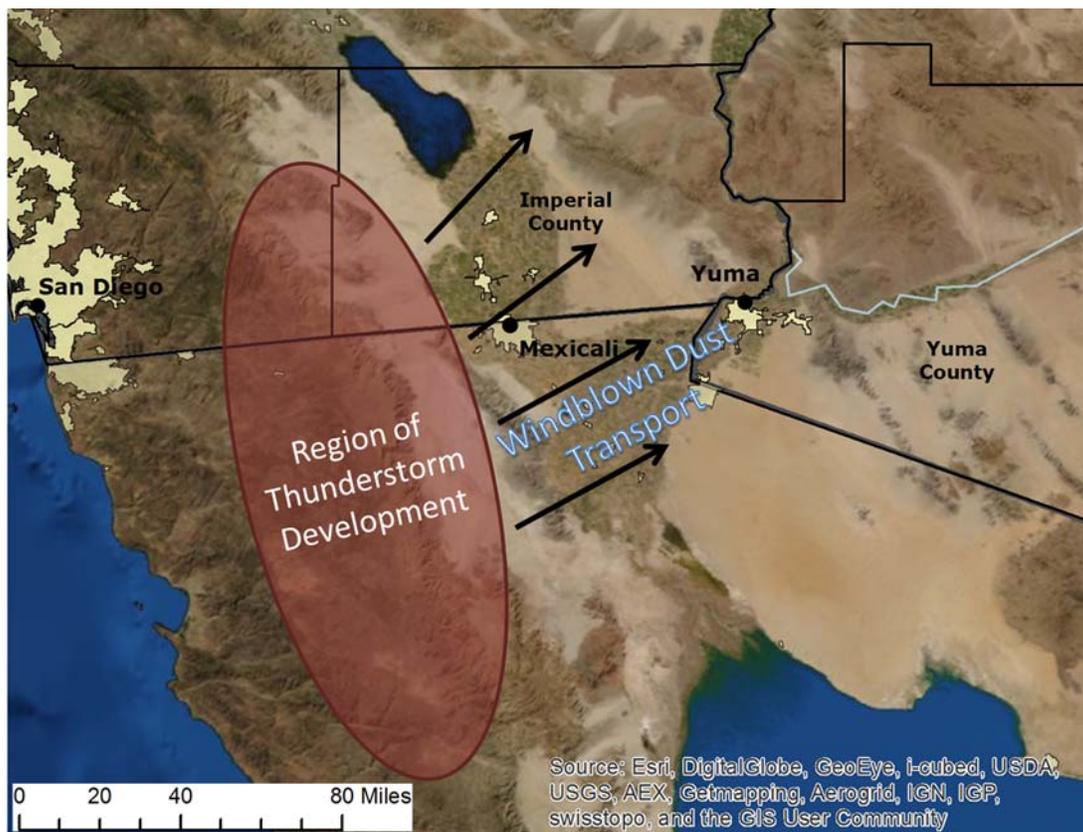


Figure 2-6. Outflow boundaries from thunderstorms over the northern Baja Peninsula transported dust into the Yuma area on August 12 and 13, 2012.

Table 2-1. PM₁₀ measurements collected in Arizona and southeastern California on August 12, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (MST)	AQS Qualifier Flag
ARIZONA							

Apache County							
N/A	TEOM	WMAT	04-001-1003-81102-1	19	45	1900	
Coconino County							
N/A	TEOM	NNIR	04-005-1237-81102-1	21	44	2100	
Gila County							
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	53	169	2300	
Miami Golf Course	TEOM	ADEQ	04-007-8000-81102-3	49	132	0500	
Maricopa County							
West Phoenix	TEOM	MCAQD	04-013-0019-81102-1	48	168	1200	
North Phoenix	BAM	MCAQD	04-013-1004-81102-1	53	146	1100	
Glendale	TEOM	MCAQD	04-013-2001-81102-1	65	167	1200	
Central Phoenix	TEOM	MCAQD	04-013-3002-81102-4	48	125	1200	
Greenwood	TEOM	MCAQD	04-013-3010-81102-1	44	122	1200	
South Phoenix	TEOM	MCAQD	04-013-4003-81102-1	48	88	1200	
West Chandler	TEOM	MCAQD	04-013-4004-81102-1	45	102	1300	
Tempe	TEOM	MCAQD	04-013-4005-81102-1	45	94	1300	
Higley	TEOM	MCAQD	04-013-4006-81102-1	45	70	1200	
West 43 rd Ave	TEOM	MCAQD	04-013-4009-81102-1	37	78	1200	
Dysart	TEOM	MCAQD	04-013-4010-81102-1	71	191	1100	
Buckeye	TEOM	MCAQD	04-013-4011-81102-1	61	102	1900	
Zuni Hills	TEOM	MCAQD	04-013-4016-81102-1	71	177	1100	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	84	N/A	N/A	
Durango Complex	TEOM	MCAQD	04-013-9812-81102-1	40	91	1200	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	50	130	1200	
Mohave County							
Bullhead City	TEOM	ADEQ	04-015-1003-81102-3	26	178	1800	IJ
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	17	53	2000	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	18	61	2300	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	8	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	52	468	2200	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	23	N/A	N/A	
Green Valley	TEOM	PCAQCD	04-019-1030-81102-1	15	27	2100	
Geronimo	TEOM	PCAQCD	04-019-1113-81102-1	22	51	1100	

Table 2-1. PM₁₀ measurements collected in Arizona and southeastern California on August 12, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (MST)	AQS Qualifier Flag
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	45	80	1500	
Apache Junction Fire Station	TEOM	PCAQCD	04-021-3002-81102-3	41	71	1200	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	70	373	2100	
Combs	TEOM	PCAQCD	04-021-3009-81102-3	49	71	0000	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	44	91	1400	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	62	124	2200	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	102	294	1900	
Santa Cruz County							
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	65	210	2000	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	213	1495	1800	RJ
CALIFORNIA							
Imperial County							
Brawley-Main Street #2	BAM	ICAPCD	06-025-0007-85101-3	103	585	1900	
Niland-English Road	BAM	ICAPCD	06-025-4004-85101-3	119	995	1900	
Riverside County							
Torres-Martinez Admin Site	BAM	TMIR	06-065-1999-81102-1	70	831	2100	5
San Bernardino County							
N/A	GRAV	MDAQMD	06-071-0306-81102-1	26	N/A	N/A	
North Amer Chem Corp	TEOM	MDAQMD	06-071-1234-81102-2	23	48	0200	

TEOM: Tapered Element Oscillating Microbalance
 GRAV: Gravimetric Analysis
 BAM: Beta Attenuation Monitor
 FRM: Federal Reference Method
 WMAT: White Mountain Apache Tribe
 NNIR: Navajo Nation Indian Reservation
 ADEQ: Arizona Department of Environmental Quality
 MCAQD: Maricopa County Air Quality Department
 FMIR: Fort McDowell Indian Reservation
 PCDEQ: Pima County Department of Environmental Quality
 PCAQCD: Pinal County Air Quality Control District
 ICAPCD: Imperial County Air Pollution Control District
 TMIR: Torres-Martinez Indian Reservation
 MDAQMD: Mojave Desert Air Quality Management District

RJ: qualifier flag for high winds (for data exclusion)
 IJ: qualifier flag for high winds (for information only)
 5: qualifier flag for an outlier

Table 2-2. PM₁₀ measurements collected in Arizona and southeastern California on August 13, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (MST)	AQS Qualifier Flag
ARIZONA							
Apache County							
N/A	TEOM	WMAT	04-001-1003-81102-1	20	44	1600	
Cochise County							
Douglas Red Cross	GRAV	ADEQ	04-003-1005-81102-1	52	N/A	N/A	
Coconino County							
Flagstaff Middle School	GRAV	ADEQ	04-005-1008-81102-1	16	N/A	N/A	
Gila County							
Payson Well Site	GRAV	ADEQ	04-007-0008-81102-1	29	N/A	N/A	
Payson Well Site	GRAV	ADEQ	04-007-0008-81102-2	27	N/A	N/A	
Miami Ridgeline	GRAV	PDC	04-007-0009-81102-1	30	N/A	N/A	
Hayden Old Jail	TEOM	ADEQ	04-007-1001-81102-3	60	176	0000	
Miami Golf Course	GRAV	ADEQ	04-007-8000-81102-1	35	N/A	N/A	
Miami Golf Course	GRAV	PDC	04-007-8000-81102-2	34	N/A	N/A	
Miami Golf Course	TEOM	ADEQ	04-007-8000-81102-3	43	81	1100	
Maricopa County							
West Phoenix	TEOM	MCAQD	04-013-0019-81102-1	76	519	2200	
North Phoenix	BAM	MCAQD	04-013-1004-81102-1	57	198	2200	
Glendale	TEOM	MCAQD	04-013-2001-81102-1	51	129	2200	
Central Phoenix	TEOM	MCAQD	04-013-3002-81102-4	87	604	2200	
South Scottsdale	GRAV	MCAQD	04-013-3003-81102-1	57	N/A	N/A	
Greenwood	TEOM	MCAQD	04-013-3010-81102-1	94	707	2200	
West Chandler	TEOM	MCAQD	04-013-4004-81102-1	75	199	2300	
Tempe	TEOM	MCAQD	04-013-4005-81102-1	68	405	2200	
Higley	TEOM	MCAQD	04-013-4006-81102-1	101	702	2200	
West 43 rd Ave	TEOM	MCAQD	04-013-4009-81102-1	96	567	2100	
Dysart	TEOM	MCAQD	04-013-4010-81102-1	45	112	2100	
Buckeye	TEOM	MCAQD	04-013-4011-81102-1	77	285	2100	
Zuni Hills	TEOM	MCAQD	04-013-4016-81102-1	41	124	2100	
Fort McDowell/ Yuma Frank	TEOM	FMIR	04-013-5100-81102-3	38	N/A	N/A	
Senior Center Air Monitoring Station	GRAV	SRPMIC	04-013-7020-81102-1	90	N/A	N/A	
Senior Center Air Monitoring Station	GRAV	SRPMIC	04-013-7020-81102-2	89	N/A	N/A	

Table 2-2. PM₁₀ measurements collected in Arizona and southeastern California on August 13, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (MST)	AQS Qualifier Flag
Lehi Air Monitoring Station	GRAV	SRPMIC	04-013-7022-81102-1	84	N/A	N/A	
Durango Complex	TEOM	MCAQD	04-013-9812-81102-1	109	548	2200	
JLG Supersite	BAM	ADEQ	04-013-9997-81102-3	67	442	2200	
Mohave County							
Bullhead City	TEOM	ADEQ	04-015-1003-81102-3	25	138	1900	
Navajo County							
N/A	TEOM	WMAT	04-017-1002-81102-1	18	46	1900	
Pima County							
Ajo	TEOM	ADEQ	04-019-0001-81102-3	98	225	0500	
Orange Grove	FRM	PCDEQ	04-019-0011-81102-2	36	N/A	N/A	
Rillito	TEOM	ADEQ	04-019-0020-81102-3	62	159	2000	
South Tucson	FRM	PCDEQ	04-019-1001-81102-1	34	N/A	N/A	
Prince Road	GRAV	PCDEQ	04-019-1009-81102-1	34	N/A	N/A	
Tangerine	GRAV	PCDEQ	04-019-1018-81102-1	30	N/A	N/A	
Santa Clara	GRAV	PCDEQ	04-019-1026-81102-1	33	N/A	N/A	
Green Valley	TEOM	PCAQCD	04-019-1030-81102-1	23	38	1900	
Geronimo	TEOM	PCAQCD	04-019-1113-81102-1	32	64	1600	
Pinal County							
Casa Grande Downtown	TEOM	PCAQCD	04-021-0001-81102-3	84	149	1100	
Apache Junction Fire Station	GRAV	PCAQCD	04-021-3002-81102-1	45	N/A	N/A	
Apache Junction Fire Station	TEOM	PCAQCD	04-021-3002-81102-3	45	81	0800	
Coolidge	GRAV	PCAQCD	04-021-3004-81102-1	59	N/A	N/A	
Pinal Air Park	GRAV	PCAQCD	04-021-3007-81102-1	47	N/A	N/A	
Stanfield	TEOM	PCAQCD	04-021-3008-81102-3	92	182	0800	
Combs	TEOM	PCAQCD	04-021-3009-81102-3	67	168	0700	
Maricopa	TEOM	PCAQCD	04-021-3010-81102-3	133	408	2300	
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-1	64	N/A	N/A	
Pinal County Housing	GRAV	PCAQCD	04-021-3011-81102-2	72	N/A	N/A	
Pinal County Housing	TEOM	PCAQCD	04-021-3011-81102-3	97	189	1800	
Cowtown	TEOM	PCAQCD	04-021-3013-81102-3	165	370	0500	
Eloy	GRAV	PCAQCD	04-021-3014-81102-1	59	N/A	N/A	
Casa Blanca	GRAV	GRIC	04-021-7004-81102-1	163	N/A	N/A	RJ

Table 2-2. PM₁₀ measurements collected in Arizona and southeastern California on August 13, 2012. Data from the Yuma Supersite monitor are shown in **bold green**.

Monitor	Monitor Type	Operator	AQS Monitor ID	24-hr Avg PM ₁₀ (µg/m ³)	1-hr Max PM ₁₀ (µg/m ³)	Time of Max 1-hr PM ₁₀ (MST)	AQS Qualifier Flag
Casa Blanca	GRAV	GRIC	04-021-7004-81102-2	161	N/A	N/A	RJ
Santa Cruz County							
Nogales Post Office	GRAV	ADEQ	04-023-0004-81102-1	51	N/A	N/A	
Nogales Post Office	BAM	ADEQ	04-023-0004-81102-3	53	135	2300	
Yavapai County							
Prescott Valley	GRAV	ADEQ	04-025-2002-81102-1	14	N/A	N/A	
Yuma County							
Yuma Supersite	TEOM	ADEQ	04-027-8011-81102-3	184	475	1800	RJ
CALIFORNIA							
Imperial County							
Calexico High School	GRAV	CARB	06-025-0005-81102-1	321	N/A	N/A	IJ
Brawley-Main Street #2	GRAV	ICAPCD	06-025-0007-85101-1	96	N/A	N/A	IJ
Brawley-Main Street #2	BAM	ICAPCD	06-025-0007-85101-3	69	298	1800	
El Centro-9 th Street	GRAV	ICAPCD	06-025-1003-85101-1	72	N/A	N/A	IJ
El Centro-9 th St	GRAV	ICAPCD	06-025-1003-85101-2	75	N/A	N/A	IJ
Westmorland	GRAV	ICAPCD	06-025-4003-81102-1	109	N/A	N/A	IJ
Niland-English Road	BAM	ICAPCD	06-025-4004-85101-1	212	N/A	N/A	IJ
Niland-English Road	BAM	ICAPCD	06-025-4004-85101-3	208	995	1700	
San Bernardino County							
Barstow	GRAV	MDAQMD	06-071-0001-81102-2	30	N/A	N/A	
N/A	GRAV	MDAQMD	06-071-0013-81102-1	16	N/A	N/A	
North Amer Chem Corp	TEOM	MDAQMD	06-071-1234-81102-2	18	42	1600	
Hesperia-Olive St	GRAV	MDAQMD	06-071-4001-81102-1	25	N/A	N/A	

TEOM: Tapered Element Oscillating Microbalance
 GRAV: Gravimetric Analysis
 BAM: Beta Attenuation Monitor
 FRM: Federal Reference Method
 WMAT: White Mountain Apache Tribe
 ADEQ: Arizona Department of Environmental Quality
 PDC: Phelps Dodge Corporation
 MCAQD: Maricopa County Air Quality Department
 FMIR: Fort McDowell Indian Reservation
 SRPMIC: Salt River Pima-Maricopa Indian Community

PCDEQ: Pima County Department of Environmental Quality
 PCAQCD: Pinal County Air Quality Control District
 GRIC: Gila River Indian Community
 CARB: California Air Resources Board
 ICAPCD: Imperial County Air Pollution Control District
 MDAQMD: Mojave Desert Air Quality Management District
 RJ: qualifier flag for high winds (for data exclusion)
 IJ: qualifier flag for high winds (for information only)

3. Causal Relationship

3.1 Discussion

Meteorological and air quality observations indicate that dust carried by thunderstorm outflows was directly responsible for the high PM₁₀ concentrations observed in Yuma on August 12 and 13, 2012. During this two-day period, synoptic scale meteorological conditions and atmospheric moisture content were favorable for the development of thunderstorms across southern Arizona, southern California, and northwestern Mexico. Two separate dust-laden thunderstorm outflow boundaries moved through the Yuma area during this period, one during the late afternoon hours on August 12, and the second during the late afternoon hours of August 13 (**Figure 3-1**). Hourly PM₁₀ concentrations were also elevated during the morning hours of August 13, likely due to deposition and re-entrainment of residual dust generated by the August 12 outflow. The thunderstorms originated over the higher terrain of southern California and far northwestern Mexico, and gusty winds associated with the outflow easily lofted large amounts of dust and PM₁₀ into the lower atmosphere and transported this dust into Yuma. The likely source regions for PM₁₀ during the August 12 and 13, 2012, events were the open desert areas of far northwestern Mexico and Imperial County. The last time Yuma recorded any measureable rainfall before the August 12 and 13, 2012, thunderstorm outflow events was on July 13, 2012, when thunderstorms produced 1.66 inches of rain at the Yuma MCAS. This combination of geography and several weeks of dry weather preceding the event resulted in a large fetch of soils that were particularly vulnerable to particulate suspension. No measureable rain was reported at Yuma or Imperial county monitors during the August 12 and 13, 2012, events.

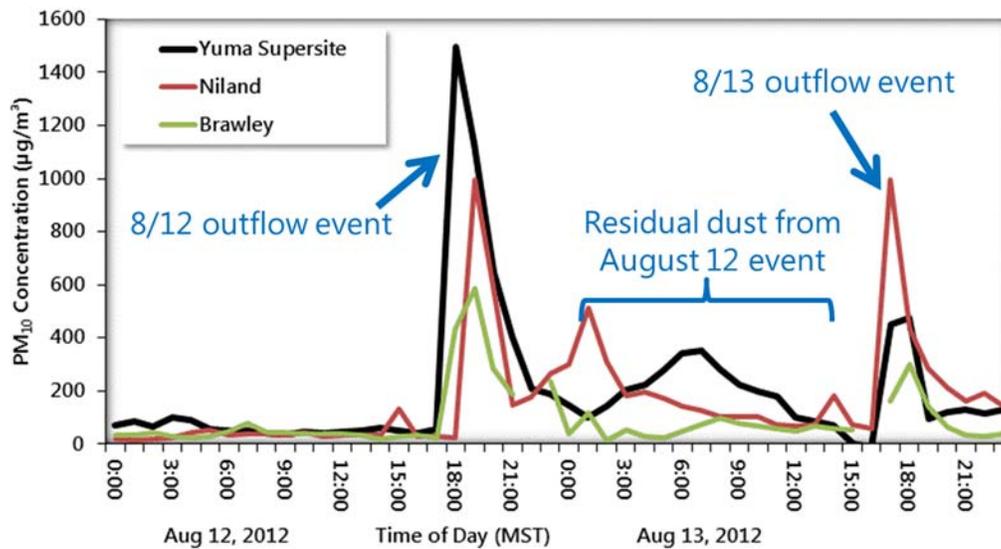


Figure 3-1. Hourly PM₁₀ concentrations at the Yuma County and Imperial County (Niland and Brawley) AQS monitors on August 12 and 13, 2012. PM₁₀ concentrations increased at all monitors in association with gusty winds due to thunderstorm outflows on the afternoons of August 12 and 13, indicating the arrival of windblown dust and the regional nature of these events.

3.1.1 Event 1: August 12, 2012

On the afternoon of August 12, intense thunderstorms developed over the higher terrain of far northwestern Mexico and southern California (**Figures 3-2 and 3-3**). Gusty winds associated with the outflow from these storms lofted dust in northwestern Mexico and Imperial County and carried it into Yuma. The progression and intensity of the thunderstorm outflow and windblown dust through the Yuma area on August 12 is summarized by the radar velocity and wind vector spatial plots shown in **Figures 3-4 and 3-5**. Between 5:00 and 6:00 p.m. (Figure 3-4), the outflow boundary was clearly defined by the radar velocity data southwest of Yuma. Meteorological and air quality conditions in Yuma were characterized by moderate wind speeds, high visibilities, and low PM₁₀ concentrations. The outflow boundary was just reaching the Mexicali, Mexico, area, where blowing dust was reported and visibility fell to 3 miles. Between 6:00 and 7:00 p.m. (Figure 3-5), the outflow boundary moved through Yuma, resulting in widespread gusty winds in excess of 25 mph, high PM₁₀ concentrations, and low visibilities. While wind speeds had begun to diminish by the time the outflow boundary reached the Yuma area, winds in the source region of far northwestern Mexico, nearer the outflow-generating thunderstorms and over 75 miles away from Yuma, were likely much stronger given the strength of the thunderstorms indicated by radar data. PM₁₀ concentrations in Yuma decreased by 9:00 p.m. but remained elevated (hourly values above 100 µg/m³) into the morning hours of August 13. The continued elevated PM₁₀ concentrations were likely due to very light winds during the overnight and morning hours, causing dust originally lofted by the thunderstorm outflow the previous afternoon to remain suspended over southeastern California and southwestern Arizona instead of pushing the dust out of the region. Peak winds measured at Yuma and Imperial county monitors on August 12 are shown in **Table 3-1**.



Figure 3-2. Visible satellite image from about 2:30 p.m. MST on August 12, 2012 (MODIS-AQUA). Bright white areas indicate tall, convective (thunderstorm) clouds. Thunderstorms over northwestern Mexico and southern California generated outflow boundaries that carried dust eastward across Imperial County and into Yuma County.

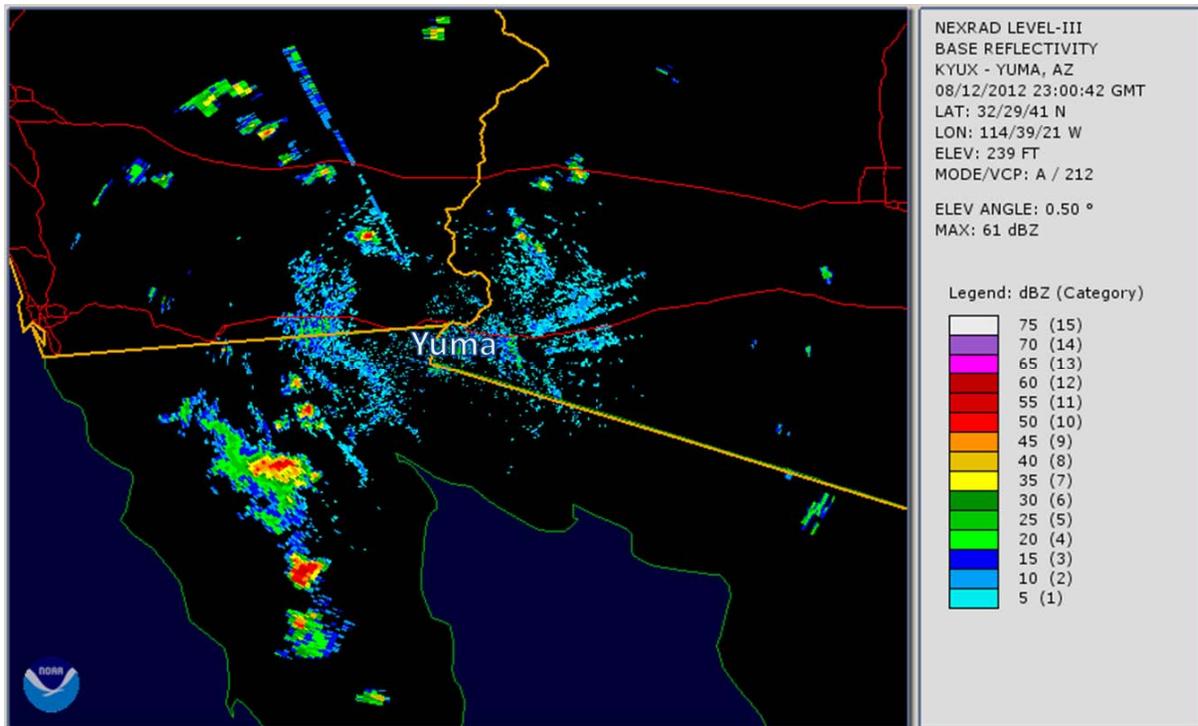


Figure 3-3. Reflectivity data from NWS Doppler radar in Yuma at 4:00 p.m. on August 12, 2012, showing strong thunderstorms over far northwestern Mexico.

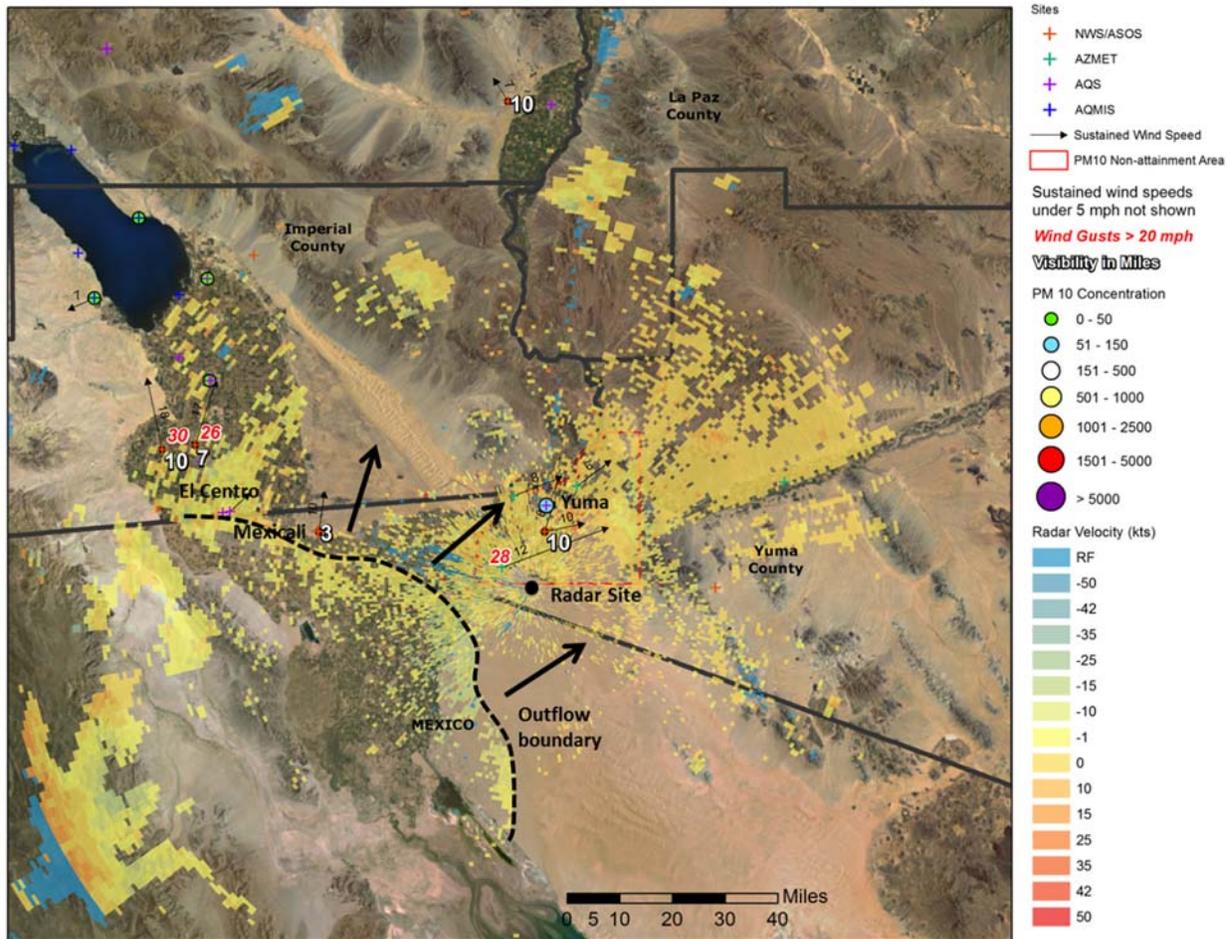


Figure 3-4. 1-hr PM₁₀ concentrations (colored circles), wind speed and direction, maximum wind gusts, and minimum visibility observations at Yuma and Imperial county monitors between 5:00 and 6:00 p.m. on August 12, 2012. Underlying are Doppler radar velocity data at 5:20 p.m., where greens indicate motion toward the radar and oranges/reds indicate motion away from the radar. Radar detected a band of incoming returns southwest of Yuma, indicating the location of the outflow boundary.

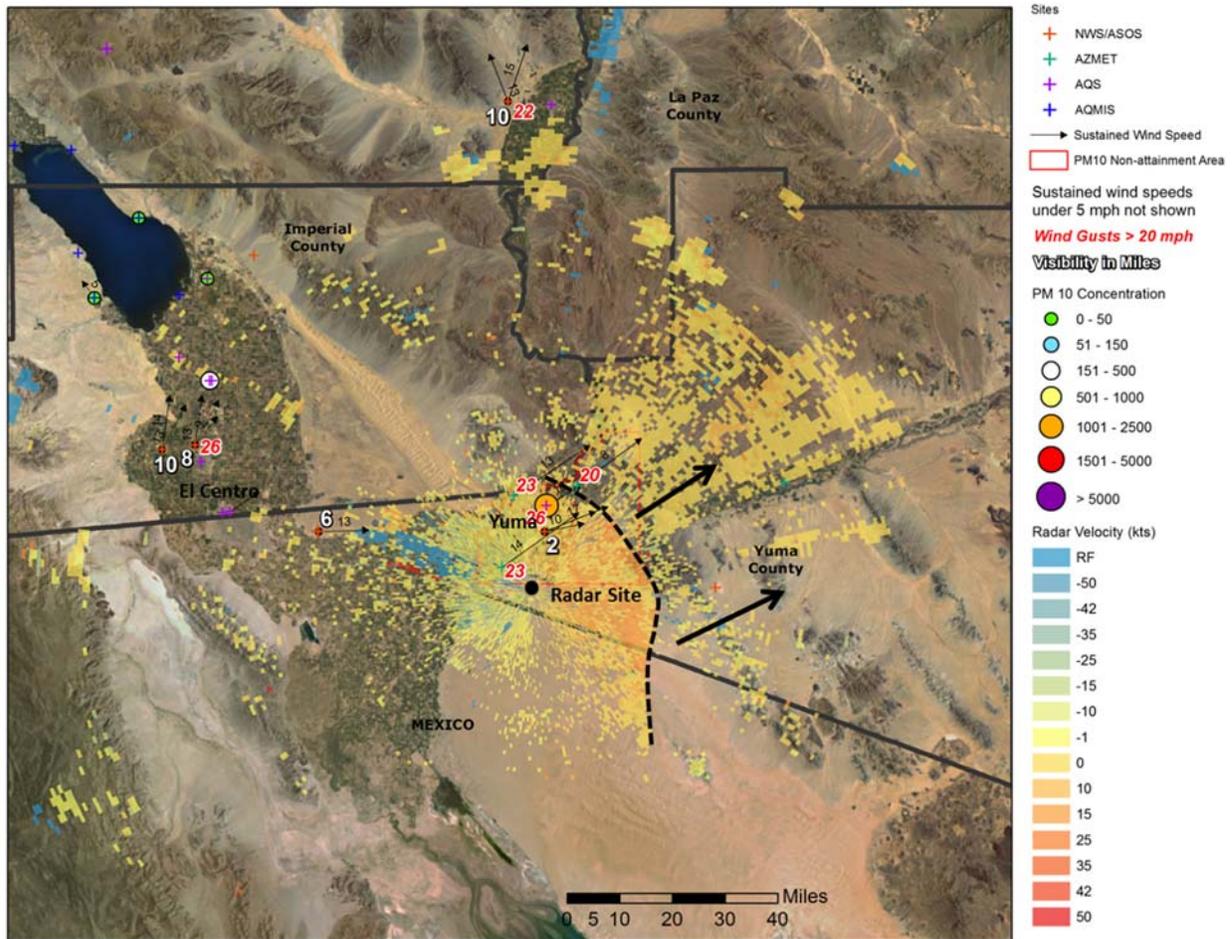


Figure 3-5. 1-hr PM₁₀ concentrations (colored circles), wind speed and direction, maximum wind gusts, and minimum visibility observations at Yuma and Imperial county monitors between 6:00 and 7:00 p.m. on August 12, 2012. Underlying are Doppler radar velocity data at 6:20 p.m., where greens indicate motion toward the radar and oranges/reds indicate motion away from the radar. Radar detected an area of strong outbound velocities over and northeast of Yuma, indicating the location of the departing outflow boundary.

Table 3-1. Observed wind speeds and wind gusts at Yuma and Imperial County monitors on August 12, 2012. The Yuma Supersite monitor reported a PM₁₀ concentration of 1495 µg/m³ at 6:00 p.m. MST on August 12, 2012, coincident with the peak wind speed and wind gust reported at that monitor.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
Niland-English Road	11	277	1500	–	–
Imperial County Airport	17	200	1753	26	1753 1807
El Centro NAF	18	170	1756	30	1756
Yuma Supersite	10	242	1800	23	1800
Yuma North Gila	8	235	1800	20	1800
Yuma South	14	236	1800	29	1700
Yuma Valley	13	238	1800	23	1800
Yuma MCAS	17	250	1820	26	1820
Roll	8	246	2000	18	1900

3.1.2 Event 2: August 13, 2012

Hourly PM₁₀ concentrations at the Yuma Supersite monitor remained above 200 µg/m³ for much of the morning on August 13. These elevated PM₁₀ concentrations were likely due to deposition and re-entrainment of dust initially lofted by the thunderstorm outflow event late on August 12. Hourly PM₁₀ concentrations at the Niland monitor in Imperial County also were elevated for several hours during the morning of August 13. On the afternoon of August 13, thunderstorms redeveloped in far northwestern Mexico and southern California (**Figures 3-6 and 3-7**). As on August 12, these storms were slow moving but generated outflow boundaries with gusty winds that lofted and transported dust into Imperial and Yuma counties. The progression and intensity of the thunderstorm outflow and windblown dust through the Yuma area on August 13 are summarized by the radar velocity and wind vector spatial plots shown in **Figures 3-8 and 3-9**. Between 4:00 and 5:00 p.m. (Figure 3-8), an outflow boundary generated by a thunderstorm on the California/Mexico border was located west of Yuma and moving east. This outflow was already impacting communities in Imperial County, where monitors indicated low visibilities and gusty southerly winds. Conditions in Yuma were characterized by light wind speeds, high visibilities, and low PM₁₀ concentrations. Between 5:00 and 6:00 p.m. (see Figure 3-9), the outflow boundary moved through Yuma, resulting in widespread gusty winds in excess of 25 mph, high PM₁₀ concentrations, and low visibilities. Peak winds measured at Yuma and Imperial County monitors on August 13 are shown in **Table 3-2**.

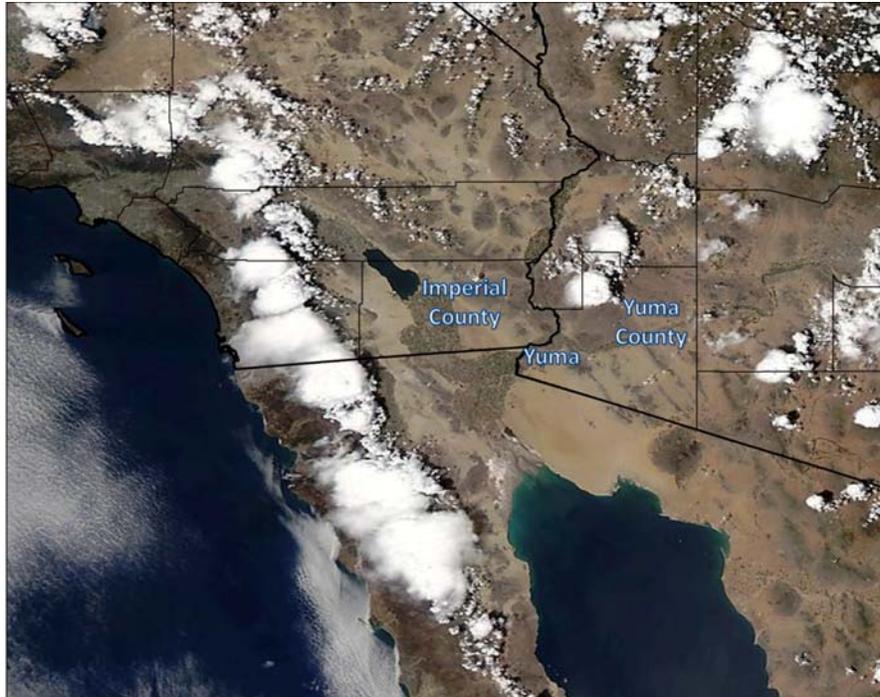


Figure 3-6. Visible satellite image from about 1:30 p.m. MST on August 13, 2012 (MODIS-AQUA). Bright white areas indicate tall, convective (thunderstorm) clouds. Thunderstorms over northwestern Mexico and southern California generated outflow boundaries that carried dust eastward across Imperial County and into Yuma County.

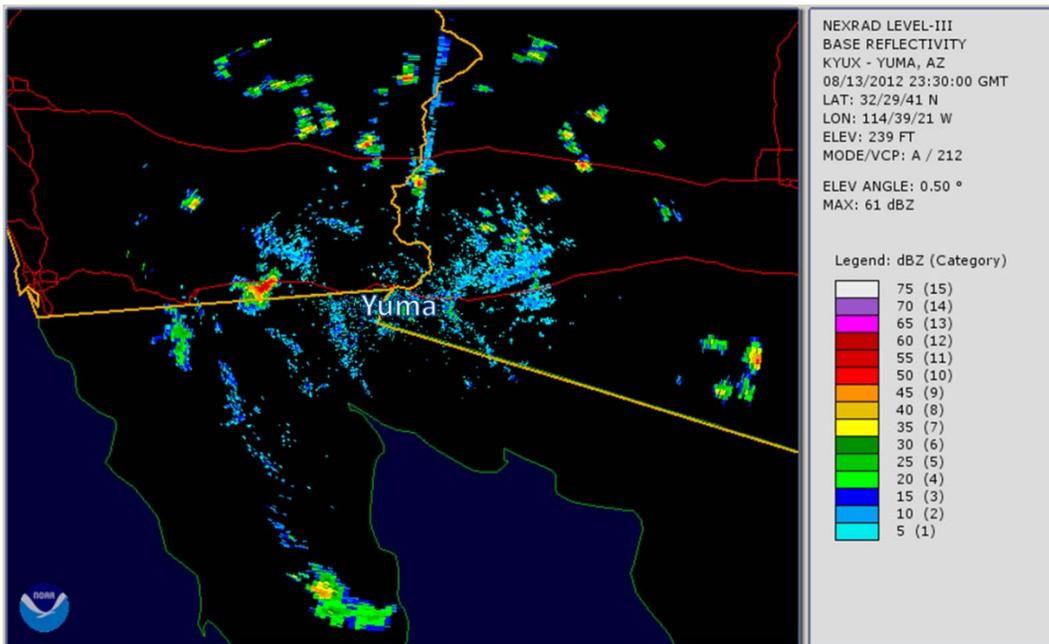


Figure 3-7. Reflectivity data from NWS Doppler radar in Yuma at 4:30 p.m. on August 13, 2012. A strong thunderstorm was located on the California/Mexico border, west of Yuma.

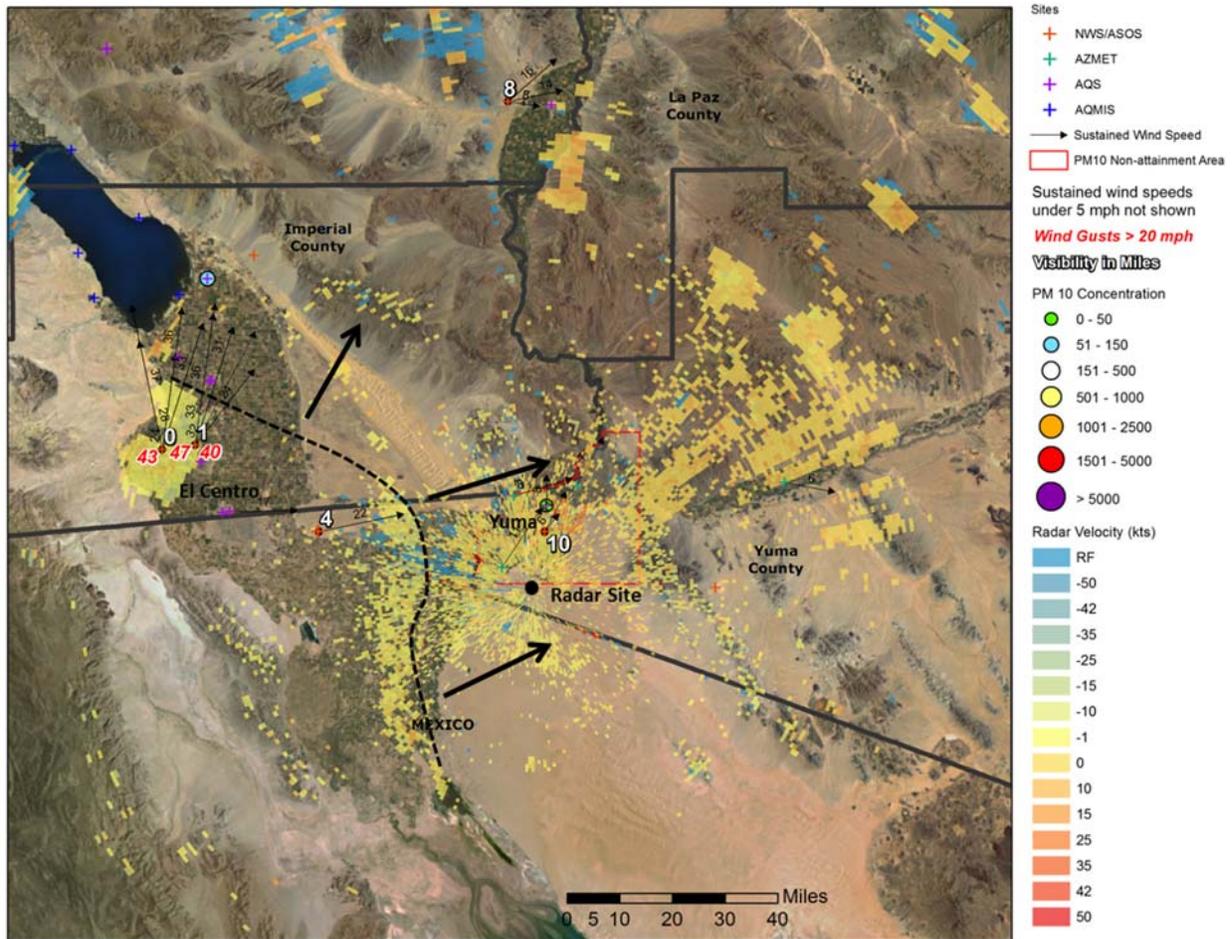


Figure 3-8. 1-hr PM₁₀ concentrations (colored circles), wind speed and direction, maximum wind gusts, and minimum visibility observations at Yuma and Imperial county monitors between 4:00 and 5:00 p.m. on August 13, 2012. Underlying are Doppler radar velocity data at 4:48 p.m., where greens indicate motion toward the radar and oranges/reds indicate motion away from the radar. Radar detected a band of incoming returns west of Yuma, indicating the location of the outflow boundary.

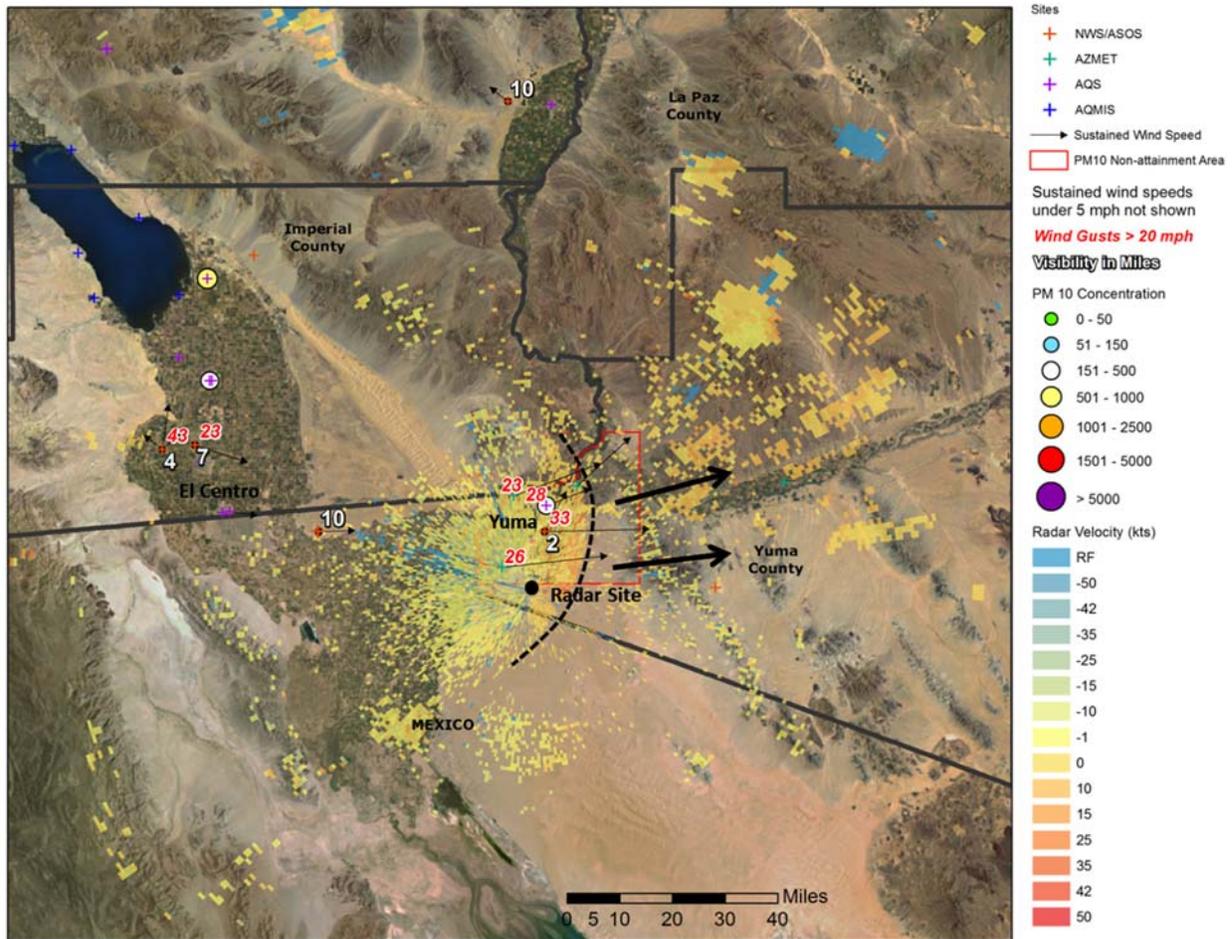


Figure 3-9. 1-hr PM₁₀ concentrations (colored circles), wind speed and direction, maximum wind gusts, and minimum visibility observations at Yuma and Imperial County monitors between 5:00 and 6:00 p.m. on August 13, 2012. Underlying are Doppler radar velocity data at 5:49 p.m., where greens indicate motion toward the radar and oranges/reds indicate motion away from the radar. Radar detected an area of strong outbound velocities east of Yuma, indicating the location of the departing outflow boundary.

Table 3-2. Observed wind speeds and wind gusts at Yuma and Imperial County monitors on August 13, 2012. The Yuma Supersite monitor reported a PM₁₀ concentration of 475 µg/m³ at 6:00 p.m. MST on August 13, 2012, coincident with the peak wind speed and wind gust reported at that monitor.

Monitor	Maximum Wind Speed (mph)	Wind Direction (degrees)	Time (MST)	Maximum Wind Gust (mph)	Time (MST)
Roll	6	269	1500	15	1900
Imperial County Airport	36	190	1633	47	1638
El Centro NAF	37	170	1641	45	1641
Niland-English Road	21	203	1700	–	–
Yuma North Gila	9	229 256	1700 1800	18	1700
Yuma South	18	265	1700	27	1700
Yuma Valley	14	251	1700	23	1700
Yuma MCAS	26	270	1755	33	1755
Yuma Supersite	12	250	1700	28	1700

3.1.3 Time Series of Meteorological and Air Quality Data

Time series of wind and PM₁₀ data from monitors in Yuma and Imperial counties show sharp increases in PM₁₀ concentrations coincident with the onset of gusty winds during the August 12 and August 13 thunderstorm outflow events (**Figures 3-10 through 3-12**). Visibility at the Yuma MCAS and Imperial County Airport also decreased significantly with the arrival of the thunderstorm outflows on both August 12 and August 13 (**Figures 3-13 and 3-14**). The National Weather Service office in Phoenix issued Blowing Dust Advisories for Yuma and Imperial counties during the August 12 event and a Dust Storm Warning for Imperial County during the August 13 event (see Appendix B). NWS Area Forecast Discussions and Short Term Forecasts also referred to the thunderstorms in southeastern California and northwestern Mexico and the associated outflows. In addition, the Yuma MCAS reported blowing dust during both outflow events. It is also important to note that before the individual outflow events in Yuma, winds were generally light (at or less than 5 mph) and PM₁₀ concentrations were lower, illustrating the correlation between the high winds and the dust. Winds in the Yuma area were generally weaker during the August 12 event compared to the August 13 event, likely because the parent thunderstorm that generated the outflow boundary was located further away from Yuma during the August 12 event. However, given that the storms each day were of similar magnitude based on radar data, it is likely that winds nearer the parent thunderstorm on August 12 were stronger than the winds observed in Yuma and were comparable to winds observed during the August 13 event.

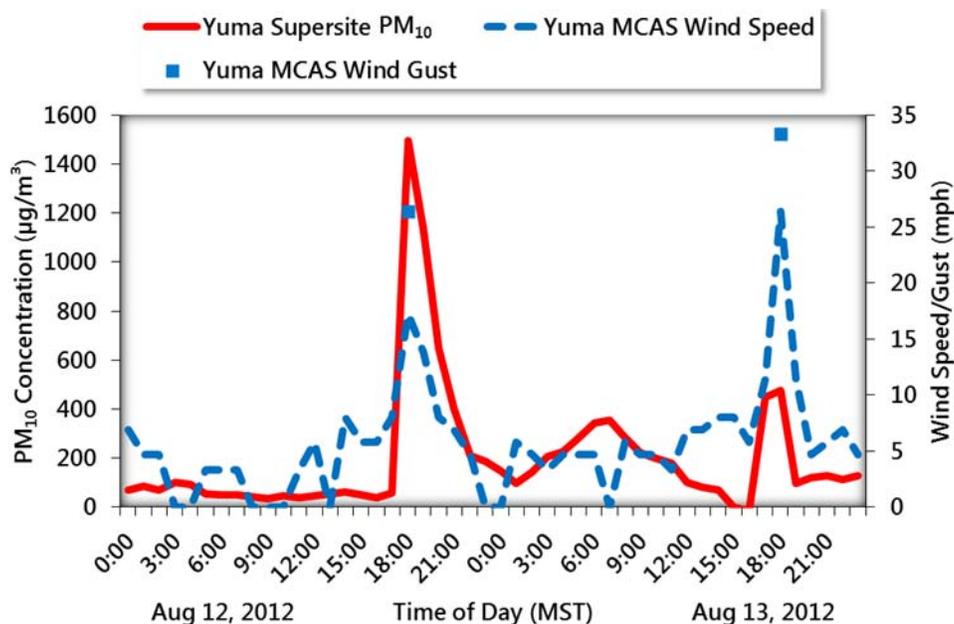


Figure 3-10. Hourly PM₁₀ concentrations at the Yuma Supersite monitor and wind speeds at the Yuma MCAS monitor on August 12 and 13, 2012. PM₁₀ concentrations and wind speeds increased sharply during the late afternoon hours of both August 12 and 13, indicating the arrival of windblown dust.

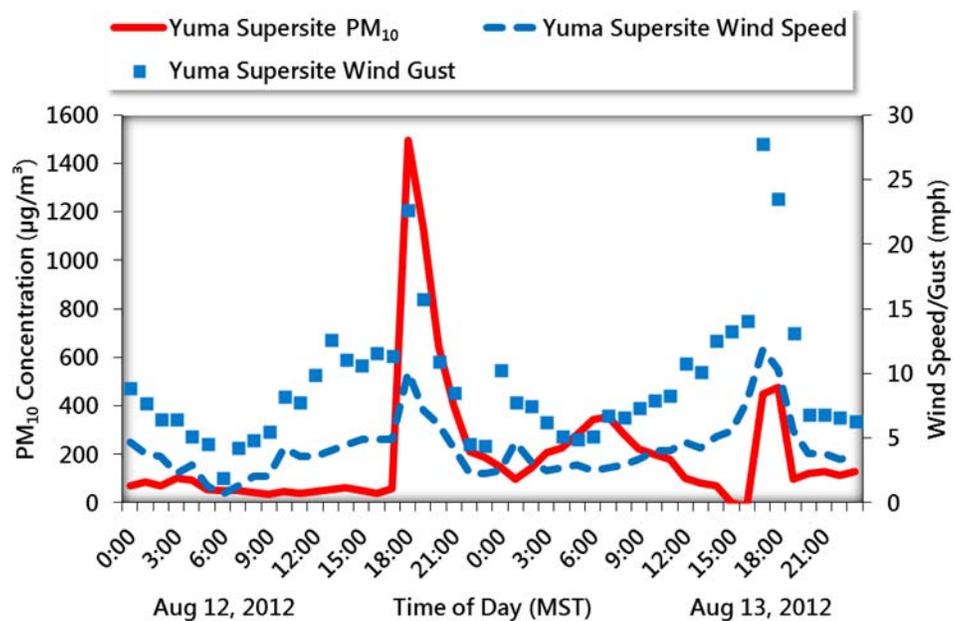


Figure 3-11. Hourly PM₁₀ concentrations and wind speeds at the Yuma Supersite monitor on August 12 and 13, 2012. PM₁₀ concentrations and wind speeds increased sharply during the late afternoon hours of both August 12 and 13, indicating the arrival of windblown dust.

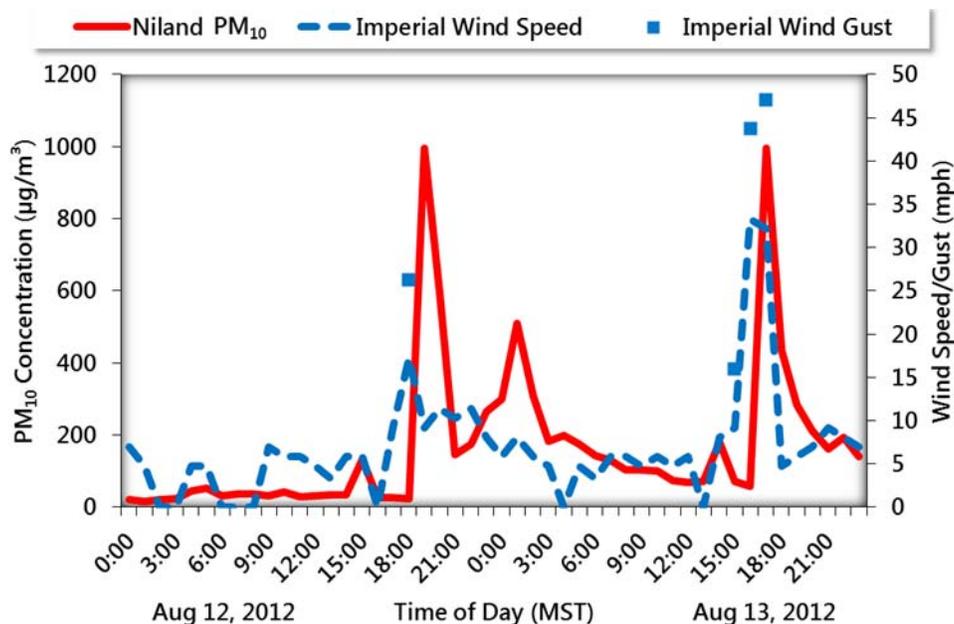


Figure 3-12. Hourly PM₁₀ concentrations at the Niland AQS monitor and wind speeds at the Imperial County airport on August 12 and 13, 2012. PM₁₀ concentrations and wind speeds increased sharply during the afternoons of August 12 and 13, 2012, indicating the arrival of windblown dust.

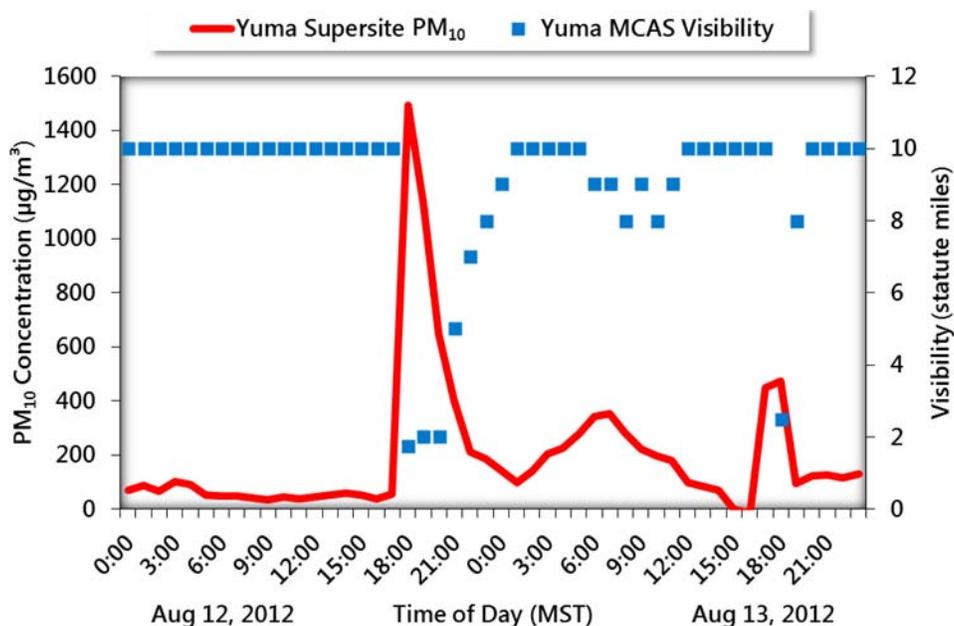


Figure 3-13. Hourly PM₁₀ concentrations at the Yuma Supersite monitor and visibility at Yuma MCAS on August 12 and 13, 2012. Visibility was greatly reduced and PM₁₀ concentrations were high during periods of blowing dust generated by thunderstorm outflows.

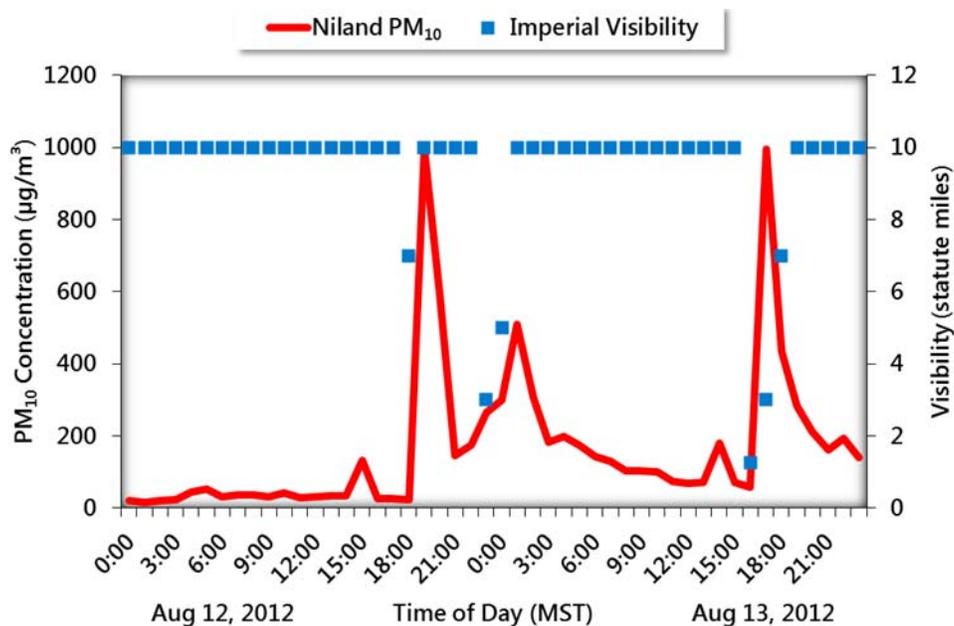


Figure 3-14. Hourly PM₁₀ concentrations at the Niland AQS monitor and visibility at the Imperial County airport on August 12 and 13, 2012. Visibility was greatly reduced and PM₁₀ concentrations were high during periods of blowing dust generated by thunderstorm outflows.

3.2 Summary

The information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM₁₀ exceedances measured at the Yuma Supersite monitor on August 12 and 13, 2012. The radar and wind data shown in this section provide a spatial and temporal representation of the individual thunderstorm outflows and associated dust as they moved through Yuma and Imperial counties. In addition, the time-series plots of air quality and meteorological data found in this section and in Appendix A show that the sharp increase in PM₁₀ concentrations coincided with the strong wind speeds and wind gusts, and that the strong winds were experienced over a large area. Dust was lofted into the lower atmosphere by widespread wind gusts in excess of 25 mph, overwhelming all reasonably available control measures. This dust likely originated in the vast, open desert areas of northwestern Mexico and Imperial County, and was transported into Yuma. This analysis provides solid weight-of-evidence showing why the Yuma Supersite monitor recorded exceedances on August 12 and 13, 2012.

4. Historical Norm

4.1 Analysis

PM₁₀ concentrations measured at the Yuma Supersite monitor on August 12 and 13, 2012, were unusual and in excess of normal historical fluctuations. The PM₁₀ concentrations measured on August 12 and 13, 2012, were some of the highest hourly and 24-hr averages measured over the last five years, with hourly concentrations exceeding 450 µg/m³. To establish the severity of this event, PM₁₀ concentrations measured on August 12 and 13, 2012, were compared to a historical 2008-2012 5-year annual data set. Time-series plots of the 24-hr average PM₁₀ concentrations for the period January 1, 2008, through December 31, 2012, provide a historical perspective of PM₁₀ concentrations (**Figure 4-1**). The 24-hr average PM₁₀ concentrations on August 12 and 13, 2012, are the 11th and 14th highest daily average in the last five years, respectively.

Additionally, time-series plots of the daily maximum 1-hr PM₁₀ concentrations were created to provide a deeper understanding of the frequency with which short-term particulate concentrations affect the Yuma area (**Figure 4-2**). The daily maximum 1-hr PM₁₀ concentrations on August 12 and 13, 2012, are the 11th and 46th highest concentrations observed in the last 5 years.

Historical daily cumulative distributions of the 24-hr average and daily maximum 1-hr PM₁₀ concentrations were created for the Yuma County monitor for the 2008–2012 period to provide additional evidence in establishing the severity of this event. **Figures 4-3 and 4-4** show histograms of 24-hr average PM₁₀ concentrations and daily maximum 1-hr PM₁₀ concentrations at the Yuma County monitor and the corresponding 95th percentile. The 24-hr average PM₁₀ concentrations and daily maximum 1-hr PM₁₀ concentrations on August 12 and 13, 2012, were above the 95th percentile at the Yuma Supersite monitor. Concentrations in excess of the 95th percentile are considered unusual.²

4.2 Summary

Given the recorded values and using methodology similar to the one accepted by EPA, it is clear that the PM₁₀ levels on August 12 and 13, 2012, were outside of normal historical fluctuations. This analysis provides evidence that the event affected air quality on a historic scale.

² Excluding days on which concentrations caused by exceptional events exceed the 95th percentile threshold employs a general test of statistical significance and has the effect of ensuring that such concentrations would clearly fall beyond the range of normal expectations for air quality during a particular time of year. Source: "The treatment of Data Influenced by Exceptional Events," 71 FR 12598.

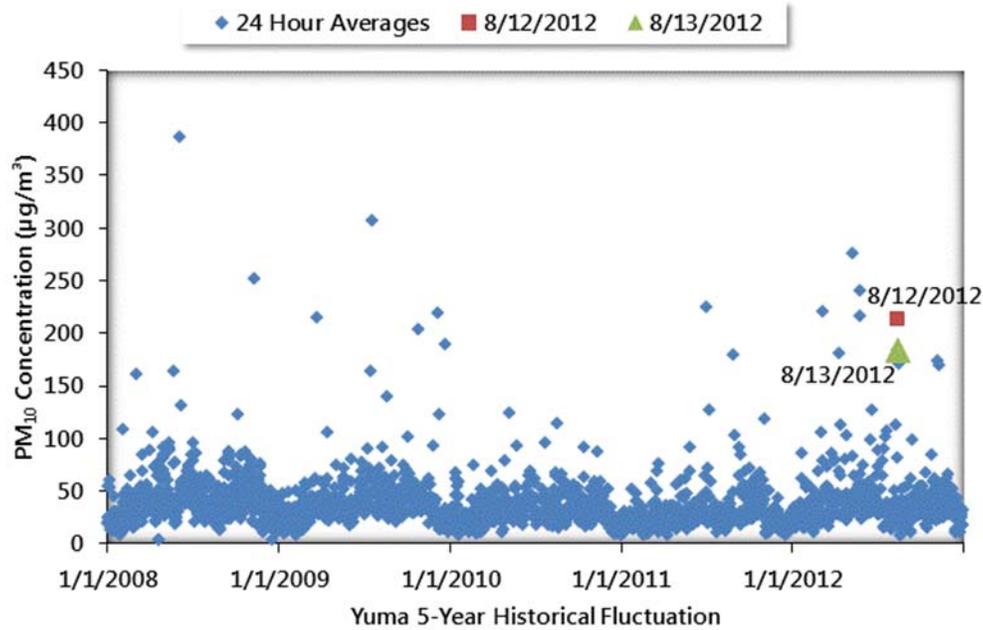


Figure 4-1. 24-hr average PM₁₀ concentrations at the Yuma Supersite monitor (2008-2012). The 24-hr average PM₁₀ concentrations on August 12 and 13, 2012, are highlighted by the red square and green triangle, respectively.

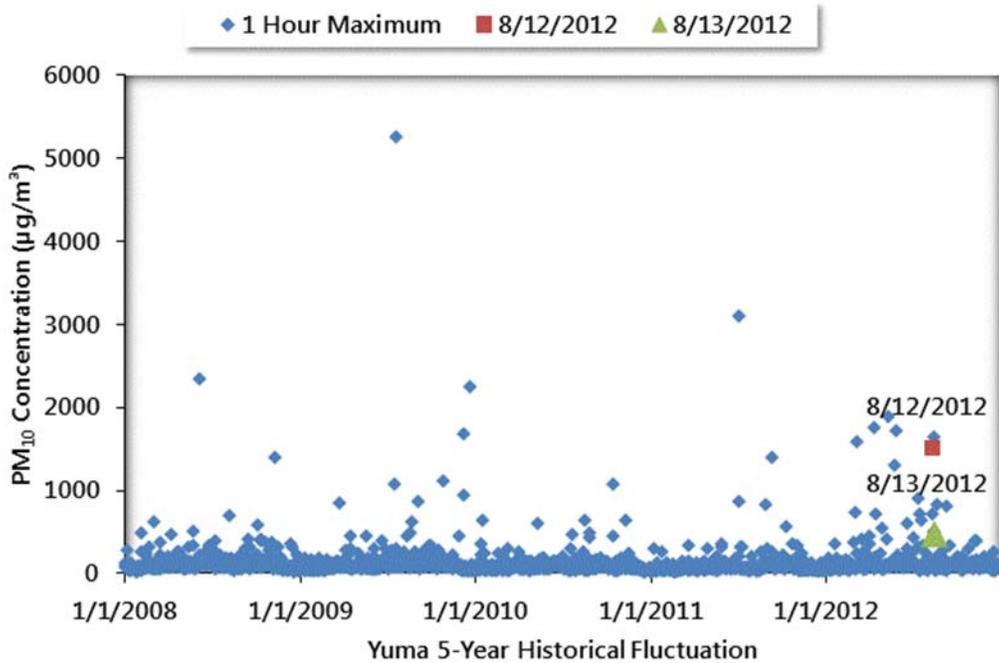


Figure 4-2. Daily maximum 1-hr PM₁₀ concentrations at the Yuma Supersite monitor (2008-2012). The daily maximum 1-hr PM₁₀ concentrations on August 12 and 13, 2012, are highlighted by the red square and green triangle, respectively.

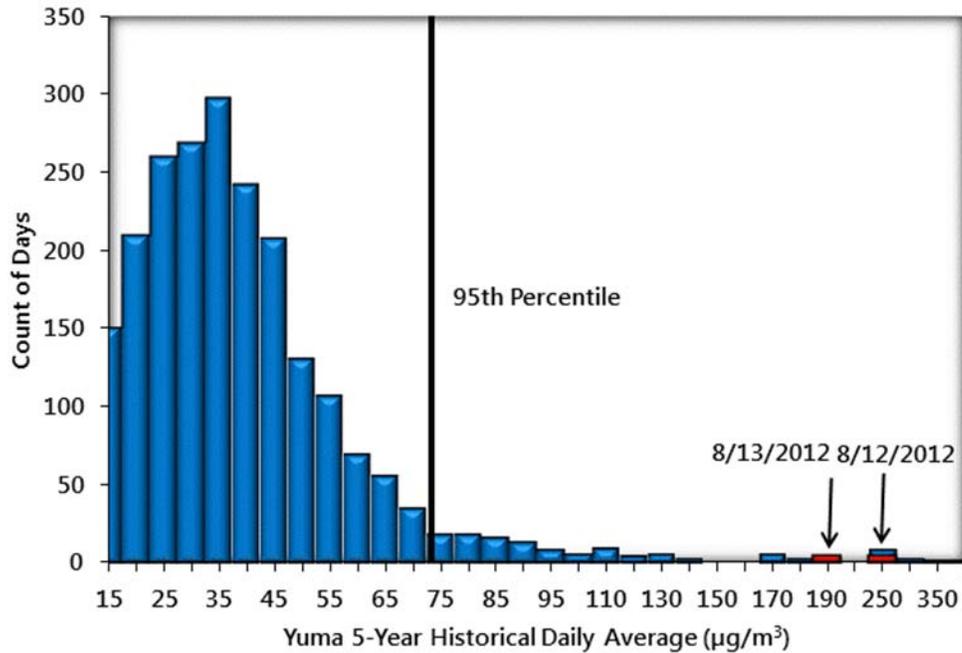


Figure 4-3. 24-hr average PM₁₀ concentrations at the Yuma Supersite monitor for 2008-2012. The 24-hr average PM₁₀ concentrations on August 12 and 13, 2012, were in excess of the 95th percentile.

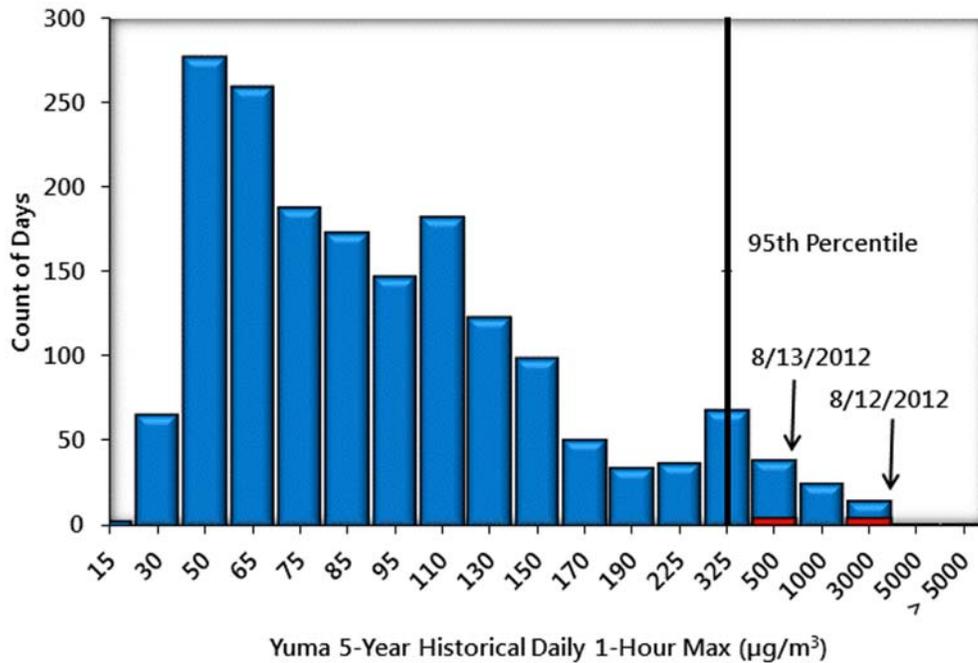


Figure 4-4. Daily maximum 1-hr PM₁₀ concentrations at the Yuma Supersite monitor for 2008-2012. The daily maximum 1-hr PM₁₀ concentrations on August 12 and 13, 2012, were in excess of the 95th percentile.

5. Not Reasonably Controllable or Preventable

5.1 Background

Yuma was designated as a moderate PM₁₀ nonattainment area by operation of the 1990 Clean Air Act. The nonattainment area is defined in 40 CFR 481.303. ADEQ completed a state implementation plan (SIP) for the area in 1991; however, the plan was found to be incomplete and in 1994 ADEQ updated the plan, identifying additional reasonably available control measures (RACM). In 2001, due to several years of “clean data” and the existence of permanent and enforceable measures, ADEQ began the development of a maintenance plan and request for redesignation of the area to attainment. The maintenance plan was submitted to EPA in August 2006.

5.1.1 Control Measures

Details of the control measures implemented from 1994-2001 are in Appendix G of the 2006 Yuma PM₁₀ Maintenance Plan. The control measures are listed in **Table 5-1**.

Table 5-1. Control measures implemented in the Yuma PM₁₀ Nonattainment Area, 1994-2001.

Implementing Agency	Reasonably Available Control Measure
City of Yuma	Paving unpaved roads
	Closing unpaved roads
	Chemically stabilizing unpaved roads
	Paving or stabilizing parking lots
	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Dust control plans for land clearing, construction projects
	Stabilizing soil; controlling dust on open lands
	Amending building codes
Town of Somerton	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Dust control plans for land clearing, construction projects
	Stabilizing soil
Yuma County	Paving unpaved roads
	Stabilizing unpaved roads
	Re-routing traffic or rapid cleanup of temporary sources of dust and spills
	Covering haul trucks
	Open Burn Permit Program (rural metro)
Irrigation Districts	Reducing traffic on unpaved roads
AZ Dept. of Transportation	Requiring contractors to adhere to local dust control plans

RACM for 2000 through 2004 can be found in Table 6.3 of the 2006 Yuma PM₁₀ Maintenance Plan and are reproduced in part in **Table 5-2**. Chapter 7 of the Maintenance Plan also contains a list of contingency measures that could be implemented promptly should any violation of the NAAQS for PM₁₀ occur.

Table 5-2. Control measures implemented in the Yuma area, 2000-2004.

Implementing Agency	Reasonably Available Control Measure
City of Yuma	Pave unpaved roads
	Pave unpaved alleys
	Pave unpaved vacant land
	Chemically stabilize unpaved roads
	Water shoulders
	Street sweep paved roads
	Install curbs and sidewalks
	Landscape median
	Magnesium chloride on alleys
	Magnesium chloride on city property
Town of Somerton	Water unpaved roads
	Water unpaved shoulders
	Pave unpaved roads
	Weekly cleanup of paved roads, mud, trackout, spills
	Pave unpaved lots
	Landscape shoulders
	Install curbs
	Pave/stabilize unpaved roads
	Chip/seal
	Magnesium chloride on unpaved roads
	Street sweeping
Yuma County	Pave unpaved roads
	Developers add new paved roads
	Chip/seal unpaved roads
	Magnesium chloride unpaved roads
	Street sweeping

Table 5-2. Control measures implemented in the Yuma area, 2000-2004.

Implementing Agency	Reasonably Available Control Measure
Immigration & Naturalization	Water drag roads
	Pipelined
	Maintain 350 “No Trespassing” signs and 50 barricades
	Patrol and water unpaved canal roads
	3 mi posted/barricaded
	Paved 2.5 mi
	2.5 mi fenced off
	Abandoned 3/8 mi
	Lined 8 mi of canal
N. Gila Irrigation District	20 miles posted
Unit B Irrigation District	3 mi posted/barricaded
Bureau of Reclamation	Water 960 miles of canal banks
Marine Corps Air Station	Remove 26 gas vehicles
	Remove 25 gas scooters
	Pave 240,329-ft roadway
	Pave 102,112-ft parking
	Sweeping 717,221-yd runway
	Sweeping 388,952-yd taxiway
	Sweeping 401,090-yd aprons and 121,380-yd other
	Stabilize desert

In 2010, the Yuma Metropolitan Planning Organization (YMPO) updated the Transportation Improvement Plan (TIP) as required to comply with the requirements for transportation conformity under Section 176(c)(2) of the Clean Air Act. The update required a review of control measures included in the 2006 Yuma PM₁₀ Maintenance Plan to assure that emissions were within the limits found in both plans for the current review years through the 2016 projected maintenance period. Yuma’s plans related to transportation improvements can be found under “Plans and Reports” at ympo.org.

5.1.2 Additional Measures

On August 18, 2002, Yuma recorded a 24-hr average PM₁₀ concentration of 170 µg/m³, which is in exceedance of the NAAQS. A Natural Events Action Plan (NEAP) was created to address and potentially implement any measures that could prevent future violations of the NAAQS. The option to develop a NEAP is no longer available; however, Yuma reviewed existing measures and developed additional measures that were later incorporated into the 2006 PM₁₀ Maintenance Plan. These included (1) a public notification and education program, still in place today and augmented recently by a pilot flag program for public schools and facilities based on the Yuma Dust Control Action Forecast (Appendices D, E, and F of the 2006

Yuma PM₁₀ Maintenance Plan); (2) an analysis of best available control measures (BACM) normally reserved for serious nonattainment areas; and (3) a review of existing control measures for construction sources, street sweepers, paved roads, covered trucks, and off-highway vehicles, stationary source opacity limits, other stationary source control measures, and agricultural best management practices (Appendix H of the 2006 Yuma PM₁₀ Maintenance Plan). In 2002, ADEQ met with Yuma stakeholders and began work on the development of a Yuma Agricultural Best Management Practices (AgBMP) rule. The rule became effective July 18, 2005, as R18-2-613 of the Arizona Administrative Code, and was submitted to EPA on August 16, 2006.

5.1.3 Review of Source-Permitted Inspections and Public Complaints

ADEQ's Arizona Unified Repository for Information Tracking of the Environment (AZURITE) database was queried to compile a list of inspections for the permitted sources in the Yuma area around the time of the August 12 and 13, 2012, PM₁₀ exceedances. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicated no evidence of unusual anthropogenic-based PM₁₀ emissions during the time period of August 9 through August 18, 2012.

5.2 Forecasts and Warnings

Dust forecasts were released prior to the event by both ADEQ and the NWS office in Phoenix (Appendix B). The ADEQ Yuma and Vicinity Dust Control Action Forecast issued on Sunday, August 12, indicated that "short periods of high PM₁₀ concentrations caused by outflow from thunderstorms are possible."

The NWS issued a Blowing Dust Advisory for Yuma and Imperial counties for the thunderstorm outflow event that occurred during the late afternoon of August 12, stating that wind gusts of up to 35 mph and visibilities below one mile were possible. The timing of the Blowing Dust Advisory coincided with the peak 1-hr PM₁₀ concentration of 1,495 µg/m³ recorded at the Yuma Supersite monitor. In addition, the NWS received a report from the Yuma area of several power poles down due to strong winds.

The NWS issued a Significant Weather Advisory, Blowing Dust Advisory, and Dust Storm Warning, and a Severe Thunderstorm Warning for south-central Imperial County for the thunderstorm outflow event that occurred during the late afternoon of August 13, stating that wind gusts of up to 50 mph and blowing dust and sand were possible. In addition, the NWS received several storm reports from Imperial County of 50 mph winds, visibilities near zero, and tree damage. These winds lofted large amounts of dust into the lower atmosphere, and this dust was carried into the Yuma area as the outflow moved east.

5.3 Wind Observations

Monitors in Yuma County recorded wind gusts of over 25 mph in association with the August 12 and 13 thunderstorm outflow events. Monitors in Imperial County recorded wind gusts of over 25 mph during the August 12 event and over 45 mph during the August 13 event.

During both thunderstorm outflow events, dust and PM₁₀ were transported from Imperial County and far northwestern Mexico into Yuma County. Wind speeds of over 25 mph are normally sufficient to overcome most PM₁₀ control measures.

5.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that outflow winds from thunderstorms caused uncontrollable PM₁₀ emissions. The RACM outlined in the Yuma PM₁₀ Maintenance Plan were in place at the time of the event. These control measures are required for areas designated as moderate non-attainment for PM₁₀, such as Yuma County. Thus, the RACM in place at the time of the event were reasonable. In addition, surface wind measurements in the Yuma area during the event were high enough (at or above 25 mph) that most reasonable PM₁₀ control measures would have been overwhelmed.

6. But-For Analysis

6.1 Discussion

Section 50.14(c)(3)(iv)(D) in 40 CFR Part 50 requires that an exceptional event demonstration satisfies that “[t]here would have been no exceedance or violation but for the event.” The prior sections of this submittal have provided detailed information that in regard to the PM₁₀ exceedances at the Yuma Supersite monitor on August 12 and 13, 2012,

- the exceedance was not reasonably controllable or preventable, and
- there was a clear causal relationship between PM₁₀ transported from thunderstorm outflow originating in desert areas outside the Yuma PM₁₀ nonattainment area and the measured PM₁₀ exceedances in Yuma.

The weight of evidence in these sections demonstrates that, but for the existence of dust emissions generated by thunderstorm outflow and the associated transport of PM₁₀, there would have been no exceedance of the NAAQS for 24-hr average PM₁₀.

As shown in Section 3, radar velocity data and time-series plots of PM₁₀ and wind speeds establish a clear causal relationship between the arrival of dust-laden thunderstorm outflow and elevated PM₁₀ concentrations at the Yuma Supersite monitor. Multiple independent measurements of wind speed, wind direction, and visibility all point to the presence of thunderstorm outflow as the mechanism for transport of PM₁₀ into the Yuma nonattainment area. High PM₁₀ concentrations and gusty winds were also reported in southeastern California, illustrating the widespread, regional nature of this event. In addition, PM₁₀ concentrations were well below the NAAQS on days immediately before and after the windblown dust event. The source regions for the thunderstorm outflow and PM₁₀ are clearly identified as desert areas of Imperial County, outside the Yuma PM₁₀ nonattainment area. The weight of evidence presented in this submittal provides no alternative that could tie the exceedances of August 12 and 13, 2012, to any causal source except PM₁₀ transported by thunderstorm outflow, confirming that there would have been no exceedance but for the presence of these uncontrollable natural events.

As detailed in Section 5, all reasonable control measures were in place and/or implemented on a continual basis. Air quality-related inspection and compliance data revealed no violations or complaints within several days before and after the time of the event. Local regulatory agencies, industry, and the general public were alerted to the possibility of dust storms due to thunderstorm activity via daily forecasts and media reports.

6.2 Summary

The weight of evidence presented in this submittal provides no alternative that could tie the exceedances of August 12 and 13, 2012, to any causal source except PM₁₀ transported by thunderstorm outflow, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.

7. Conclusions

The PM₁₀ exceedances that occurred on August 12 and 13, 2012, satisfy the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data, evidence must be provided for the following elements:

1. The event satisfies the criteria set forth in 40 CFR 50.1 (j) that
 - a. the event affected air quality,
 - b. the event was not reasonably controllable or preventable, and
 - c. the event was caused by human activity unlikely to recur in a particular location or was a natural event;
2. There is a clear causal relationship between the measurement(s) under consideration and the event;
3. The event is associated with a measured concentration(s) in excess of normal historical fluctuations; and
4. There would have been no exceedance or violation but for the event.

7.1 Affects Air Quality

As stated in the preamble to the Exceptional Events Rule, the event in question is considered to have affected air quality if it can be shown that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in Sections 2, 3, 4, and 5, we can reasonably conclude that the event in question affected air quality.

7.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 requires that an event must be “not reasonably controllable or preventable” in order to be defined as an exceptional event. This requirement is met by demonstrating that despite reasonable control measures in place within Yuma County, high winds overwhelmed all reasonably available controls. The PM₁₀ exceedance discussed in this report was caused by naturally occurring thunderstorm outflow that transported dust into Yuma County from areas largely outside the Yuma PM₁₀ nonattainment area. These facts provide strong evidence that the PM₁₀ exceedances on August 12 and 13, 2012, were not reasonably controllable or preventable.

7.3 Natural Event

As discussed above, the PM₁₀ exceedances in Yuma on August 12 and 13, 2012, were shown to be caused by transport of PM₁₀ into Yuma from thunderstorm outflow. The event therefore qualifies as a natural event.

7.4 Clear Causal Relationship

The following points demonstrate that the high PM₁₀ concentrations were caused by windblown dust:

- Time-series graphs of PM₁₀ concentrations show that the timing of high PM₁₀ at the Yuma Supersite was consistent with gusty winds and low visibilities at Yuma-area meteorological stations (Section 3).
- High PM₁₀ concentrations and gusty winds were reported in Yuma County, Arizona, and Imperial County, California, illustrating the widespread, regional, and uncontrollable nature of this event (Section 3).
- PM₁₀ concentrations were well below the NAAQS on days immediately before and after the windblown dust event (Section 3).
- Dry conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by high winds (Section 3).

7.5 Historical Norm

The 24-hr average and daily 1-hr maximum PM₁₀ values measured at the Yuma Supersite monitor on August 12 and 13, 2012, were historically unusual compared to a multi-year data set (Section 4).

7.6 But For

On the basis of the weight of evidence described above and in Section 6, the exceedances of the federal 24-hr PM₁₀ standard on August 12 and 13, 2012, at the Yuma Supersite monitor would not have occurred but for the thunderstorm-driven high winds and transport of dust from areas largely outside the Yuma PM₁₀ nonattainment area.

Appendix A: Air Quality and Meteorological Data for Yuma County

This section contains time-series graphs of air quality and meteorological data for Yuma and other regional monitors on August 12 and 13, 2012. The data show a regionwide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM₁₀ concentrations in Yuma.

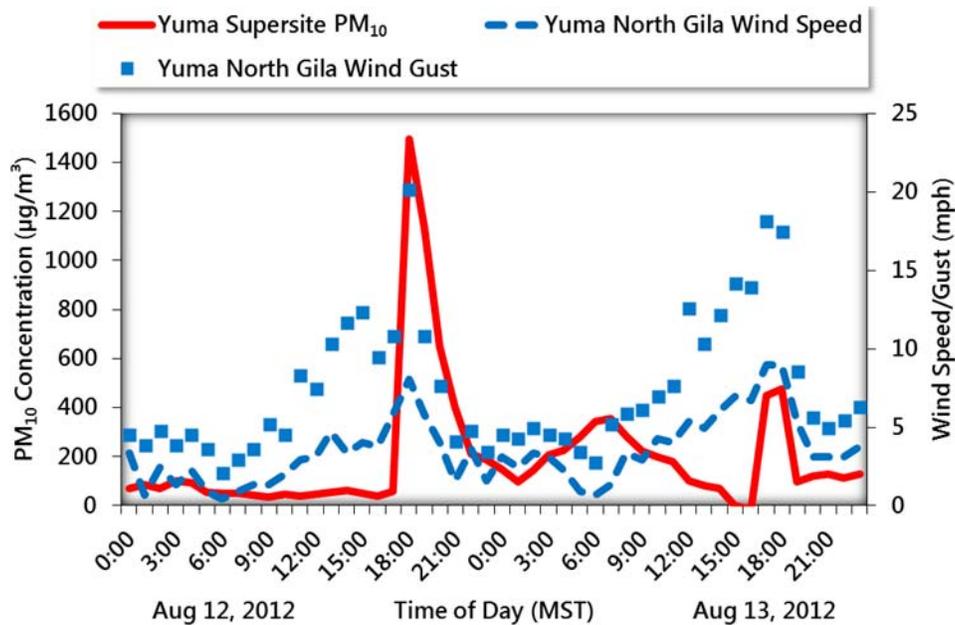


Figure A-1. Hourly PM₁₀ concentrations at the Yuma Supersite monitor and wind speeds at the Yuma North Gila monitor on August 12 and 13, 2012.

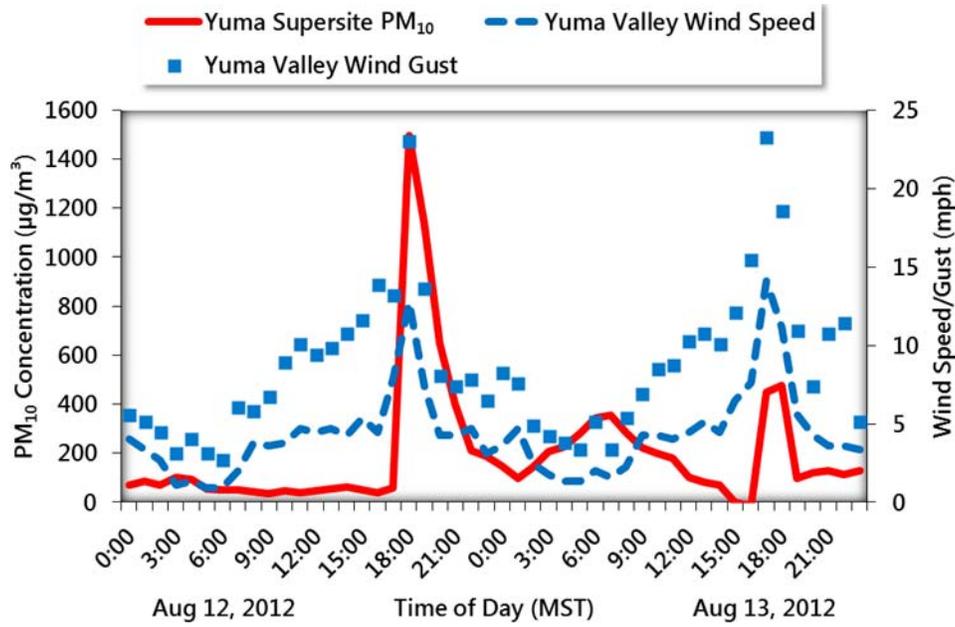


Figure A-2. Hourly PM₁₀ concentrations at the Yuma Supersite monitor and wind speeds at the Yuma Valley monitor on August 12 and 13, 2012.

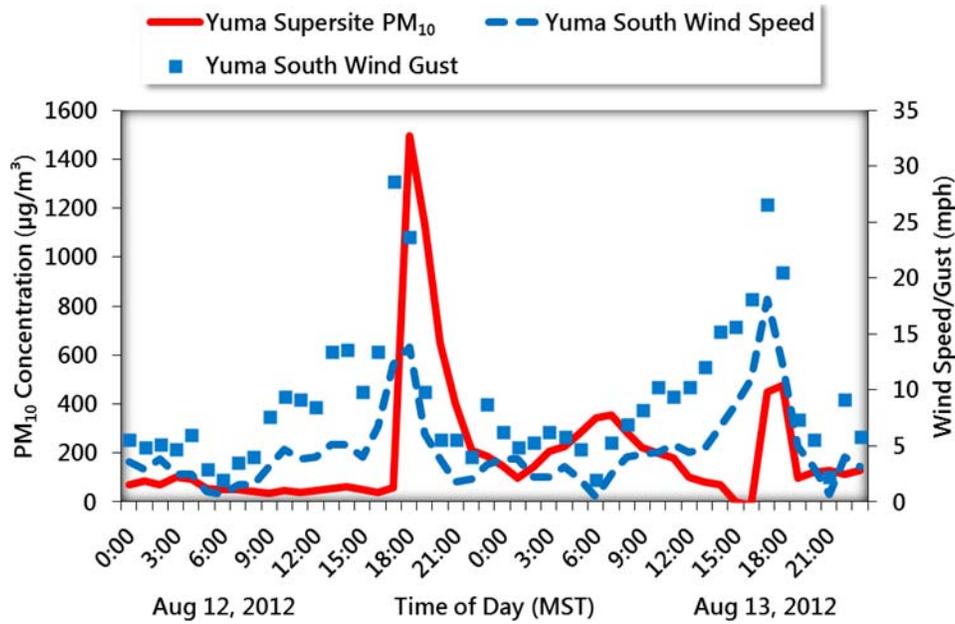


Figure A-3. Hourly PM₁₀ concentrations at the Yuma Supersite monitor and wind speeds at the Yuma South monitor on August 12 and 13, 2012.

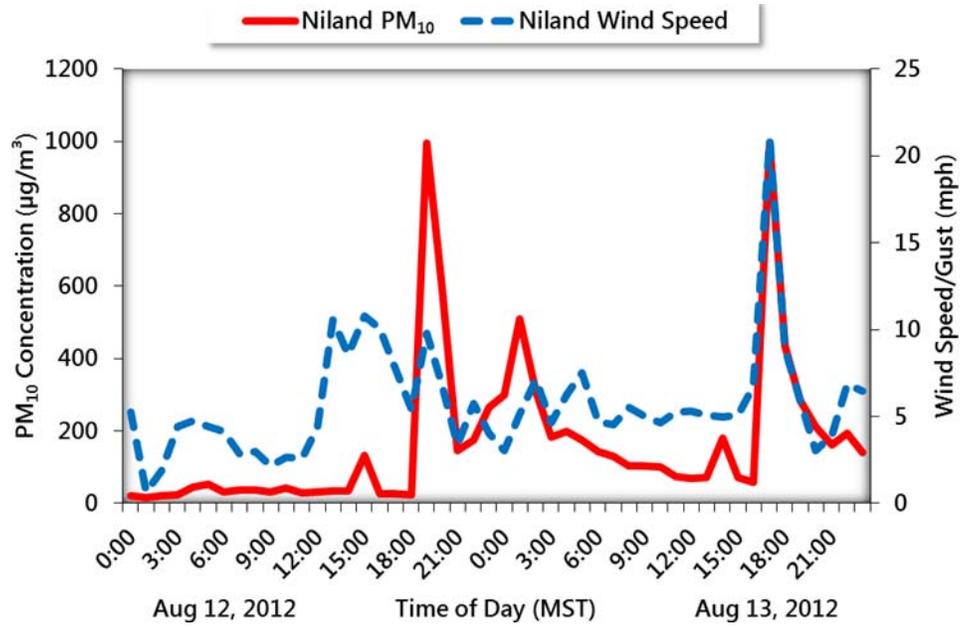


Figure A-4. Hourly PM₁₀ concentrations and wind speeds at the Niland monitor in Imperial County, California, on August 12 and 13, 2012.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
YUMA MCAS (03145), YUMA, AZ (08/12/2012)

Elevation: 213 ft. above sea level

Latitude: 32.65

Longitude: -114.616

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
12	0055	5	FEW080 SCT129	10.00		97	36.1	73	22.5	60	15.6	29	5	210		29.45						29.68
12	0155	5	FEW080 SCT120	10.00		97	36.1	73	22.5	60	15.6	29	5	280		29.45	8	001	29.66	AA		29.68
12	0255	5	CLR	10.00		94	34.4	72	22.3	61	16.1	33	0	000		29.45			29.67	AA		29.68
12	0355	5	CLR	10.00		94	34.4	72	22.3	61	16.1	33	0	000		29.45			29.66	AA		29.68
12	0455	5	CLR	10.00		91	32.8	72	22.1	62	16.7	38	3	180		29.46	3	003	29.67	AA		29.69
12	0555	5	FEW080 SCT120	10.00		92	33.3	73	22.6	63	17.2	38	3	170		29.46			29.68	AA		29.69
12	0655	5	FEW100	10.00		91	32.8	72	22.1	62	16.7	38	3	210		29.47			29.69	AA		29.70
12	0755	5	FEW100	10.00		95	35.0	73	22.5	61	16.1	32	0	000		29.49	3	012	29.71	AA		29.72
12	0855	5	FEW100	10.00		98	36.7	73	22.6	60	15.6	28	0	000		29.50			29.72	AA		29.73
12	0955	5	FEW100	10.00		101	38.3	74	23.1	60	15.6	26	0	000		29.51			29.72	AA		29.74
12	1055	5	FEW080	10.00		103	39.4	75	23.6	61	16.1	25	3	220		29.50	0	002	29.72	AA		29.73
12	1155	5	FEW080	10.00		107	41.7	74	23.2	57	13.9	19	6	180		29.48			29.70	AA		29.71
12	1255	5	FEW080	10.00		111	43.9	74	23.5	56	13.3	17	0	000		29.46			29.68	AA		29.69
12	1355	5	FEW080	10.00		112	44.4	74	23.4	55	12.8	15	8	220		29.44	8	021	29.65	AA		29.67
12	1455	5	FEW080	10.00		113	45.0	74	23.4	54	12.2	14	6	170		29.41			29.62	AA		29.64
12	1555	5	FEW080 SCT150	10.00		114	45.6	74	23.1	52	11.1	13	6	VR		29.38			29.60	AA		29.61
12	1643	5	BKN100	10.00		115	46.0	74	23.2	52	11.0	13	M	M		29.38			M	SP		29.61
12	1655	5	SCT060CB SCT150	10.00		115	46.1	74	23.2	52	11.1	13	8	200		29.38	6	019	29.60	AA		29.61
12	1755	5	SCT080 BKN120	10.00		113	45.0	75	23.8	56	13.3	16	10	260		29.38			29.59	AA		29.61
12	1820	5	FEW000 SCT080 BKN120	1.75	BLDU	108	42.0	75	23.8	59	15.0	20	17	250	26	29.39			M	SP		29.62
12	1855	5	FEW000 SCT080 BKN120	2.00	BLDU	106	41.1	74	23.5	59	15.0	21	14	250		29.39			29.61	AA		29.62
12	1955	5	FEW000 SCT080 SCT120	2.00	DU	103	39.4	74	23.1	59	15.0	23	8	250		29.41	3	010	29.63	AA		29.64
12	2021	5	FEW000 SCT080 SCT120	3.00	DU	102	39.0	74	23.5	61	16.0	26	8	270		29.42			M	SP		29.65
12	2055	5	FEW000 SCT100	5.00	DU	101	38.3	74	23.1	60	15.6	26	7	260		29.43			29.65	AA		29.66
12	2155	5	FEW100	7.00		99	37.2	74	23.1	61	16.1	29	5	270		29.45			29.66	AA		29.68
12	2255	5	FEW100	8.00		99	37.2	74	23.1	61	16.1	29	0	000		29.45	1	014	29.67	AA		29.68
12	2355	5	FEW100	9.00		97	36.1	74	23.3	63	17.2	33	0	000		29.45			29.67	AA		29.68

A-4

Figure A-5. Hourly observations table of quality-controlled local climatological data from Yuma MCAS (03145), Yuma, Arizona (08/12/2012). Note in the Weather Type column that BLDU (blowing dust) and DU (dust) with reduced visibilities were reported between 6:00 p.m. and 9:00 p.m. on August 12. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
YUMA MCAS (03145), YUMA, AZ (08/13/2012)

Elevation: 213 ft. above sea level

Latitude: 32.65

Longitude: -114.616

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
13	0055	5	FEW100	10.00		93	33.9	73	23.0	64	17.8	38	6	210		29.45						29.68
13	0155	5	CLR	10.00		93	33.9	71	21.6	59	15.0	32	5	230		29.44	8	002	29.66	AA		29.67
13	0255	5	CLR	10.00		93	33.9	71	21.6	59	15.0	32	3	240		29.45			29.66	AA		29.68
13	0355	5	CLR	10.00		92	33.3	72	22.0	61	16.1	36	5	130		29.44			29.66	AA		29.67
13	0455	5	CLR	10.00		89	31.7	71	21.5	61	16.1	39	5	210		29.45	3	003	29.67	AA		29.68
13	0555	5	FEW050 SCT100	9.00		90	32.2	72	21.9	62	16.7	39	5	160		29.47			29.69	AA		29.70
13	0655	5	FEW060 SCT120	9.00		89	31.7	70	21.2	60	15.6	38	0	000		29.49			29.70	AA		29.72
13	0755	5	FEW080 SCT100	8.00		93	33.9	71	21.9	60	15.6	33	6	180		29.51	2	018	29.72	AA		29.74
13	0855	5	FEW080 SCT120	9.00		96	35.6	72	22.3	60	15.6	30	5	240		29.51			29.73	AA		29.74
13	0955	5	FEW080 SCT120	8.00		101	38.3	73	22.8	59	15.0	25	5	300		29.52			29.74	AA		29.75
13	1055	5	FEW080	9.00		105	40.6	74	23.2	58	14.4	21	3	VR		29.51	0	001	29.73	AA		29.74
13	1155	5	FEW080 SCT120	10.00		109	42.8	76	24.5	61	16.1	21	7	VR		29.50			29.72	AA		29.73
13	1255	5	FEW060CB SCT100	10.00		111	43.9	75	24.0	58	14.4	18	7	180		29.47			29.69	AA		29.70
13	1355	5	FEW060CB SCT100	10.00		112	44.4	75	23.7	56	13.3	16	8	200		29.45	8	022	29.66	AA		29.68
13	1455	5	FEW060CB SCT100	10.00		114	45.6	74	23.5	54	12.2	14	8	200		29.42			29.64	AA		29.65
13	1555	5	SCT060CB SCT100	10.00		115	46.1	74	23.2	52	11.1	13	6	220		29.39			29.61	AA		29.62
13	1655	5	SCT060CB SCT100	10.00		116	46.7	71	21.6	42	5.6	8	11	210		29.39	6	020	29.60	AA		29.62
13	1755	5	SCT021 SCT060 BKN110	2.50	BLDU	109	42.8	72	22.3	52	11.1	15	26	270	33	29.40			29.62	AA		29.63
13	1855	5	SCT060 SCT100 BKN150	8.00		106	41.1	72	21.9	52	11.1	17	11	290		29.41			29.62	AA		29.64
13	1955	5	SCT060 BKN100	10.00		104	40.0	71	21.4	51	10.6	17	5	280		29.42	3	011	29.64	AA		29.65
13	2055	5	SCT060 SCT100	10.00		100	37.8	70	21.2	53	11.7	21	6	240		29.43			29.65	AA		29.66
13	2155	5	SCT060 SCT100	10.00		99	37.2	70	20.8	52	11.1	21	7	150		29.45			29.67	AA		29.68
13	2255	5	FEW060 SCT100	10.00		97	36.1	69	20.5	52	11.1	22	5	210		29.45	1	011	29.67	AA		29.68
13	2355	5	FEW060 SCT100	10.00		96	35.6	69	20.3	52	11.1	23	5	160		29.46			29.67	AA		29.69

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Figure A-6. Hourly observations table of quality-controlled local climatological data from Yuma MCAS (03145), Yuma, Arizona (08/13/2012). Note in the Weather Type column that BLDU (blowing dust) and reduced visibilities were reported between 6:00 p.m. and 8:00 p.m. on August 13. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
IMPERIAL COUNTY AIRPORT (03144), IMPERIAL, CA (08/12/2012)

Elevation: -58 ft. below sea level

Latitude: 32.834

Longitude: -115.578

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
12	0053	12	CLR	10.00		94	34.4	74	23.2	64	17.8	37	0	000		29.72	3	006	29.67	AA		29.66
12	0153	12	CLR	10.00		90	32.2	74	23.2	66	18.9	45	0	000		29.72			29.66	AA		29.66
12	0253	12	CLR	10.00		87	30.6	74	23.0	67	19.4	52	5	260		29.72	5	002	29.66	AA		29.66
12	0353	12	CLR	10.00		88	31.1	73	22.9	66	18.9	48	5	230		29.72			29.66	AA		29.66
12	0453	12	CLR	10.00		89	31.7	73	22.7	65	18.3	45	0	000		29.73			29.67	AA		29.67
12	0553	12	CLR	10.00		90	32.2	73	22.9	65	18.3	44	0	000		29.74	1	013	29.68	AA		29.68
12	0653	12	CLR	10.00		93	33.9	74	23.0	64	17.8	38	0	000		29.75			29.70	AA		29.69
12	0753	12	CLR	10.00		100	37.8	76	24.4	65	18.3	32	7	340		29.76			29.70	AA		29.70
12	0853	12	CLR	10.00		104	40.0	76	24.6	64	17.8	27	6	020		29.76	0	002	29.71	AA		29.70
12	0953	12	CLR	10.00		107	41.7	77	24.8	63	17.2	24	6	040		29.76			29.70	AA		29.70
12	1053	12	CLR	10.00		109	42.8	75	23.8	58	14.4	19	5	VR		29.74			29.68	AA		29.68
12	1153	12	CLR	10.00		110	43.3	75	23.9	58	14.4	18	3	VR		29.72			29.66	AA		29.66
12	1253	12	CLR	10.00		112	44.4	75	23.9	57	13.9	17	6	VR		29.70	8	021	29.64	AA		29.64
12	1353	12	FEW100	10.00		114	45.6	75	24.0	56	13.3	15	6	140		29.68			29.62	AA		29.62
12	1453	12	FEW110	10.00		114	45.6	75	23.8	55	12.8	15	0	000		29.65			29.59	AA		29.59
12	1553	12	FEW110	10.00		114	45.6	75	23.8	55	12.8	15	9	240		29.65	6	015	29.59	AA		29.59
12	1653	12	SCT029 SCT110	7.00		107	41.7	76	24.5	62	16.7	23	17	200	26	29.66			29.60	AA		29.60
12	1707	12	SCT029 BKN110	9.00		108	42.0	77	24.9	63	17.0	23	13	210		29.66			M	SP		29.60
12	1714	12	BKN029	9.00		106	41.0	76	24.6	63	17.0	25	13	190		29.66			M	SP		29.60
12	1729	12	BKN031	8.00		106	41.0	76	24.6	63	17.0	25	13	210		29.66			M	SP		29.60
12	1753	12	CLR	10.00		105	40.6	75	23.9	61	16.1	24	9	220		29.66			29.60	AA		29.60
12	1853	12	CLR	10.00		99	37.2	75	23.6	63	17.2	31	11	270		29.68	3	008	29.62	AA		29.62
12	1953	12	CLR	10.00		98	36.7	72	22.1	58	14.4	26	10	270		29.69			29.63	AA		29.63
12	2053	12	FEW012	10.00		98	36.7	73	22.7	60	15.6	28	11	280		29.72			29.66	AA		29.66
12	2059	12	BKN009	9.00		99	37.0	74	23.1	61	16.0	29	8	280		29.72			M	SP		29.66
12	2138	12	SCT007	5.00	HZ	99	37.0	74	23.1	61	16.0	29	8	270		29.72			M	SP		29.66
12	2145	12	BKN007	4.00	HZ	97	36.0	73	22.8	61	16.0	30	8	280		29.72			M	SP		29.66
12	2153	12	BKN007	3.00	HZ	96	35.6	72	22.4	60	15.6	30	8	290		29.71	0	013	29.66	AA		29.65
12	2214	12	SCT007	4.00	HZ	97	36.0	73	22.8	61	16.0	30	6	290		29.71			M	SP		29.65
12	2232	12	FEW005	2.50	HZ	93	34.0	72	22.2	61	16.0	34	0	000		29.72			M	SP		29.66
12	2245	12	CLR	3.00	HZ	95	35.0	73	22.5	61	16.0	32	5	290		29.72			M	SP		29.66
12	2253	12	CLR	5.00	HZ	94	34.4	72	22.3	61	16.1	33	6	270		29.72			29.66	AA		29.66
12	2353	12	CLR	10.00		95	35.0	72	21.9	59	15.0	30	8	290		29.71			29.66	AA		29.65

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Figure A-7. Hourly observations table of quality-controlled local climatological data from Imperial County Airport (03144), Imperial, California (08/12/2012). Note in the Weather Type column that HZ (haze) and reduced visibilities were reported between 9:00 p.m. and 11:00 p.m. on August 12. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
IMPERIAL COUNTY AIRPORT (03144), IMPERIAL, CA (08/13/2012)

Elevation: -58 ft. below sea level

Latitude: 32.834

Longitude: -115.578

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
13	0053	12	CLR	10.00		91	32.8	71	21.8	61	16.1	37	6	280		29.71	8	002	29.65	AA		29.65
13	0153	12	CLR	10.00		90	32.2	71	21.7	61	16.1	38	5	260		29.71			29.65	AA		29.65
13	0253	12	CLR	10.00		91	32.8	71	21.8	61	16.1	37	0	000		29.72			29.66	AA		29.66
13	0353	12	CLR	10.00		88	31.1	72	21.9	63	17.2	43	5	240		29.71	0	002	29.65	AA		29.65
13	0453	12	CLR	10.00		87	30.6	71	21.8	63	17.2	45	3	250		29.73			29.67	AA		29.67
13	0553	12	CLR	10.00		87	30.6	72	22.4	65	18.3	48	6	250		29.75			29.69	AA		29.69
13	0653	12	CLR	10.00		92	33.3	73	22.6	63	17.2	38	6	240		29.77	3	018	29.71	AA		29.71
13	0753	12	CLR	10.00		98	36.7	74	23.5	63	17.2	32	5	220		29.77			29.71	AA		29.71
13	0853	12	CLR	10.00		104	40.0	73	22.8	57	13.9	21	6	210		29.77	0	001	29.72	AA		29.71
13	0953	12	CLR	10.00		107	41.7	74	23.0	56	13.3	19	5	230		29.77			29.71	AA		29.71
13	1053	12	CLR	10.00		111	43.9	75	23.6	56	13.3	17	6	130		29.75			29.70	AA		29.69
13	1153	12	CLR	10.00		112	44.4	75	23.7	56	13.3	16	0	000		29.73			29.67	AA		29.67
13	1253	12	CLR	10.00		113	45.0	75	23.9	56	13.3	16	8	120		29.70	8	023	29.65	AA		29.64
13	1353	12	CLR	10.00		115	46.1	74	23.5	53	11.7	13	9	120	16	29.68			29.62	AA		29.62
13	1453	12	FEW100	10.00		115	46.1	74	23.1	51	10.6	12	8	100	16	29.65			29.59	AA		29.59
13	1518	12	FEW028 SCT100 SCT110	1.25	HZ	109	43.0	74	23.5	57	14.0	18	33s	190	44	29.69			M	SP		29.63
13	1527	12	FEW023 SCT075 BKN110	0.75	HZ	104	40.0	73	22.8	57	14.0	21	31	200	45	29.70			M	SP		29.64
13	1533	12	FEW029 SCT080 BKN100	1.50	HZ	102	39.0	74	23.0	59	15.0	24	36	190	44	29.72			M	SP		29.66
13	1538	12	FEW031 SCT080 BKN100	3.00	HZ	99	37.0	74	23.1	61	16.0	29	32	210	47	29.70			M	SP		29.64
13	1553	12	BKN039 BKN080 BKN100	6.00	VCTS HZ	97	36.1	74	23.3	63	17.2	33	24	220	40	29.68	5	008	29.62	AA		29.62
13	1605	12	SCT039 SCT095 SCT110	10.00		95	35.0	74	23.3	64	18.0	36	14	290	23	29.67			M	SP		29.61
13	1653	12	CLR	7.00		97	36.1	74	23.3	63	17.2	33	5	210		29.66			29.60	AA		29.60
13	1753	12	CLR	10.00		99	37.2	76	24.2	65	18.3	33	6	240		29.66			29.60	AA		29.60
13	1853	12	CLR	10.00		97	36.1	75	23.6	64	17.8	34	7	240		29.68	5	001	29.62	AA		29.62
13	1953	12	CLR	10.00		95	35.0	73	22.8	62	16.7	34	9	230		29.70			29.64	AA		29.64
13	2053	12	CLR	10.00		93	33.9	73	22.7	63	17.2	37	8	240		29.71			29.65	AA		29.65
13	2153	12	CLR	10.00		90	32.2	73	22.6	64	17.8	42	7	290		29.72	1	013	29.66	AA		29.66
13	2253	12	CLR	10.00		90	32.2	72	22.3	63	17.2	41	7	260		29.71			29.65	AA		29.65
13	2353	12	CLR	10.00		88	31.1	72	22.2	64	17.8	45	7	250		29.72			29.66	AA		29.66

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Figure A-8. Hourly observations table of quality-controlled local climatological data from Imperial County Airport (03144), Imperial, California (08/13/2012). Note in the Weather Type column that HZ (haze) and reduced visibilities were reported between 3:00 p.m. and 4:00 p.m. on August 13. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
NAF (23199), EL CENTRO, CA (08/12/2012)

Elevation: -42 ft. below sea level

Latitude: 32.816

Longitude: -115.683

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
12	0056	5	CLR	10.00		93	33.9	72	22.4	62	16.7	36	0	000		29.71	3	004	29.71	AA		29.67
12	0156	5	CLR	10.00		90	32.2	73	22.6	64	17.8	42	0	000		29.70			29.70	AA		29.66
12	0256	5	CLR	10.00		88	31.1	72	21.9	63	17.2	43	0	000		29.70			29.71	AA		29.66
12	0356	5	CLR	10.00		88	31.1	72	22.2	64	17.8	45	5	220		29.71	3	000	29.71	AA		29.67
12	0456	5	CLR	10.00		87	30.6	72	22.4	65	18.3	48	5	230		29.71			29.72	AA		29.67
12	0556	5	CLR	10.00		89	31.7	72	22.4	64	17.8	44	0	000		29.72			29.73	AA		29.68
12	0656	5	CLR	10.00		95	35.0	73	22.8	62	16.7	34	0	000		29.74	3	011	29.74	AA		29.70
12	0756	5	CLR	10.00		102	38.9	73	22.5	57	13.9	23	6	310		29.74			29.75	AA		29.70
12	0856	5	CLR	10.00		106	41.1	75	23.6	59	15.0	21	7	350		29.75	0	000	29.75	AA		29.71
12	0956	5	CLR	10.00		108	42.2	75	23.9	59	15.0	20	7	VR		29.74			29.74	AA		29.70
12	1056	5	CLR	10.00		110	43.3	76	24.1	59	15.0	19	7	060		29.72			29.72	AA		29.68
12	1156	5	CLR	10.00		112	44.4	75	23.9	57	13.9	17	6	090		29.70			29.71	AA		29.66
12	1256	5	CLR	10.00		113	45.0	76	24.3	58	14.4	17	6	060		29.68	8	020	29.68	AA		29.64
12	1356	5	CLR	10.00		113	45.0	75	23.6	55	12.8	15	0	000		29.66			29.67	AA		29.62
12	1456	5	FEW110	10.00		114	45.6	75	23.8	55	12.8	15	0	000		29.64			29.64	AA		29.60
12	1556	5	FEW110	10.00		114	45.6	75	23.8	55	12.8	15	7	110		29.64	5	015	29.64	AA		29.60
12	1656	5	BKN024 BKN110	10.00		107	41.7	76	24.2	61	16.1	22	18	170	30	29.64			29.64	AA		29.60
12	1735	5	SCT020	10.00		108	42.0	74	23.4	57	14.0	19	14	190		29.64			M	SP		29.60
12	1756	5	CLR	10.00		105	40.6	73	22.9	57	13.9	21	13	210		29.64			29.64	AA		29.60
12	1856	5	CLR	10.00		100	37.8	73	22.7	59	15.0	26	16	270		29.66	3	009	29.67	AA		29.62
12	1956	5	CLR	10.00		99	37.2	72	22.3	58	14.4	26	10	260		29.68			29.68	AA		29.64
12	2056	5	BKN005	10.00		100	37.8	72	22.4	58	14.4	25	15	290		29.70			29.70	AA		29.66
12	2109	5	OVC003	10.00		100	38.0	73	22.7	59	15.0	26	14	290		29.70			M	SP		29.66
12	2156	5	OVC003	10.00		98	36.7	72	22.4	59	15.0	27	9	260		29.70	1	012	29.70	AA		29.66
12	2220	5	SCT005	10.00		97	36.0	72	22.2	59	15.0	28	9	250		29.70			M	SP		29.66
12	2256	5	CLR	10.00		96	35.6	71	21.6	57	13.9	27	10	260		29.70			29.70	AA		29.66
12	2356	5	CLR	10.00		94	34.4	71	21.5	58	14.4	30	7	300		29.70			29.71	AA		29.66

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Figure A-9. Hourly observations table of quality-controlled local climatological data from NAF (23199), El Centro, California (08/12/2012). Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

QUALITY CONTROLLED LOCAL CLIMATOLOGICAL DATA
HOURLY OBSERVATIONS TABLE
NAF (23199), EL CENTRO, CA (08/13/2012)

Elevation: -42 ft. below sea level

Latitude: 32.816

Longitude: -115.683

Data Version: VER2

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Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti-meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
13	0056	5	CLR	10.00		92	33.3	70	21.2	58	14.4	32	7	260		29.69	8	002	29.70	AA		29.65
13	0156	5	CLR	10.00		89	31.7	71	21.5	61	16.1	39	6	260		29.69			29.70	AA		29.65
13	0256	5	CLR	10.00		86	30.0	70	21.0	61	16.1	43	5	040		29.70			29.70	AA		29.66
13	0356	5	CLR	10.00		89	31.7	71	21.5	61	16.1	39	6	220		29.70	3	002	29.70	AA		29.66
13	0456	5	CLR	10.00		89	31.7	71	21.5	61	16.1	39	7	250		29.72			29.72	AA		29.68
13	0556	5	FEW100	10.00		88	31.1	72	21.9	63	17.2	43	5	260		29.74	1	017	29.74	AA		29.70
13	0656	5	CLR	10.00		94	34.4	72	22.3	61	16.1	33	0	000		29.75			29.75	AA		29.71
13	0756	5	CLR	10.00		100	37.8	73	22.7	59	15.0	26	0	000		29.76			29.76	AA		29.72
13	0856	5	CLR	10.00		106	41.1	72	22.2	53	11.7	17	5	200		29.76	0	000	29.76	AA		29.72
13	0956	5	FEW060	10.00		108	42.2	73	22.5	53	11.7	16	0	000		29.75			29.75	AA		29.71
13	1056	5	FEW060CB	10.00		110	43.3	74	23.2	55	12.8	16	6	070		29.74			29.74	AA		29.70
13	1156	5	FEW060CB	10.00		111	43.9	75	23.6	56	13.3	17	7	VR		29.71	8	022	29.72	AA		29.67
13	1256	5	FEW060CB	10.00		114	45.6	76	24.4	58	14.4	16	6	090		29.68			29.69	AA		29.64
13	1356	5	FEW060	10.00		115	46.1	74	23.5	53	11.7	13	5	110		29.67			29.67	AA		29.63
13	1456	5	SCT060	10.00		113	45.0	75	23.6	55	12.8	15	16	220	22	29.65			29.65	AA		29.61
13	1519	5	SCT060CB	0.50s	BLDU _s	109	43.0	74	23.1	55	13.0	17	33	200	44	29.67			M	SP		29.63
13	1534	5	SCT060CB	0.50s	BLDU _s	104	40.0	73	22.8	57	14.0	21	36	190	41	29.69			M	SP		29.65
13	1541	5	SCT060CB	1.00	BLDU	104	40.0	72	22.1	54	12.0	19	37	170	45	29.69			M	SP		29.65
13	1552	5	SCT060CB	1.00	TSRA	99	37.0	74	23.1	61	16.0	29	28	170	39	29.68			M	SP		29.64
13	1556	5	SCT060CB	1.00	TSRA	96	35.6	74	23.2	63	17.2	34	24	190	43	29.69	3	007	29.69	AA	T	29.65
13	1603	5	FEW032CB SCT075CB SCT110	4.00	TSRA	93	34.0	74	23.0	64	18.0	38	11	190	43	29.67			M	SP		29.63
13	1608	5	FEW032CB SCT075CB SCT110	10.00	TS	95	35.0	74	23.3	64	18.0	36	3	VR		29.66			M	SP		29.62
13	1618	5	FEW032CB SCT075CB SCT110	10.00		95	35.0	76	24.5	68	20.0	41	6	230		29.65			M	SP		29.61
13	1656	5	SCT075 SCT110	10.00		94	34.4	77	24.7	69	20.6	44	6	130		29.64				AA	T	29.60
13	1756	5	SCT100	10.00		102	38.9	73	23.0	59	15.0	24	3	VR		29.65				AA		29.61
13	1856	5	FEW120	10.00		96	35.6	72	22.1	59	15.0	29	10	250		29.66	5	009	29.66	AA		29.62
13	1956	5	FEW150	10.00		95	35.0	72	21.9	59	15.0	30	11	240		29.68				AA		29.64
13	2056	5	CLR	10.00		92	33.3	72	22.0	61	16.1	36	M	M		29.70				AA		29.66
13	2156	5	CLR	10.00		92	33.3	72	22.0	61	16.1	36	11	260		29.70	0	013	29.70	AA		29.66
13	2256	5	CLR	10.00		92	33.3	71	21.7	60	15.6	34	7	290		29.69				AA		29.65
13	2356	5	CLR	10.00		90	32.2	71	21.7	61	16.1	38	8	240		29.70				AA		29.66

Figure A-10. Hourly observations table of quality-controlled local climatological data from NAF (23199), El Centro, California (08/13/2012). Note in the Weather Type column that BLDU (blowing dust) and reduced visibilities were reported between 3:00 p.m. and 4:00 p.m. on August 13. Dynamically generated via <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

Appendix B: ADEQ and NWS Forecast Products



LINK TO HISTORICAL AIR POLLUTION EXCEEDANCE DATA FOR YUMA

YUMA AIR QUALITY FORECAST FOR MONDAY, AUGUST 13, 2012

This report is updated by 1:00 p.m. Sunday thru Friday and is valid for areas within and bordering the city of Yuma, Arizona

FORECAST DATE	YESTERDAY SAT 08/11/2012	TODAY SUN 08/12/2012	TOMORROW MON 08/13/2012	EXTENDED TUE 08/14/2012
NOTICES (*SEE BELOW FOR DETAILS)	DUST NWS EXCESSIVE HEAT WARNING	DUST NWS EXCESSIVE HEAT WARNING	NWS EXCESSIVE HEAT WARNING	NWS EXCESSIVE HEAT WARNING
AIR POLLUTANT	AQI Reading/Category (Preliminary data only)			
O3*	100 MODERATE	50 GOOD	54 MODERATE	51 MODERATE
PM-10*	38 GOOD	58 MODERATE	34 GOOD	36 GOOD

* O3 = Ozone PM-10 = Particle: 10 microns & smaller

**"Ozone Health Watch" means that the highest concentration of OZONE may approach the federal health standard.
 "PM10 Health Watch" means that the highest concentration of PM-10 may approach the federal health standard.
 "High Pollution Advisory" means that the highest concentration of OZONE or PM-10 may exceed the federal health standard.
 "DUST" means that short periods of high PM-10 concentrations caused by outflow from thunderstorms are possible.

Health message for Sunday August 12: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Health message for Monday August 13: Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.

Synopsis and Discussion

OZONE (O3): It appears that a prolonged fetch of easterly winds managed to deliver additional ozone and/or its precursors from the Phoenix metro area to western portions of Arizona where ozone levels at the Yuma monitoring site reached the mid-moderate range of the Air Quality Index on Friday and were just shy of unhealthy on Saturday. This wind flow has now shifted so local ozone concentrations should drop into the low-moderate range by Monday.

COARSE PARTICLES (PM-10): After one more day of elevated summer monsoon moisture levels, a brief drying trend is forecast to occur over the Yuma area thru about Tuesday. This means a decreased risk for dense blowing dust generated by strong thunderstorm outflow boundary winds with PM-10 levels forecast to be in the good range of the Air Quality Index.

POLLUTION MONITOR READINGS FOR SATURDAY, AUGUST 11, 2012

O3 (OZONE)

Info on current 8-hour ozone standard: http://www.epa.gov/air/pollution/pdfs/2008_03_aqi_changes.pdf
 For archived AQI maps go to: <http://www.airnow.gov/index.cfm?action=airnow.maps>

SITE NAME	MAX 8-HR VALUE (PPB)	MAX AQI	AQI COLOR CODE
Yuma Supersite	75	100	Yellow

PM-10 (PARTICLES)

SITE NAME	MAX 24-HR VALUE (ug/m3)	MAX AQI	AQI COLOR CODE
Yuma Supersite	41	38	Green

Click Here to find out how the AQI forecast is used in the Yuma Air Quality Flag Program



YUMA SUPERSITE POLLUTION MONITORS LOCATION MAP



National Weather Service statements, storm reports, advisories, and warnings

AREA FORECAST DISCUSSION...UPDATED
NATIONAL WEATHER SERVICE PHOENIX AZ
415 PM MST SUN AUG 12 2012

.UPDATE...UPDATED AVIATION DISCUSSION...

.AVIATION...
SOUTH-CENTRAL ARIZONA INCLUDING KPHX...KIWA...AND KSDL...
MOSTLY CLEAR SKIES AND TYPICAL DIURNAL WINDS EXPECTED THROUGH MONDAY
EVENING.

SOUTHEAST CALIFORNIA/SOUTHWEST ARIZONA INCLUDING KIPL AND KBLH...
SHOWERS AND THUNDERSTORMS SHOULD AVOID BOTH TERMINALS HOWEVER BETTER
SHOT OF THUNDER AT BLH. DISTANT STORMS COULD PRODUCE BLOWING DUST AT
IPL BUT CONFIDENCE IS TOO LOW TO INCLUDE AT THIS POINT. MOSTLY CLEAR
SKIES LIKELY AFTER 09Z AT BOTH SITES.

AVIATION DISCUSSION NOT UPDATED FOR AMENDED TAFS.

SHORT TERM FORECAST
NATIONAL WEATHER SERVICE PHOENIX AZ
455 PM MST SUN AUG 12 2012

AZZ025-CAZ031-033-130200-
YUMA/MARTINEZ LAKE AND VICINITY-LOWER COLORADO RIVER VALLEY CA-
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...FORTUNA FOOTHILLS...SAN LUIS...SOMERTON...
YUMA...BLYTHE...BRAWLEY...CALEXICO...EL CENTRO...GLAMIS...IMPERIAL...
AND THE SALTON SEA
455 PM MST SUN AUG 12 2012 /455 PM PDT SUN AUG 12 2012/

.NOW...
SOUTHWEST WINDS 15 TO 30 MPH...GENERATED BY STORMS OVER THE HIGHER
TERRAIN OF NORTHERN BAJA CALIFORNIA...WILL OVERSPREAD SOUTHEAST
IMPERIAL COUNTY AND SOUTHWEST YUMA COUNTY BETWEEN 530 PM AND 7 PM.
SOME BLOWING SAND AND DUST MAY ACCOMPANY THE GUSTY WINDS. IN
ADDITION...ISOLATED THUNDERSTORMS WILL BE POSSIBLE...AND STRONGER
STORMS COULD PRODUCE STRONG WINDS AND DENSE BLOWING DUST OR SAND.
MOTORISTS ON INTERSTATE 8 AND OTHER ROADWAYS FROM IMPERIAL TO YUMA
SHOULD BE PREPARED TO ENCOUNTER SUDDEN CHANGES IN DRIVING CONDITIONS.

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
531 PM MST SUN AUG 12 2012

CAZ033-130200-
/O.NEW.KPSR.DU.Y.0028.120813T0031Z-120813T0200Z/
/O.CON.KPSR.EH.W.0011.000000T0000Z-120815T0300Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
531 PM PDT SUN AUG 12 2012

...**BLOWING DUST ADVISORY** IN EFFECT UNTIL 7 PM PDT THIS EVENING...
...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM PDT
TUESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A BLOWING DUST
ADVISORY...WHICH IS IN EFFECT UNTIL 7 PM PDT THIS EVENING. AN
EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM PDT TUESDAY.

* AFFECTED AREA...WESTERN AND CENTRAL IMPERIAL COUNTY...INCLUDING EL
CENTRO...PLASTER CITY...IMPERIAL...HOLTVILLE...AND INTERSTATE 8

* TIMING...THROUGH 7 PM.

* WINDS...SOUTH 20 TO 30 MPH.

* VISIBILITY...BELOW 1 MILE AT TIMES DUE TO BLOWING DUST OR SAND.

* IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS COULD CREATE
DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE MORE LIKELY
DURING BLOWING DUST EVENTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY. IF YOU ENCOUNTER
BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT
APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR
VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR
FOOT OFF THE BRAKE PEDAL.

URGENT - WEATHER MESSAGE
 NATIONAL WEATHER SERVICE PHOENIX AZ
 612 PM MST SUN AUG 12 2012

AZZ025-026-130215-
 /O.EXA.KPSR.DU.Y.0028.000000T0000Z-120813T0200Z/
 /O.CON.KPSR.EH.W.0011.000000T0000Z-120815T0300Z/
 YUMA/MARTINEZ LAKE AND VICINITY-SOUTHWEST DESERTS-
 INCLUDING THE CITIES OF...FORTUNA FOOTHILLS...YUMA...TACNA...
 WELLTON
 612 PM MST SUN AUG 12 2012

...**BLOWING DUST ADVISORY** IN EFFECT UNTIL 7 PM MST THIS EVENING...
 ...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM MST
 TUESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A BLOWING DUST
 ADVISORY...WHICH IS IN EFFECT UNTIL 7 PM MST THIS EVENING. AN
 EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 8 PM MST TUESDAY.

* AFFECTED AREA...WESTERN AND CENTRAL YUMA COUNTY... INCLUDING
 YUMA...SOMERTON...FORTUNA FOOTHILLS...TACNA AND INTERSTATE 8

* TIMING...THROUGH 7 PM.

* WINDS...SOUTHWEST 20 TO 30 MPH...GUSTS TO 35 MPH.

* VISIBILITY...BELOW 1 MILE AT TIMES DUE TO BLOWING DUST OR SAND.

* IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS COULD
 CREATE DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE
 MORE LIKELY DURING BLOWING DUST EVENTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY. IF YOU ENCOUNTER
 BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT
 APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR
 VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR
 FOOT OFF THE BRAKE PEDAL.

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 715 PM MST SUN AUG 12 2012

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

0428 PM TSTM WND DMG 4 ESE KINTER 32.74N 114.33W
 08/12/2012 YUMA AZ TRAINED SPOTTER

6 POWER POLES DOWN NEAR COUNTY 6TH STREET AND AVE 18E

AREA FORECAST DISCUSSION

NATIONAL WEATHER SERVICE PHOENIX AZ
911 PM MST SUN AUG 12 2012

.SYNOPSIS...

STRONG HIGH PRESSURE WILL CONTINUE OVER THE DESERT SOUTHWEST THROUGH TUESDAY...RESULTING IN WELL ABOVE NORMAL TEMPERATURES AND PERIODS OF EXCESSIVE HEAT. MONSOON MOISTURE WILL SLOWLY SPREAD BACK INTO THE REGION STARTING WEDNESDAY...RESULTING IN AN INCREASING THREAT OF AFTERNOON THUNDERSTORM ACTIVITY OVER SOUTHEAST CALIFORNIA AND SOUTHWEST ARIZONA THROUGH SATURDAY. THE BEST CHANCE OF AFTERNOON AND EVENING THUNDERSTORM ACTIVITY ACROSS SOUTH CENTRAL ARIZONA LOOK TO BE THURSDAY AND INTO THE WEEKEND.

&&

.DISCUSSION...

ISOLATED SHOWERS AND THUNDERSTORMS WERE MAINLY CONFINED TO FAR SOUTHWEST ARIZONA AND SOUTHEAST CALIFORNIA...AS WELL AS ACROSS BAJA CALIFORNIA EARLIER THIS AFTERNOON. MOST OF THE STORMS HAVE DIED OFF...HOWEVER NEW CONVECTION HAS FORMED ON THE OUTFLOWS OF THESE STORMS ACROSS MARICOPA AND PINAL COUNTIES. WITH AFTERNOON HIGHS AROUND 115...IT'S EASY TO UNDERSTAND WHY THE ATMOSPHERE CONTINUES TO CONVECT AND OVERTURN THIS LATE INTO THE EVENING. I EXPECT ISOLATED THUNDERSTORMS TO CONTINUE THROUGH THE OVERNIGHT HOURS...COVERAGE WILL BE MINIMAL...BUT I FELT IT WORTHY OF A 10 PERCENT MENTION IN THE FORECAST UNTIL DAYBREAK. OTHERWISE...FORECAST REMAINS UNCHANGED.

CAZ033-140100-

IMPERIAL COUNTY-

INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO...GLAMIS...
IMPERIAL...AND THE SALTON SEA
343 PM PDT MON AUG 13 2012

.NOW...

ISOLATED THUNDERSTORMS WILL AFFECT IMPERIAL COUNTY THROUGH 6 PM. STORMS WILL BE MOST NUMEROUS OVER AND WEST OF IMPERIAL. GUSTY WINDS IN EXCESS OF 45 MPH...LOCALIZED AREAS OF DENSE BLOWING DUST OR SAND... BRIEF MODERATE TO HEAVY RAIN...AND CLOUD TO GROUND LIGHTNING WILL OCCUR WITH STORMS. STORM MOVEMENT WILL BE TOWARD THE NORTH OR NORTHWEST AT 10 MPH. MOTORISTS ON INTERSTATE 8 AND OTHER ROADWAYS SHOULD BE PREPARED FOR SUDDEN CHANGES IN DRIVING CONDITIONS.

SPECIAL WEATHER STATEMENT

NATIONAL WEATHER SERVICE PHOENIX AZ
353 PM MST MON AUG 13 2012

CAZ033-132345-
IMPERIAL CA-
353 PM PDT MON AUG 13 2012

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

SIGNIFICANT WEATHER ADVISORY FOR...
SOUTH CENTRAL IMPERIAL COUNTY IN SOUTHEAST CALIFORNIA

UNTIL 445 PM PDT

AT 345 PM PDT...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A
STRONG THUNDERSTORM 9 MILES SOUTH OF MT. SIGNAL...MOVING NORTH AT 15
MPH.

WINDS UP TO 50 MPH AND BLOWING DUST AND SAND IS POSSIBLE. MOTORISTS
TRAVELING ALONG INTERSTATE 8 SHOULD BE PREPARED FOR RAPIDLY CHANGING
WEATHER CONDITIONS.

LOCATIONS IMPACTED INCLUDE...

CALEXICO...
MT. SIGNAL...
EL CENTRO NAVAL AIRFIELD...

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
354 PM MST MON AUG 13 2012

CAZ033-140000-
/O.NEW.KPSR.DU.Y.0029.120813T2254Z-120814T0000Z/
/O.CON.KPSR.EH.W.0011.000000T0000Z-120815T1200Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
354 PM PDT MON AUG 13 2012

...**BLOWING DUST ADVISORY** IN EFFECT UNTIL 5 PM PDT THIS
AFTERNOON...
...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 5 AM PDT
WEDNESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A BLOWING DUST ADVISORY...WHICH IS IN EFFECT UNTIL 5 PM PDT THIS AFTERNOON. AN EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 5 AM PDT WEDNESDAY.

* AFFECTED AREA...WESTERN AND CENTRAL IMPERIAL COUNTY...INCLUDING INTERSTATE 8...IMPERIAL...EL CENTRO...SEELEY...PLASTER CITY...BRAWLEY

* TIMING...THROUGH 5 PM.

* WINDS...SOUTH 20 TO 30 MPH...WITH GUSTS TO 40 MPH.

* VISIBILITY...BELOW ONE MILE AT TIMES DUE TO BLOWING SAND AND DUST.

* IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS WILL CREATE DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE MORE LIKELY DURING DUST STORMS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY. IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

REMEMBER...PULL ASIDE...STAY ALIVE.

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
402 PM MST MON AUG 13 2012

CAZ033-140015-
/O.UPG.KPSR.DU.Y.0029.000000T0000Z-120814T0000Z/
/O.NEW.KPSR.DS.W.0014.120813T2302Z-120814T0000Z/
/O.CON.KPSR.EH.W.0011.000000T0000Z-120815T1200Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
402 PM PDT MON AUG 13 2012

...**DUST STORM WARNING** IN EFFECT UNTIL 5 PM PDT THIS AFTERNOON...
...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 5 AM PDT
WEDNESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A DUST STORM
WARNING...WHICH IS IN EFFECT UNTIL 5 PM PDT THIS AFTERNOON. THE
BLOWING DUST ADVISORY IS NO LONGER IN EFFECT. AN EXCESSIVE HEAT
WARNING REMAINS IN EFFECT UNTIL 5 AM PDT WEDNESDAY.

* AFFECTED AREA...WESTERN AND CENTRAL IMPERIAL COUNTY... INCLUDING
INTERSTATE 8...IMPERIAL...EL CENTRO...SEELEY... PLASTER CITY...BRAWLEY

* TIMING...THROUGH 5 PM.

* WINDS...SOUTH 25 TO 35 MPH...WITH GUSTS TO 45 MPH.

* VISIBILITY...BELOW ONE QUARTER MILE...POSSIBLY NEAR ZERO AT TIMES.

* IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS WILL
CREATE DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE
MORE LIKELY DURING DUST STORMS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A DUST STORM WARNING IS ISSUED WHEN WINDS HAVE GENERATED LARGE
AREAS OF BLOWING DUST OR BLOWING SAND THAT HAVE SUBSTANTIALLY
REDUCED VISIBILITIES...TO 1/4 MILE OR LESS...RESULTING IN
HAZARDOUS DRIVING CONDITIONS IN SOME AREAS. BE READY FOR A SUDDEN
DROP IN VISIBILITY TO NEAR ZERO. USE EXTRA CAUTION AND SLOW DOWN
WHILE DRIVING...AS OBJECTS ON AND NEAR ROADWAYS WILL BE SEEN ONLY
AT CLOSE RANGE. IF YOU ENCOUNTER BLOWING DUST OR BLOWING SAND ON
THE ROADWAY OR SEE IT APPROACHING...PULL OFF THE ROAD AS FAR AS
POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE LIGHTS ALL THE
WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 407 PM MST MON AUG 13 2012

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

0358 PM DUST STORM 5 SW SEELEY 32.74N 115.74W
 08/13/2012 IMPERIAL CA TRAINED SPOTTER

VISIBILITY ONE QUARTER MILE ALONG INTERSTATE 8

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 414 PM MST MON AUG 13 2012

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

0405 PM TSTM WND DMG HEBER 32.73N 115.52W
 08/13/2012 IMPERIAL CA EMERGENCY MNGR

TREES DOWN. WINDS ESTIMATED AT 50 MPH. VISIBILITY NEAR
 ZERO IN BLOWING DUST

SPECIAL WEATHER STATEMENT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 419 PM PDT MON AUG 13 2012

CAZ033-140015-
 IMPERIAL CA-
 419 PM PDT MON AUG 13 2012

...SIGNIFICANT WEATHER ADVISORY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

SIGNIFICANT WEATHER ADVISORY FOR...
 CENTRAL IMPERIAL COUNTY IN SOUTHEAST CALIFORNIA

UNTIL 515 PM PDT

AT 415 PM PDT...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED
 STRONG OUTFLOW WINDS FROM THUNDERSTORMS ALONG A LINE EXTENDING FROM
 PLASTER CITY TO IMPERIAL TO HOLTVILLE TO 12 MILES SOUTHEAST OF
 HOLTVILLE...AND MOVING NORTH AT 30 MPH.

WINDS UP TO 50 MPH AND LOCALLY DENSE BLOWING DUST ARE POSSIBLE.

LOCATIONS IMPACTED INCLUDE...
 BRAWLEY...
 WESTMORLAND...

PRELIMINARY LOCAL STORM REPORT
 NATIONAL WEATHER SERVICE PHOENIX AZ
 421 PM MST MON AUG 13 2012

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

0410 PM TSTM WND DMG CALEXICO 32.68N 115.50W
 08/13/2012 IMPERIAL CA TRAINED SPOTTER

TREES DOWN BLOCKING ROAD. NEAR ZERO VISIBILITY IN
 BLOWING DUST.

BULLETIN - EAS ACTIVATION REQUESTED
SEVERE THUNDERSTORM WARNING
 NATIONAL WEATHER SERVICE PHOENIX AZ
 428 PM PDT MON AUG 13 2012

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A

* SEVERE THUNDERSTORM WARNING FOR...
 CENTRAL IMPERIAL COUNTY IN SOUTHEAST CALIFORNIA...
 THIS INCLUDES THE CITIES OF...IMPERIAL...EL CENTRO...CALEXICO...
 BRAWLEY...

* UNTIL 530 PM PDT

* AT 425 PM PDT...NATIONAL WEATHER SERVICE METEOROLOGISTS DETECTED A
 SEVERE THUNDERSTORM CAPABLE OF PRODUCING DAMAGING WINDS IN EXCESS
 OF 60 MPH. IN ADDITION...DENSE BLOWING DUST MAY ACCOMPANY THIS
 SEVERE STORM. THIS STORM WAS LOCATED NEAR EL CENTRO...AND MOVING
 NORTH AT 20 MPH.

* OTHER LOCATIONS IN THE WARNING INCLUDE BUT ARE NOT LIMITED TO
 HOLTVILLE...EL CENTRO NAVAL AIRFIELD AND WESTMORLAND

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF YOU ARE IN THE WARNING AREA...GO INSIDE A STURDY BUILDING.
 REMEMBER...A SEVERE THUNDERSTORM WILL PRODUCE DAMAGING WINDS AND
 DEADLY LIGHTNING.

IF YOU ENCOUNTER DENSE BLOWING DUST WHILE DRIVING...PULL OVER AS FAR
 OFF THE ROADWAY AS POSSIBLE AND PARK. TURN OFF YOUR HEADLIGHTS AND
 KEEP YOUR FOOT OFF THE BRAKE.

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE PHOENIX AZ
459 PM MST MON AUG 13 2012

CAZ033-140100-
/O.EXP.KPSR.DS.W.0014.000000T0000Z-120814T0000Z/
/O.NEW.KPSR.DU.Y.0030.120814T0000Z-120814T0100Z/
/O.CON.KPSR.EH.W.0011.000000T0000Z-120815T1200Z/
IMPERIAL COUNTY-
INCLUDING THE CITIES OF...BRAWLEY...CALEXICO...EL CENTRO
459 PM PDT MON AUG 13 2012

...**BLOWING DUST ADVISORY** IN EFFECT UNTIL 6 PM PDT THIS EVENING...
...**DUST STORM WARNING** WILL EXPIRE AT 5 PM PDT THIS AFTERNOON...
...EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 5 AM PDT
WEDNESDAY...

THE NATIONAL WEATHER SERVICE IN PHOENIX HAS ISSUED A BLOWING DUST
ADVISORY...WHICH IS IN EFFECT UNTIL 6 PM PDT THIS EVENING. THE
DUST STORM WARNING WILL EXPIRE AT 5 PM PDT THIS AFTERNOON. AN
EXCESSIVE HEAT WARNING REMAINS IN EFFECT UNTIL 5 AM PDT
WEDNESDAY.

* AFFECTED AREA...IMPERIAL COUNTY...INCLUDING CALIPATRIA...NILAND...
GLAMIS...AND BRAWLEY. THE LEADING EDGE OF GUSTY OUTFLOW WINDS
GENERATED BY STORMS OVER WESTERN IMPERIAL COUNTY WILL PUSH NORTH
AND EAST ACROSS IMPERIAL COUNTY.

* TIMING...THROUGH 6 PM.

* WINDS...SOUTH 20 TO 30 MPH...WITH GUSTS TO 35 MPH.

* VISIBILITY...BELOW ONE MILE AT TIMES.

* IMPACTS...SUDDENLY REDUCED VISIBILITIES ON ROADWAYS WILL CREATE
DANGEROUS DRIVING CONDITIONS. MULTI-CAR PILEUPS ARE MORE LIKELY
DURING BLOWING DUST EVENTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

BE READY FOR A SUDDEN DROP IN VISIBILITY. IF YOU ENCOUNTER BLOWING
DUST OR BLOWING SAND ON THE ROADWAY OR SEE IT APPROACHING...PULL OFF
THE ROAD AS FAR AS POSSIBLE AND PUT YOUR VEHICLE IN PARK. TURN THE
LIGHTS ALL THE WAY OFF AND KEEP YOUR FOOT OFF THE BRAKE PEDAL.

REMEMBER...PULL ASIDE...STAY ALIVE.