



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street  
San Francisco, CA 94105-3901

JUL 01 2013

OFFICE OF THE  
REGIONAL ADMINISTRATOR

Mr. Eric Massey  
Director, Air Division  
Arizona Department of Environmental Quality  
1110 W. Washington St.  
Phoenix, Arizona 85007

Dear Mr. Massey:

This letter responds to Arizona Department of Environmental Quality's (ADEQ) February 13, 2013 submittal regarding 37 exceedances of the 24-hour PM<sub>10</sub> standard that occurred at several monitoring stations within the Phoenix PM<sub>10</sub> nonattainment area on the following days: September 11 and 12, 2011, June 16, June 27, July 11, August 11, August 14, and September 6, 2012.

ADEQ's submittal included documentation that these exceedances were caused by high wind exceptional events. EPA has reviewed the documentation provided by ADEQ to demonstrate that the exceedances on these days meet the criteria for an exceptional event in the Exceptional Events Rule (EER). EPA concurs based on the weight of the evidence that the exceedances were caused by high wind exceptional events and finds that ADEQ has successfully made the demonstrations referred to in 40 CFR §50.14 to EPA's satisfaction. In addition, ADEQ has met the schedule and procedural requirements in section 50.14(c) with respect to the same data. A more detailed assessment of ADEQ's demonstration is enclosed. My staff has or shortly will enter "concurrence flags" for these data into EPA's AQS data system.

Based on these determinations, EPA will exclude these data from the following types of calculations and activities:

- EPA's Air Quality Data system (AQS) will not count these days as exceedances when generating user reports, or include them in design values estimates, unless the AQS user specifically indicates that they should be included.
- EPA will accept the exclusion of these data for the purposes of selecting appropriate background concentrations for New Source Review air quality analyses.<sup>1</sup>
- EPA will accept the exclusion of these data for the purposes of selecting appropriate background concentrations for transportation conformity hot spot analyses.<sup>2</sup>
- The data will continue to be publicly available, but EPA's publications and public information statements on the status of air quality in the affected area will not reflect these data in any summary statistic of potential regulatory application, unless such inclusion is specifically noted.<sup>3</sup>

<sup>1</sup> If we are the permitting authority, we will propose permits on this basis. If we are commenting on another permitting authority's proposed action, our comments will be consistent with the determinations in this letter.

<sup>2</sup> Applicable only to PM<sub>10</sub> and PM<sub>2.5</sub>.

<sup>3</sup> These data may be included in statistics intended to describe trends in actual air quality in the area.

In addition, EPA will rely on calculated values that exclude these data in proposed regulatory actions, such as a proposed designation, classification, attainment demonstration, or finding as to whether the Phoenix PM<sub>10</sub> nonattainment area has met the PM<sub>10</sub> NAAQS. These regulatory actions require EPA to provide an opportunity for public comment prior to taking a final Agency action. If EPA is pursuing one of these actions for the Phoenix PM<sub>10</sub> nonattainment area, EPA will open a new comment period during which EPA may receive comments on the exceptional event submission you have made and the determinations conveyed in this letter. If so, we must consider and respond to those comments before taking final regulatory action. Accordingly, the determinations conveyed in this letter do not constitute final EPA action regarding any matter on which EPA is required to provide an opportunity for public comment. In particular, this point applies to determinations regarding the attainment status or classification of the area. Final actions will take place only after EPA completes notice and comment rulemaking on those determinations. As an additional clarification, the determinations conveyed in this letter are applicable only to determinations incorporating the submitted data relative to the PM<sub>10</sub> NAAQS.

If you have any questions or wish to discuss this matter further, please contact Deborah Jordan, Director of the Air Division at (415) 947-8715.

Sincerely,

*for Allen Strauss 1 July 2013*  
Jared Blumenfeld

Enclosure

cc: Ms. Theresa Rigney, ADEQ

## EXCEPTIONAL EVENTS RULE REQUIREMENTS

EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. The EER added 40 CFR §50.1(j), (k) and (l); §50.14; and §51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements, and requirements for air agency demonstrations, all of which must be met before EPA can concur under the EER on the exclusion of air quality data from regulatory decisions.

Under 40 CFR §50.14(c)(3)(iv), the air agency demonstration to justify exclusion of data must provide evidence that:

- A. “The event satisfies the criteria set forth in 40 CFR §50.1(j)” for the definition of an exceptional event;
  - The event “affects air quality.”
  - The event “is not reasonably controllable or preventable.”
  - The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”<sup>1</sup>
- B. “There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;”
- C. “The event is associated with a measured concentration in excess of normal historical fluctuations, including background;” and
- D. “There would have been no exceedance or violation but for the event.”

### **Not Reasonably Controllable or Preventable (nRCP)**

EPA evaluates whether an event was not reasonably controllable or preventable at the time of the event by taking into account controls in place and wind speed, along with other factors.<sup>2</sup> For *natural* sources of dust, a high wind dust event can generally be considered to be not reasonably controllable or preventable if winds are high enough to cause emissions from natural undisturbed areas. For *anthropogenic* sources of dust, a high wind dust event is also eligible to be considered to be not reasonably controllable or preventable if:

1. The anthropogenic sources of dust have reasonable controls in place,
2. The reasonable controls have been effectively implemented and enforced, and
3. The wind speed was high enough to overwhelm the reasonable controls.

### **Historical Fluctuations (HF)**

EPA evaluates whether a measured exceedance is in excess of historical fluctuation by taking into account the level of the exceedance in relation to historical data, which is typically 3 to 5 years.

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<sup>1</sup>A natural event is further described in 40 CFR 50.1(k) as “an event in which human activity plays little or no direct causal role.”

<sup>2</sup>See e.g., Affirmation of Attainment of PM-10 NAAQS for the San Joaquin Valley Nonattainment Area, 73 FR 14691 (March 19, 2008).

### **Clear Causal Relationship (CCR)**

EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area. Demonstrations typically include documentation showing that the event in fact occurred and that emissions related to the event were transported in the direction of the monitor(s) where elevated concentrations measurements were recorded; the size of the area affected by the transported emissions; the relationship in time between the event, transport of emissions, and recorded concentrations; and, as appropriate, pollutant species-specific information supporting a causal relationship between the event and the measured concentration.

### **Affects Air Quality (AAQ)**

EPA will generally consider events to have affected air quality if the CCR and HF requirements have been adequately demonstrated.

### **Natural Event**

EPA will generally consider a high wind dust event to be a natural event in cases where windblown dust is entirely from natural sources or where contributing anthropogenic sources of windblown dust are reasonably controlled.<sup>3</sup> This generally involves adequately demonstrating both the nRCP and CCR requirements.

### **No Exceedance or Violation But For the Event (NEBF)**

Generally, for high wind dust events, the NEBF demonstration is similar to and informed by the demonstration of the nRCP and CCR requirements, and is expected to show that the measured concentration would have been below the applicable NAAQS without the effect of the event.

## **OVERVIEW OF EVENTS**

On February 13, 2013, Arizona Department of Environmental Quality (ADEQ) submitted seven exceptional events demonstrations for 37 exceedances of the 24-hour PM<sub>10</sub> standard that occurred at several monitoring stations within the Phoenix PM<sub>10</sub> nonattainment area on the following days: September 11 & 12, 2011, June 16, June 27, July 11, August 11, August 14, and September 6, 2012. Table 1 summarized these exceedances.

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<sup>3</sup>EPA will generally consider human activity to have played little or no *direct* role in causing emissions of the dust generated by high wind for purposes of the regulatory definition of “natural event” if contributing anthropogenic sources of the dust are reasonably controlled, regardless of the amount of dust coming from these reasonably controlled anthropogenic sources, and thus the event could be considered a natural event. In such cases, EPA believes that it would generally be a reasonable interpretation of its regulations to find that the anthropogenic source had “little” direct causal role. If anthropogenic sources of windblown dust that are reasonably controllable but that did not have those reasonable controls applied at the time of the high wind event have contributed significantly to a measured concentration, the event would not be considered a natural event. See preamble to the EER at 72 FR 13566, f.n.11.

Generally, ADEQ explains that the exceedances measured on September 11 & 12, 2011, June 16, June 27, July 11, August 11, August 14, and September 6, 2012, were associated with “monsoonal thunderstorm activity” and “thunderstorm-driven high winds.” ADEQ provided a comprehensive description and discussion of each of these events in the respective demonstrations. ADEQ’s narrative is summarized in the following sections.

Table 1: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
September 11, 2011	JLG Supersite	04-013-9997-3	185
	JLG Supersite	04-013-9997-4	178
	North Phoenix	04-013-1004-1	184
	North Phoenix	04-013-1004-2	183
	West Phoenix	04-013-0019-1	168
September 12, 2011	Durango Complex	04-013-9812-1	229
	West 43 <sup>rd</sup>	04-013-4009-1	161
	West Phoenix	04-013-0019-1	200
June 16, 2012	Buckeye	04-013-4011-1	202
	Durango Complex	04-013-9812-1	186
	Dysart	04-013-4010-1	167
	Higley	04-013-4006-1	194
	South Phoenix	04-013-4003-1	165
	West 43 <sup>rd</sup>	04-013-4009-1	211
	West Phoenix	04-013-0019-1	189
June 27, 2012	Central Phoenix	04-013-3002-4	340
	Durango Complex	04-013-9812-1	221
	Glendale	04-013-2001-1	337
	Greenwood	04-013-3010-1	323
	Higley	04-013-4006-1	224
	JLG Supersite	04-013-9997-3	344
	JLG Supersite	04-013-9997-4	329
	North Phoenix	04-013-1004-1	178
	South Phoenix	04-013-4003-1	342
	Tempe	04-013-4005-1	169
	West 43 <sup>rd</sup>	04-013-4009-1	221
	West Chandler	04-013-4004-1	220
	Zuni Hills	04-013-4016-1	285
July 11, 2012	Durango Complex	04-013-9812-1	217
	Greenwood	04-013-3010-1	212
	South Phoenix	04-013-4003-1	285
	West 43 <sup>rd</sup>	04-013-4009-1	172
August 11, 2012	Higley	04-013-4006-1	159
	West Chandler	04-013-4004-1	219
August 14, 2012	Durango Complex	04-013-9812-1	179
	West 43 <sup>rd</sup>	04-013-4009-1	254
September 6, 2012	West Chandler	04-013-4004-1	164

## Event Days: September 11 & 12, 2011

Table 2: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
September 11, 2011	JLG Supersite	04-013-9997-3	185
	JLG Supersite	04-013-9997-4	178
	North Phoenix	04-013-1004-1	184
	North Phoenix	04-013-1004-2	183
	West Phoenix	04-013-0019-1	168
September 12, 2011	Durango Complex	04-013-9812-1	229
	West 43 <sup>rd</sup>	04-013-4009-1	161
	West Phoenix	04-013-0019-1	200

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 20 mph on September 11, 2011, and above 25 mph on September 12, 2011. For example, maximum sustained wind speeds of 20 mph with gusts of 25 mph were measured at Phoenix Sky Harbor Airport on September 11, 2011, and maximum sustained wind speeds of 25 mph with gusts of 32 mph, 25 mph with gusts of 36, and 26 mph with gusts of 33 mph were measured at Phoenix Sky Harbor, Casa Grande Municipal Airport, and Williams Gateway Airport on September 12, 2011, respectively. Also, while not included in the demonstration, it is important to note that the National Oceanic and Atmospheric Administration’s (NOAA) National Climatic Data Center Storm events database included reports of strong thunderstorm winds in upwind areas of the exceeding monitoring stations in the area north of the city of Maricopa in Pinal County that were observed to be in excess of 46 mph. Also, 50 mph winds were observed in conjunction with a NOAA report of a dust storm in the greater Phoenix Area on September 11, 2011.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs and one localized, low-impact violation of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Strong thunderstorm outflows with sustained winds ranging from 20-30 mph, and even greater speeds nearest the source regions... were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into the Phoenix PM<sub>10</sub> nonattainment area, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources to the south and southeast of the nonattainment area, provides strong evidence that the events and exceedances

of September 11 & 12, 2011, recorded within the Phoenix PM<sub>10</sub> nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex Geographic Information System (GIS) analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located south and southeast of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process -includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 3: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section IV: p. 20-26, Section V: p. 27-42, App. E	Sufficient	Yes
September 12, 2011	Section IV: p. 20-26, Section V: p. 43-63, App. E	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “events that occurred on September 11 & 12, 2011, resulted in one of the top ten highest 24-hour average PM<sub>10</sub> concentrations seen in the last five years.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on September 11 & 12, 2011, were in excess of normal historical fluctuations.

Table 4: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section III: p. 16-19, App. A	Sufficient	Yes
September 12, 2011	Section III: p. 16-19, App. A	Sufficient	Yes

**Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors and climate information. The conceptual model also included a very detailed discussion of the events that occurred on September 11 & 12, 2011, and a time series graph for the four day period from September 10, 2011, to September 13, 2011, that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included time-lapse video evidence, satellite imagery, metrological data from various National Weather Service (NWS) stations within the Phoenix PM<sub>10</sub> nonattainment area and Pinal County, time series graphs for the events that included hourly PM<sub>10</sub> concentrations from monitors

within the Phoenix PM<sub>10</sub> nonattainment area, visibility and sustained with speed from Phoenix Sky Harbor Airport. ADEQ also included an additional times series graphs for the September 11 & 12, 2011, events that included 5-minute PM<sub>10</sub> concentrations from various PM<sub>10</sub> monitors within the Phoenix PM<sub>10</sub> nonattainment area compared to 5-minute wind speed from the Central Phoenix monitoring station, and PM<sub>10</sub> concentrations from monitors located in Pinal County compared to wind speed and visibility at Casa Grande Municipal Airport, respectively. Finally, ADEQ included a detailed and extensive GIS analysis that included PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, base velocity radar, and visibility to track the transport of PM<sub>10</sub> throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The time-lapse videos of the event can be found at the following locations:

- September 11, 2011: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_09112011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_09112011.mp4)
- September 12, 2011: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_09122011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_09122011.mp4)

While not included in the demonstration, it is important to note that NOAA's National Climatic Data Center Storm events database included dust storm observations on September 11, 2011, at 6:15 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Dust Storm Warning for the period of 6:00 PM to 7:00 PM, NWS Significant Weather Advisory for the period of 5:19 PM to 7:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), haze (HZ), and dust (DU). Also, as previously mentioned in the nRCP section of this document, the wind speeds associated with this event reached the 20 mph range at meteorological stations in the area, but the NOAA's National Climatic Data Center Storm events database included observations of strong thunderstorm winds in excess of 46 mph just north of the City of Maricopa in Pinal County at 5:30 PM. These observations are consistent with the base velocity radar data included in the GIS analysis in Figure 5-4 in ADEQ's demonstration, as well as the location of the collapsing thunderstorm and the area of formation of the outflow boundary as described by ADEQ in Section V on p. 27 and p. 32 and of the September 11, 2012, event demonstration. The timing of the September 12, 2011, event is consistent with the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS) and blowing dust.

ADEQ stated that the evidence presented has “demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the satellite images, time series graphs, and meteorological data tables provided in this section for September 11 & 12, 2011, show the temporal progression of the dust events from the development of the thunderstorms, to the increase in wind speeds, and to the rise in PM<sub>10</sub> concentrations. The GIS maps for September 11<sup>th</sup> also showed how soon after the main outflow boundary passed through the Phoenix area, that stagnation allowed PM<sub>10</sub> concentrations to remain high at a few sites. The GIS maps for September 12<sup>th</sup> showed how strong winds and high PM<sub>10</sub> concentrations in Pinal County traveled northward into Maricopa County, leading to a subsequent increase in wind speeds and PM<sub>10</sub> concentrations at the Phoenix area PM<sub>10</sub> monitors. The combination of the PM<sub>10</sub> concentrations and wind data from Maricopa County on September 11<sup>th</sup>, and from Maricopa and Pinal Counties on September 12<sup>th</sup>, supports the conclusion that the events were primarily caused by windblown dust from emission sources outside of Maricopa County and the transport of PM<sub>10</sub> into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, the complex GIS maps, time-lapse video evidence, NOAA dust storm and thunderstorm wind observations, NWS advisories, and NWS station reports of reduced visibility, blowing dust, haze, and dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at monitors identified in Table 2 of this document.

Table 5: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section II: p. 4-15, Section V: p. 27-42, App. D, App. E	Sufficient	Yes
September 12, 2011	Section II: p. 4-15, Section V: p. 43-63, App. D, App. E	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event[s] in question affected air quality.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 6: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section VII: p. 66	Sufficient	Yes
September 12, 2011	Section VII: p. 66	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “events shown to cause these exceedances were emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundaries on September 11 & 12, 2011” and that “the events therefore qualify as a natural events.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 7: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section VII: p. 66-67	Sufficient	Yes
September 12, 2011	Section VII: p. 66-67	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provides no alternative that could tie the exceedances to any other causal source but transported and re-entrained PM<sub>10</sub> generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” ADEQ's summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 8: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 11, 2011	Section VI: p. 65	Sufficient	Yes
September 12, 2011	Section VI: p. 65	Sufficient	Yes

### **Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 9 outlines EPA’s evaluation of these requirements.

Table 9: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1 App. B	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>4</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. D <sup>5</sup>	Yes

### **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 2 on September 11 & 12, 2011. EPA has determined that the flagged exceedances at these locations on these days meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the events provide sufficient evidence to conclude that the events were not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the events and the measured exceedances, there would have been no exceedances but for the events, and the measured exceedances were in excess of normal historical fluctuations.

<sup>4</sup> See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>5</sup> A copy of the affidavit was not included in App. D, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## Event Day: June 16, 2012

Table 10: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
June 16, 2012	Buckeye	04-013-4011-1	202
	Durango Complex	04-013-9812-1	186
	Dysart	04-013-4010-1	167
	Higley	04-013-4006-1	194
	South Phoenix	04-013-4003-1	165
	West 43 <sup>rd</sup>	04-013-4009-1	211
	West Phoenix	04-013-0019-1	189

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 29 mph with gusts of 39 mph, and 32 mph with gusts of 46 mph, and 30 mph with gusts of 37 were measured at Williams Gateway Airport, Casa Grande Municipal Airport, and Falcon Field Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs and a few localized, low-impact violations of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Strong thunderstorm outflows with sustained winds ranging from 20-30 mph, and even greater speeds nearest the source regions, described in Section V, were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations from the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provides strong evidence that the events and exceedances of June 16, 2012, recorded within the Phoenix PM<sub>10</sub> nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for

the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 11: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section IV: p.18-24, Section V: p. 25-34, App. E	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “event that occurred on June 16, 2012, resulted in one of the top 12 highest 24-hour average PM<sub>10</sub> concentrations seen in the last five-plus years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on June 16, 2012, were in excess of normal historical fluctuations.

Table 12: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section III: p. 14-17, App. A	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a very detailed discussion of the event that occurred on June 16, 2012, and a time series graph for the event that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included satellite imagery, time-lapse video evidence, a time series graph for the event that contained hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area, visibility and sustained wind speed from Phoenix Sky Harbor International Airport, and sustained wind speed from Williams Gateway Airport. The CCR analysis also included a time series graph that contained PM<sub>10</sub> concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport, and the raw data tables for numerous NWS stations in Maricopa and Pinal Counties. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Time-lapse video of the event was included and can be found at the following location:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_06162012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_06162012.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on June 16, 2012, at 4:30 PM (central deserts) and 5:09 PM (greater Phoenix area). The timing of these dust storm reports for this event is

consistent with the issuance of a NWS Significant Weather Advisory for the period of 4:24 PM to 6:00 PM, NWS Dust Storm Warning for the period of 4:30 PM to 7:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), haze (HZ), and dust storms (DS).

ADEQ stated that the evidence presented shows a clear causal relationship “between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the satellite images, time series graphs, and meteorological data tables provided in this section show the temporal progression of the dust events from the development of the thunderstorms, to the increase in wind speeds, and to the rise in PM<sub>10</sub> concentrations. The combination of the PM<sub>10</sub> and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM<sub>10</sub> nonattainment area. This information supports the conclusion that the events were primarily caused by windblown dust from emission sources outside of Maricopa County and the transport of PM<sub>10</sub> into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, time-lapse video evidence, NOAA dust storm observations, NWS advisories, and NWS station reports of reduced visibility, blowing dust, haze, and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the monitors identified in Table 10 of this document.

Table 13: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section V: p. 25-34, App. D, App. E	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 14: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section VII: p. 36	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “events shown to cause these exceedances were emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundary on June 16, 2012” and that “the events therefore qualify as natural events.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 15: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section VII: p. 36	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provides no alternative that could tie the exceedances of June 16, 2012, to any other causal source but transported and re-entrained PM<sub>10</sub> generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 16: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 16, 2012	Section VI: p.35	Sufficient	Yes

### **Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 17 outlines EPA’s evaluation of these requirements.

Table 17: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1, App. B	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p.1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>6</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p.2, App. C <sup>7</sup>	Yes

<sup>6</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>7</sup>A copy of the affidavit was not included in App. C, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 10 on June 16, 2012. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the event provides sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedances, there would have been no exceedances but for the event, and the measured exceedances were in excess of normal historical fluctuations.

## Event Day: June 27, 2012

Table 18: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
June 27, 2012	Central Phoenix	04-013-3002-4	340
	Durango Complex	04-013-9812-1	221
	Glendale	04-013-2001-1	337
	Greenwood	04-013-3010-1	323
	Higley	04-013-4006-1	224
	JLG Supersite	04-013-9997-3	344
	JLG Supersite	04-013-9997-4	329
	North Phoenix	04-013-1004-1	178
	South Phoenix	04-013-4003-1	342
	Tempe	04-013-4005-1	169
	West 43 <sup>rd</sup>	04-013-4009-1	221
	West Chandler	04-013-4004-1	220
	Zuni Hills	04-013-4016-1	285

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 38 mph with gusts of 45 mph, 34 mph with gusts of 47 mph, 31 mph with gusts of 39 mph, and 31 mph with gusts of 44 mph were measured at Chandler Municipal Airport, Williams Gateway Airport, Casa Grande Municipal Airport, and Phoenix Sky Harbor, respectively.

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the southeast of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub>

concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 19: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section IV: p. 18-25, Section V: p. 26-35, App. E	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that the “event that occurred on June 27, 2012, resulted in one of the top 10 highest 24-hour average PM<sub>10</sub> concentrations seen in the last five-plus years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on July 18, 2011, were in excess of normal historical fluctuations.

Table 20: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section III: p. 14-17. App. A	Sufficient	Yes

**Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a very detailed discussion of the event that occurred on June 27, 2012, and a time series graph for the event that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included satellite imagery, time-lapse video evidence, a time series graph for the event that contained hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area, visibility and sustained wind speed from Phoenix Sky Harbor International Airport, and sustained wind speed from Williams Gateway Airport. The CCR analysis also included a time series graph that contained PM<sub>10</sub> concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport, and the raw data tables for numerous NWS stations in Maricopa and Pinal Counties. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Time-lapse video of the event was included and can be found at the following location:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_06272012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_06272012.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_06272012.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_06272012.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on June 17, 2012, at 6:00 PM (central deserts) and 6:40 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 5:30 PM to 6:00 PM, NWS Severe Thunderstorm Warning for the period of 6:09 PM to 7:30 PM, NWS Significant Weather Advisory for the period of 6:58 PM to 8:15 PM, NWS Dust Storm Warning for the period of 6:02 PM to 9:00 PM, NWS preliminary local storm reports of dust storms, the observed increased PM<sub>10</sub>

concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust, haze, dust, and dust storms (DS).

ADEQ stated that the evidence presented shows a clear causal relationship “between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the satellite images, time series graphs, and meteorological data tables provided in this section show the temporal progression of the dust events from the development of the thunderstorms, to the increase in wind speeds, and to the rise in PM<sub>10</sub> concentrations. The combination of the PM<sub>10</sub> and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM<sub>10</sub> nonattainment area. This information supports the conclusion that the PM<sub>10</sub> exceedances observed on June 27, 2012, were the result of emissions entrained into the atmosphere by strong thunderstorm outflow boundary winds from source areas to the southeast, outside of the Phoenix PM<sub>10</sub> nonattainment area, and transported into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, time-lapse video evidence, NOAA dust storm observations, NWS local storm reports, NWS advisories, and NWS station reports of reduced visibility, blowing dust, haze, dust, and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at monitors identified in Table 18 of this document.

Table 21: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section V: p. 26-35, App. D, App. E	Sufficient	Yes

**Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 22: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section VII: p. 37	Sufficient	Yes

**Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the events shown to cause these exceedances were emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundary on June 27, 2012” and that “the events therefore qualify as natural events.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 23: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section VII: p. 37	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provides no alternative that could tie the exceedances of June 27, 2012, to any other causal source but transported and re-entrained PM<sub>10</sub> generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 24: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
June 27, 2012	Section VI: p. 36	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 25 outlines EPA’s evaluation of these requirements.

Table 25: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. B	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>8</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. C	Yes

<sup>8</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 18 on June 27, 2012. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the event provides sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedances, there would have been no exceedances but for the event, and the measured exceedances were in excess of normal historical fluctuations.

## Event Day: July 11, 2012

Table 26: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
July 11, 2012	Durango Complex	04-013-9812-1	217
	Greenwood	04-013-3010-1	212
	South Phoenix	04-013-4003-1	285
	West 43 <sup>rd</sup>	04-013-4009-1	172

### Not Reasonably Controllable or Preventable (nRCP)

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 20 mph in multiple locations nearby and upwind of the exceeding monitoring stations throughout the Phoenix PM<sub>10</sub> nonattainment area and above 25 mph in Pinal County. For example, maximum sustained wind speeds of 23 mph with gusts of 33 mph, and 25 mph with gusts of 33 mph were measured at Phoenix Sky Harbor Airport and Casa Grande Municipal Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high-wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> Nonattainment Area. Widespread thunderstorm outflows with sustained winds in excess of 20 mph with gusts over 30 mph were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into and across the Phoenix area, with a majority of the PM<sub>10</sub> emissions recorded by Phoenix area monitors coming from sources outside of the Phoenix PM<sub>10</sub> Nonattainment Area, provides strong evidence that the exceedances of July 11, 2012, recorded within the Phoenix PM<sub>10</sub> Nonattainment Area were not reasonably controllable or preventable.”

While ADEQ states that the majority of the PM<sub>10</sub> emissions were generated outside of the Phoenix PM<sub>10</sub> Nonattainment Area, ADEQ’s documentation included information on the event that indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area may have been affected by PM<sub>10</sub> transport primarily from within the nonattainment area, specifically, the areas in the southeastern portion of the nonattainment area. Information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 27: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 11, 2012	Section V: p 1-7, Section III: p. 1-7, App. A	Sufficient	Yes

## **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “the PM<sub>10</sub> concentrations measured...on July 11, 2012, were among the highest 24-hr averages...measured over the five-year period.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on July 11, 2012, were in excess of normal historical fluctuations.

Table 28: Documentation of HF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
July 11, 2012	Section IV: p. 1-2, App. C	Sufficient	Yes

## **Clear Causal Relationship (CCR)**

Section II of ADEQ's demonstration included a conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a discussion of the event that occurred on July 11, 2012, and general map of the region of the thunderstorm development in relation to the Phoenix PM<sub>10</sub> nonattainment area.

Section III, Appendix A, and Appendix B of the demonstration included satellite imagery visibility photos, time-lapse video evidence, a map of the Phoenix area that displays wind speed and direction at the peak hour of PM<sub>10</sub> concentrations during the event, a map with radar base velocity data that identifies thunderstorm outflow boundaries, a time series of hourly PM<sub>10</sub> concentrations from PM<sub>10</sub> monitors in Pinal County, a time series graph that shows hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area and visibility from Phoenix Sky Harbor Airport, and the raw data tables for numerous NWS stations in Maricopa and Pinal Counties. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. ADEQ also provided a discussion for every map that described the conditions at that time. Time-lapse videos of the event can be found at the following location:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_07112012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_07112012.mp4)

The timing of the event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 8:30 PM to 12:00 AM, NWS Significant Weather Advisory for the period of 10:35 PM to 11:15 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms, haze, and dust.

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust and the PM<sub>10</sub> exceedances measured at four Phoenix-area monitors on July 11, 2012. The radar and wind data shown in this section illustrate the spatial and temporal extent of the dust storm as it moved through the Phoenix area. 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 PM<sub>10</sub> concentrations coincided with the strong wind speeds and wind gusts.”

The analysis in Sections II, III, Appendix A, and Appendix B, specifically, the PM<sub>10</sub> time series graphs, winds speed and direction measurements, maps, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility, thunderstorms, haze, and dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the monitors identified in Table 26 of this document.

Table 29: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 11, 2012	Section II: p. 1-9 Section IV: p. 1-2, App. C, B, & D	Sufficient	Yes

**Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 30: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 11, 2012	Section VII: p. 1	Sufficient	Yes

**Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “PM<sub>10</sub> exceedances on July 11, 2012, were shown to be caused by PM<sub>10</sub> transported into the Phoenix area by thunderstorm outflow” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 31: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 11, 2012	Section VII: p. 1	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

Table 32: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 11, 2012	Section VI: p. 1	Sufficient	Yes

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provides no alternative that could tie the exceedance of July 11, 2012, to any causal source other than PM<sub>10</sub> transported by thunderstorm outflow, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 33 outlines EPA’s evaluation of these requirements.

Table 33: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 1 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p. 1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>9</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p. 1-2 App. E <sup>10</sup>	Yes

### **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 26 on July 11, 2012. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the event provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances were in excess of normal historical fluctuations.

<sup>9</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>10</sup>A copy of the affidavit was not included in App. E, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## Event Day: August 11, 2012

Table 34: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
August 11, 2012	Higley	04-013-4006-1	159
	West Chandler	04-013-4004-1	219

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 32 mph with gusts of 41 mph, and 25 mph with gusts of 36 mph were measured at Chandler Municipal Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the thunderstorm outflow transported high concentrations of PM<sub>10</sub> into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread sustained winds in excess of 20 mph with gusts over 30 mph were strong enough to overwhelm available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong winds that transported PM<sub>10</sub> emissions into and across Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provides strong evidence that the exceedances of August 11, 2012, recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section III of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 35: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section V: p. 1-8, Section III: p. 1-10, App. A	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “the PM<sub>10</sub> concentrations measured...on August 11, 2012, resulted in some of the highest 24-hr averages...measured over the five-year period.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on August 11, 2012, were in excess of normal historical fluctuations.

Table 36: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section IV: p. 1-2, App. C	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a discussion of the event that occurred on August 11, 2012, and general map of the region of the thunderstorm development in relation to the Phoenix PM<sub>10</sub> nonattainment area.

Section III and Appendix A of the demonstration included satellite imagery visibility photos, time-lapse video evidence, the raw data tables for numerous NWS stations in Maricopa and Pinal Counties, and a number of time series graphs that include hourly PM<sub>10</sub> data from Pinal and Maricopa Counties, wind speed, and visibility from Chandler Airport. ADEQ also included a detailed GIS analysis with PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, base velocity radar, and visibility to track the transport of PM<sub>10</sub> throughout the region. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. ADEQ also provided a discussion for every map that described the conditions at that time. Time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_08112012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_08112012.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_08112012.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_08112012.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on August 11, 2012, at 4:30 PM (central deserts) and 5:00 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Dust Storm Warning for the period of 4:00 PM to 6:00 PM, NWS preliminary local storm reports of dust storms, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust and dust storms.

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust and the PM<sub>10</sub> exceedances measured in the Phoenix PM<sub>10</sub> nonattainment area on August 11, 2012.” ADEQ further stated that “the wind, visibility, PM<sub>10</sub>, and radar data shown in this section illustrate the spatial and temporal extent of the dust storm as it moved through Maricopa County. In addition,

meteorological data tables found in Appendix A show that the sharp increase in PM<sub>10</sub> concentrations coincided with gusty winds, low visibilities, and airport observer reports of blowing dust. The fact that PM<sub>10</sub> concentrations in Pinal County peaked prior to PM<sub>10</sub> concentrations peaking in Maricopa County illustrates that a vast majority of the dust that impacted the nonattainment area monitors originated outside of Maricopa County and was transported into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II, III, and Appendix A specifically, the PM<sub>10</sub> time series graphs, winds speed and direction measurements, GIS maps, time-lapse video evidence, NOAA dust storm observations, NWS advisories, NWS preliminary local storm reports , and NWS station reports of reduced visibility, blowing dust and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the West Chandler and Higley monitors. Furthermore, while exceedances occurring at only a few monitors in the network are inherently more complex, the GIS analysis (Figures 3-7 through 3-10 in ADEQ’s demonstration) indicates higher wind speeds were measured in the eastern portion of the nonattainment area influenced the spatial extent of PM<sub>10</sub> throughout the Phoenix PM<sub>10</sub> nonattainment area and was likely responsible for the exceedances at the West Chandler and Higley monitors.

Table 37: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section III: p. 1-10, App. A, App. B, App. D	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 38: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section VII: p. 1	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “PM<sub>10</sub> exceedances in the Phoenix area on August 11, 2012, were shown to be caused by transport of PM<sub>10</sub> into the Phoenix area from gusty winds associated with thunderstorm outflow ” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 39: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section VII: p. 1	Section VII: p. 1	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provides no alternative that could tie the exceedance of August 11, 2012, to any causal source other than PM<sub>10</sub> transported by gusty winds due to thunderstorm outflow, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 40: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 11, 2012	Section VI: p.1	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 41 outlines EPA’s evaluation of these requirements.

Table 41: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.2 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p.2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>11</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p.2-3 App. E <sup>12</sup>	Yes

<sup>11</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>12</sup>A copy of the affidavit was not included in App. E, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 34 on August 11, 2012. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the event provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedances, there would have been no exceedances but for the event, and the measured exceedances were in excess of normal historical fluctuations.

## Event Day: August 14, 2012

Table 42: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
August 14, 2012	Durango Complex	04-013-9812-1	179
	West 43 <sup>rd</sup>	04-013-4009-1	254

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 34 mph with gusts of 41 mph, and 31 mph with gusts of 40 mph were measured at Luke Air Force Base, and Casa Grande Municipal Airport, respectively. Sustained wind speeds of 23 mph with gusts of 33 mph were also measured at Phoenix Sky Harbor Airport.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the thunderstorm outflow transported high concentrations of PM<sub>10</sub> into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread sustained winds in excess of 20 mph with gusts over 40 mph were strong enough to overwhelm available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong winds that transported PM<sub>10</sub> emissions into and across Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provides strong evidence that the exceedances of August 14, 2012, recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section III of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub>

concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 43: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 14, 2012	Section V: p. 1-7, Section III: p. 1-12, App A	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “the PM<sub>10</sub> concentrations measured...on August 14, 2012, resulted in one of the highest 24-hr averages...measured over the five-year period.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on August 14, 2012, were in excess of normal historical fluctuations.

Table 44: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 14, 2012	Section IV: p. 1-2, App. C	Sufficient	Yes

**Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a discussion of the event that occurred on August 14, 2012, and a general map of the region of the thunderstorm development in relation to the Phoenix PM<sub>10</sub> nonattainment area.

Section III of the demonstration included satellite imagery visibility photos, time-lapse video evidence, the raw data tables for numerous NWS stations in Maricopa and Pinal Counties, and a number of time series graphs that include hourly PM<sub>10</sub> data from Pinal and Maricopa Counties, wind speed, and visibility from Phoenix Sky Harbor Airport. ADEQ also included a detailed GIS analysis with PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, base velocity radar, and visibility to track the transport of PM<sub>10</sub> throughout the region. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. ADEQ also provided a discussion for every map that described the conditions at that time. Time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_08142012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_08142012.mp4)

The timing of the August 14, 2012, event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 8:00 PM to 11:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms, blowing dust, haze, and dust storms.

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust and the PM<sub>10</sub> exceedances measured in the Phoenix PM<sub>10</sub> nonattainment area on August 14, 2012.” ADEQ further stated that “The wind, visibility, PM<sub>10</sub>, and radar data shown in this section illustrate the spatial and temporal extent of the dust storm as it moved through Maricopa County. In addition,

meteorological data tables found in Appendix A show that the sharp increase in PM<sub>10</sub> concentrations coincided with the gusty winds, low visibilities, and airport reports of blowing dust. The fact that PM<sub>10</sub> concentrations in Pinal County spiked before PM<sub>10</sub> concentrations increased in Maricopa County shows that a vast majority of the dust that impacted the nonattainment area monitors originated outside of Maricopa County and was transported into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II, III, and Appendix A specifically, the PM<sub>10</sub> time series graphs, winds speed and direction measurements, GIS maps, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility, blowing dust and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the West 43<sup>rd</sup> Avenue and Durango Complex monitors. Furthermore, while exceedances occurring at only a few monitors in the network are inherently more complex, the GIS analysis (Figures 3-7 through 3-10 in ADEQ’s demonstration) indicates higher wind speeds were measured in the western portion of the nonattainment area and variation in wind direction at nearby monitors influenced the spatial extent of PM<sub>10</sub> throughout the Phoenix PM<sub>10</sub> nonattainment area and was likely responsible for the exceedances at the West 43<sup>rd</sup> Avenue and Durango Complex monitors.

Table 45: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 14, 2012	Section III: p. 1-12, App. A, App. B, App. D	Sufficient	Yes

**Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 46: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 14, 2012	Section VII: p. 1	Sufficient	Yes

**Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “PM<sub>10</sub> exceedances in the Phoenix area on August 14, 2012, were shown to be caused by transport of PM<sub>10</sub> into the Phoenix area from gusty winds associated with thunderstorm outflow ” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 47: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 14, 2012	Section VII: p. 1	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provides no alternative that could tie the exceedance of August 14, 2012, to any causal source other than PM<sub>10</sub> transported by gusty winds due to thunderstorm outflow, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 48: Documentation of NEBF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
August 14, 2012	Section VI: p. 1	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 49 outlines EPA’s evaluation of these requirements.

Table 49: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>13</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2-3 App. E <sup>14</sup>	Yes

<sup>13</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>14</sup>A copy of the affidavit was not included in App. E, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 42 on August 14, 2012. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the event provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedances, there would have been no exceedances but for the event, and the measured exceedances were in excess of normal historical fluctuations.

## Event Day: September 6, 2012

Table 50: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
September 6, 2012	West Chandler	04-013-4004-1	164

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 20 mph in multiple locations nearby and upwind of the exceeding monitoring stations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 23 mph with gusts of 40 mph, 24 mph with gusts of 29, and 24 mph with gusts of 33 mph were measured at Chandler Municipal Airport, Phoenix Sky Harbor Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the thunderstorm outflow transported high concentrations of PM<sub>10</sub> into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread wind gusts over 30 mph were strong enough to overwhelm available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong winds that transported PM<sub>10</sub> emissions into and across Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provides strong evidence that the exceedances of September 6, 2012, recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section III of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south of the nonattainment area. Some of these source areas are located in Pinal County, portions of which were recently designated as a moderate nonattainment area (West Pinal) for the 1987 24-hour PM<sub>10</sub> NAAQS (77 FR 32024, May 31, 2012). Currently, the state is undergoing the appropriate process of developing a state implementation plan (SIP), due January 2, 2014, that provides for attainment of the PM<sub>10</sub> standard as expeditiously as practicable but no later than the end of the sixth calendar year after redesignation. The SIP development process includes the requirement to identify and implement reasonably available control measures for the area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 51: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section V: p. 1-8, Section III: p. 1-10, App. A	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages and stated that these figures show that “the PM<sub>10</sub> concentrations measured at the West Chandler monitor on September 6, 2012, resulted in some of the highest 24-hr averages...measured over the five-year period.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on September 6, 2012, were in excess of normal historical fluctuations.

Table 52: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section IV: p. 1-2	Sufficient	Yes

**Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information. The conceptual model also included a discussion of the event that occurred on September 6, 2012.

Section III and Appendix A of the demonstration included satellite imagery visibility photos, time-lapse video evidence, the raw data tables for numerous NWS stations in Maricopa County, and a number of time series graphs that include hourly PM<sub>10</sub> data from Pinal and Maricopa Counties, wind speed, and visibility from Chandler Airport. ADEQ also included a detailed GIS analysis with PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, base velocity radar, and visibility to track the transport of PM<sub>10</sub> throughout the region. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. ADEQ also provided a discussion for every map that described the conditions at that time. Time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_09062012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_09062012.mp4)
- Superstition Mountains: [www.phoenixvis.net/videos/mpeg4/SUPM\\_09062012.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_09062012.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on September 6, 2012, at 4:15 PM (central deserts) and 4:50 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Dust Storm Warning for the period of 4:16 PM to 7:00 PM, NWS Blowing Dust Advisory for the period of 4:41 PM to 5:00 PM, NWS Severe Thunderstorm Warning for the period of 4:19 PM to 5:00 PM, NWS preliminary local storm reports of dust storms, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms, blowing dust, haze, and dust storms.

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust and the PM<sub>10</sub> exceedances measured in the Phoenix PM<sub>10</sub> nonattainment area on September 6, 2012.” ADEQ further stated that “The wind, visibility, PM<sub>10</sub>, and radar data shown in this section illustrate the

spatial and temporal extent of the dust storm as it moved through Maricopa County. In addition, meteorological data tables found in Appendix A show that the sharp increase in PM<sub>10</sub> concentrations coincided with the gusty winds, low visibilities, and airport observer reports of blowing dust. The fact that PM<sub>10</sub> concentrations in Pinal County spiked prior to PM<sub>10</sub> concentrations increasing in Maricopa County illustrate that a vast majority of the dust that impacted the nonattainment area monitors originated outside of Maricopa County and was transported into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II, III, and Appendix A specifically, the PM<sub>10</sub> time series graphs, winds speed and direction measurements, GIS maps, time-lapse video evidence, NOAA dust storm observations, NWS advisories, NWS preliminary local storm reports, and NWS station reports of reduced visibility, blowing dust and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the West Chandler monitor. Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the GIS analysis (Figures 3-6 through 3-9 in ADEQ’s demonstration) indicates that a shift in wind direction from the southwest to west influenced the spatial extent of PM<sub>10</sub> throughout the Phoenix PM<sub>10</sub> nonattainment area and was likely responsible for the isolated exceedance at the West Chandler monitor.

Table 53: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section III: p. 1-10, App. A, App. B, App. C	Sufficient	Yes

**Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 54: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section VII: p. 1	Sufficient	Yes

**Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “ PM<sub>10</sub> exceedances in the Phoenix area on September 6, 2012, were shown to be caused by transport of PM<sub>10</sub> into the Phoenix area from gusty winds associated with thunderstorm outflow” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 55: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section VII: p. 1	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provides no alternative that could tie the exceedance of September 6, 2012, to any causal source other than PM<sub>10</sub> transported by gusty winds due to thunderstorm outflow, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 56: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 6, 2012	Section VI: p. 1	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 49 outlines EPA’s evaluation of these requirements.

Table 57: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. C	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	February 13, 2013 letter <sup>15</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 1 App. D <sup>16</sup>	Yes

<sup>15</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated February 13, 2013.

<sup>16</sup>A copy of the affidavit was not included in App. D, as stated in Section I of the final demonstration, but was submitted to EPA as part of the February 13, 2013 submission.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused an exceedance of the 24-hour PM<sub>10</sub> NAAQS at the location outlined in Table 50 on September 6, 2012. EPA has determined that the flagged exceedance at this location on this day meets the definition of an exceptional event: the exceedances affected air quality, was not reasonably controllable or preventable, and met the definition of a natural event. In addition to transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the low pressure system provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there was a clear causal relationship between the event and the measured exceedance, there would have been no exceedance but for the event, and the measured exceedance was in excess of normal historical fluctuations.

## **CONCLUSION**

EPA finds that the weight of evidence is sufficient for concurrence on the flagging of the data for the monitors identified in Table 1 on September 11 & 12, 2011, June 16, June 27, July 11, August 11, August 14, and September 6, 2012. These concurrences do not constitute final EPA action to exclude these data from consideration for purposes of determining the attainment status of the area. Final actions will come only after EPA completes notice and comment rulemaking on any such determinations.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street  
San Francisco, CA 94105-3901

MAY 06 2013

OFFICE OF THE  
REGIONAL ADMINISTRATOR

Mr. Eric Massey, Director  
Air Quality Division  
Arizona Department of Environmental Quality  
1110 W. Washington Street  
Phoenix, Arizona 85007

Dear Mr. Massey:

This letter responds to Arizona Department of Environmental Quality's (ADEQ) January 28, 2013 submittal regarding 65 exceedances of the 24-hour PM<sub>10</sub> standard that occurred at several monitoring stations within the Phoenix PM<sub>10</sub> nonattainment area on the following days: February 19, July 18, August 3, August 18, August 25-28, September 2, October 4, November 4, 2011 and February 27, 2012.<sup>1</sup>

ADEQ's submittal included documentation that these exceedances were caused by high wind exceptional events. EPA has reviewed the documentation provided by ADEQ to demonstrate that the exceedances on these days meet the criteria for an exceptional event in the Exceptional Events Rule (EER). EPA concurs based on the weight of the evidence that the exceedances were caused by high wind exceptional events and finds that ADEQ has successfully made the demonstrations referred to in 40 CFR §50.14 to EPA's satisfaction. In addition, ADEQ has met the schedule and procedural requirements in section 50.14(c) with respect to the same data. A more detailed assessment of ADEQ's demonstration is enclosed. My staff has or shortly will enter "concurrency flags" for these data into EPA's AQS data system.

Based on these determinations, EPA will exclude these data from the following types of calculations and activities:

- EPA's Air Quality Data system (AQS) will not count these days as exceedances when generating user reports, or include them in design values estimates, unless the AQS user specifically indicates that they should be included.
- EPA will accept the exclusion of these data for the purposes of selecting appropriate background concentrations for New Source Review air quality analyses.<sup>2</sup>
- EPA will accept the exclusion of these data for the purposes of selecting appropriate background concentrations for transportation conformity hot spot analyses.<sup>3</sup>

<sup>1</sup>ADEQ also submitted an exceptional events demonstration for exceedances of the 24-hour PM<sub>10</sub> standard that occurred on January 21-22, 2012 within the Phoenix PM<sub>10</sub> nonattainment area and an exceedance measured in Yuma, AZ on July 3, 2011. At this time, EPA is not acting on the January 21-22, 2012 or the July 3, 2011 Yuma, AZ demonstrations.

<sup>2</sup> If we are the permitting authority, we will propose permits on this basis. If we are commenting on another permitting authority's proposed action, our comments will be consistent with the determinations in this letter.

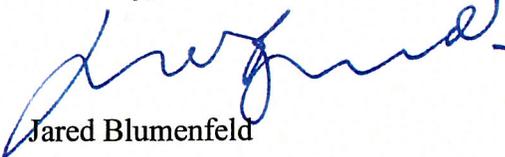
<sup>3</sup> Applicable only to PM<sub>10</sub> and PM<sub>2.5</sub>.

- The data will continue to be publically available, but EPA's publications and public information statements on the status of air quality in the affected area will not reflect these data in any summary statistic of potential regulatory application, unless such inclusion is specifically noted.<sup>4</sup>

In addition, EPA will rely on calculated values that exclude this data in proposed regulatory actions, such as a proposed designation, classification, attainment demonstration, or finding as to whether the Phoenix PM<sub>10</sub> nonattainment area has met the PM<sub>10</sub> NAAQS. These regulatory actions require EPA to provide an opportunity for public comment prior to taking a final Agency action. If EPA is pursuing one of these actions for the Phoenix PM<sub>10</sub> nonattainment area, EPA will open a new comment period during which EPA may receive comments on the exceptional event submission you have made and the determinations conveyed in this letter. If so, we must consider and respond to those comments before taking final regulatory action. Accordingly, the determinations conveyed in this letter do not constitute final EPA action regarding any matter on which EPA is required to provide an opportunity for public comment. In particular, this point applies to determinations regarding the attainment status or classification of the area. Final actions will take place only after EPA completes notice and comment rulemaking on those determinations. As an additional clarification, the determinations conveyed in this letter are applicable only to determinations incorporating the submitted data relative to the PM<sub>10</sub> NAAQS.

If you have any questions or wish to discuss this matter further, please contact Deborah Jordan, Director, Air Division at (415) 947-8715.

Sincerely,



Jared Blumenfeld

Enclosure

cc: Theresa Rigney, ADEQ

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<sup>4</sup> These data may be included in statistics intended to describe trends in actual air quality in the area.

## EXCEPTIONAL EVENTS RULE REQUIREMENTS

EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. The EER added 40 CFR §50.1(j), (k) and (l); §50.14; and §51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements, and requirements for air agency demonstrations, all of which must be met before EPA can concur under the EER on the exclusion of air quality data from regulatory decisions.

Under 40 CFR §50.14(c)(3)(iv), the air agency demonstration to justify exclusion of data must provide evidence that:

- A. “The event satisfies the criteria set forth in 40 CFR §50.1(j)” for the definition of an exceptional event;
  - The event “affects air quality.”
  - The event “is not reasonably controllable or preventable.”
  - The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”<sup>1</sup>
- B. “There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;”
- C. “The event is associated with a measured concentration in excess of normal historical fluctuations, including background;” and
- D. “There would have been no exceedance or violation but for the event.”

### **Not Reasonably Controllable or Preventable (nRCP)**

EPA evaluates whether an event was not reasonably controllable or preventable at the time of the event by taking into account controls in place and wind speed, along with other factors.<sup>2</sup> For *natural* sources of dust, a high wind dust event can generally be considered to be not reasonably controllable or preventable if winds are high enough to cause emissions from natural undisturbed areas. For *anthropogenic* sources of dust, a high wind dust event is also eligible to be considered to be not reasonably controllable or preventable if:

1. The anthropogenic sources of dust have reasonable controls in place,
2. The reasonable controls have been effectively implemented and enforced, and
3. The wind speed was high enough to overwhelm the reasonable controls.

### **Historical Fluctuations (HF)**

EPA evaluates whether a measured exceedance is in excess of historical fluctuation by taking into account the level of the exceedance in relation to historical data, which is typically 3 to 5 years.

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<sup>1</sup>A natural event is further described in 40 CFR 50.1(k) as “an event in which human activity plays little or no direct causal role.”

<sup>2</sup>See e.g., Affirmation of Attainment of PM-10 NAAQS for the San Joaquin Valley Nonattainment Area, 73 FR 14691 (March 19, 2008).

## **Clear Causal Relationship (CCR)**

EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area. Demonstrations typically include documentation showing that the event in fact occurred and that emissions related to the event were transported in the direction of the monitor(s) where elevated concentrations measurements were recorded; the size of the area affected by the transported emissions; the relationship in time between the event, transport of emissions, and recorded concentrations; and, as appropriate, pollutant species-specific information supporting a causal relationship between the event and the measured concentration.

## **Affects Air Quality (AAQ)**

Generally, EPA will consider events to have affected air quality if the CCR and HF requirements have been adequately demonstrated.

## **Natural Event**

Generally, EPA will consider a high wind dust event to be a natural event in cases where windblown dust is entirely from natural sources or where all significant anthropogenic sources of windblown dust have been reasonably controlled.<sup>3</sup> This typically involves adequately demonstrating both the nRCP and CCR requirements.

## **No Exceedance or Violation But For the Event (NEBF)**

Generally, for high wind dust events, the NEBF demonstration is similar to and informed by the demonstration of the nRCP and CCR requirements, and is expected to show that the measured concentration would have been below the applicable NAAQS without the effect of the event.

## **OVERVIEW OF EVENTS**

On January 28, 2013, Arizona Department of Environmental Quality (ADEQ) submitted nine exceptional events demonstrations for 65 exceedances of the 24-hour PM<sub>10</sub> standard that occurred at several monitoring stations within the Phoenix PM<sub>10</sub> nonattainment area on the following days: February 19, July 18, August 3, August 18, August 25-28, September 2, October 4, November 4, 2011 and February 27, 2012. Table 1 summarizes these exceedances.

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<sup>3</sup>The EPA will generally consider human activity to have played little or no *direct* role in causing emissions of the dust generated by high wind for purposes of the regulatory definition of “natural event” if contributing anthropogenic sources of the dust are reasonably controlled, regardless of the amount of dust coming from these reasonably controlled anthropogenic sources, and thus the event could be considered a natural event. In such cases, the EPA believes that it would generally be a reasonable interpretation of its regulations to find that the anthropogenic source had “little” direct causal role. If anthropogenic sources of windblown dust that are reasonably controllable but that did not have those reasonable controls applied at the time of the high wind event have contributed significantly to a measured concentration, the event would not be considered a natural event. See preamble to the EER at 72 FR 13566, f.n. 11.

Generally, ADEQ states that the exceedances measured on July 18, August 3, August 18, August 25-28, and September 2, 2011 were associated with “monsoonal thunderstorm activity” and “thunderstorm-driven high winds,” while the exceedances measured on February 19, October 4, November 4, 2011, and February 27, 2012 were associated with the passage of “low pressure systems” or “strong Pacific cold fronts.” ADEQ provided a comprehensive description and discussion of each of these events in the respective demonstrations.<sup>4</sup>

Table 1: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
February 19, 2011	West Chandler	04-013-4004-1	168
July 18, 2011	Buckeye	04-013-4011-1	196
	Central Phoenix	04-013-3002-4	210
	Durango Complex	04-013-9812-1	267
	Dysart	04-013-4010-1	163
	Greenwood	04-013-3010-1	208
	South Phoenix	04-013-4003-1	303
	West 43 <sup>rd</sup>	04-013-4009-1	159
	West Phoenix	04-013-0019-1	244
August 3, 2011	West Chandler	04-013-4004-1	249
August 18, 2011	Buckeye	04-013-4011-1	296
	Central Phoenix	04-013-3002-4	232
	South Phoenix	04-013-4003-1	179
	West Chandler	04-013-4004-1	186
August 25, 2011	Buckeye	04-013-4011-1	235
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	436
	Dysart	04-013-4010-1	273
	Glendale	04-013-2001-1	240
	Buckeye	04-013-4011-1	388
	JLG Supersite	04-013-9997-3	227
	JLG Supersite	04-013-9997-4	228
	South Phoenix	04-013-4003-1	308
	West 43 <sup>rd</sup>	04-013-4009-1	369
	West Chandler	04-013-4004-1	278
	West Phoenix	04-013-0019-1	212
	Zuni Hills	04-013-4016-1	212
August 26, 2011	Apache Junction	04-021-3002-1	169
August 27, 2011	Buckeye	04-013-4011-1	225
	Central Phoenix	04-013-3002-4	233
	Durango Complex	04-013-9812-1	261
	Glendale	04-013-2001-1	219
	Greenwood	04-013-3010-1	207
	South Phoenix	04-013-4003-1	301
	West 43 <sup>rd</sup>	04-013-4009-1	292
	West Chandler	04-013-4004-1	228
	West Phoenix	04-013-0019-1	164
August 28, 2011	Apache Junction	04-021-3002-1	283
	Higley	04-013-4006-1	175

<sup>4</sup>ADEQ also submitted an exceptional events demonstration for exceedances of the 24-hour PM<sub>10</sub> standard that occurred on January 21-22, 2012 within the Phoenix PM<sub>10</sub> nonattainment area and an exceedance measured in Yuma, AZ on July 3, 2011. At this time, EPA is not acting on the January 21-22, 2012 or the July 3, 2011 Yuma, AZ demonstrations.

Table 1: EPA PM<sub>10</sub> Exceedance Summary

<b>Exceedance Date</b>	<b>Monitor/Site Name</b>	<b>AQS ID</b>	<b>24-hour Avg. (µg/m<sup>3</sup>)</b>
September 2, 2011	Apache Junction	04-021-3002-1	217
	Buckeye	04-013-4011-1	169
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	225
	Greenwood	04-013-3010-1	198
	Higley	04-013-4006-1	213
	JLG Supersite	04-013-9997-4	208
	South Phoenix	04-013-4003-1	339
	West 43 <sup>rd</sup>	04-013-4009-1	219
	West Chandler	04-013-4004-1	387
October 4, 2011	Higley	04-013-4006-1	158
	West Chandler	04-013-4004-1	251
November 4, 2011	Apache Junction	04-021-3002-1	225
	Buckeye	04-013-4011-1	284
	Central Phoenix	04-013-3002-4	223
	Durango Complex	04-013-9812-1	251
	Dysart	04-013-4010-1	224
	Glendale	04-013-2001-1	229
	Greenwood	04-013-3010-1	231
	Higley	04-013-4006-1	258
	JLG Supersite	04-013-9997-3	200
	JLG Supersite	04-013-9997-4	199
	North Phoenix	04-013-1004-1	186
	North Phoenix	04-013-1004-2	186
	South Phoenix	04-013-4003-1	231
	West 43 <sup>rd</sup>	04-013-4009-1	242
	West Chandler	04-013-4004-1	670
	West Phoenix	04-013-0019-1	279
Zuni Hills	04-013-4016-1	258	
February 27, 2012	West 43 <sup>rd</sup>	04-013-4009-1	167

## FEBRUARY 19, 2011

Table 2: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
February 19, 2011	West Chandler	04-013-4004-1	168

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 33 mph with gusts of 52 mph, 33 mph with gusts of 43 mph, and 31 mph with gusts of 44 mph were measured at Chandler Municipal Airport, Williams Gateway Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explained that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the pre-frontal storm winds generated and transported high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the nonattainment area. Sustained winds over 30 mph and gusts over 50 mph easily overwhelmed all available efforts to limit PM<sub>10</sub> concentrations from the event. The fact that this was a natural event involving pre-frontal storm winds that generated and transported PM<sub>10</sub> emissions in Maricopa County provided strong evidence that the exceedance on February 19, 2011 recorded at the West Chandler monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 3: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section IV: p. 17-23, Section V: p. 24-41	Sufficient	Yes

## **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> 24-hour averages and PM<sub>10</sub> daily maximum hourly averages in Figures 3-1 and 3-2 of the demonstration, respectively. ADEQ also stated that these figures “indicate that the PM<sub>10</sub> concentrations seen at the West Chandler monitor on February 19, 2011 were in excess of normal historical fluctuations.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on February 19, 2011 were in excess of normal historical fluctuations.

Table 4: Documentation of HF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
February 19, 2011	Section III: p. 15-16	Sufficient	Yes

## **Clear Causal Relationship (CCR)**

Section II of ADEQ's demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate information, and surface weather maps for the event for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on February 19, 2011 and a time series graph for the event that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, precipitation, and visibility to track the transport of PM<sub>10</sub> throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time. The timing of the event is consistent with the issuance of a National Weather Service (NWS) Wind Advisory for the period of 11:00 AM to 2:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), haze (HZ), and dust (DU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_02192011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_02192011.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_02192011.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_02192011.mp4)
- Camelback Mountains: [http://www.phoenixvis.net/videos/mpeg4/CAME\\_02192011.mp4](http://www.phoenixvis.net/videos/mpeg4/CAME_02192011.mp4)

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust generated and transported by the pre-frontal storm winds and the exceedance at the West Chandler monitor.” ADEQ further stated that “the particular wind magnitudes and wind direction, the proximity of the exceeding monitor to open and desert areas of Pinal County, and the delay in the storm precipitation reaching the areas around the exceeding monitor provide solid evidence as to why only one monitor within the Maricopa County nonattainment area recorded an exceedance.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, GIS maps, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility, blowing dust, haze, and dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from pre-frontal storm winds and the exceedance measured at the West Chandler monitor. Furthermore, while exceedances occurring at only

one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through 5-10) indicates that a shift in wind direction from the southwest to west, the spatial extent of precipitation throughout the Phoenix PM<sub>10</sub> nonattainment area, and stronger wind speeds in the eastern portion of the nonattainment area are likely responsible for the isolated exceedance at the West Chandler monitoring station.

Table 5: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section II: p.4-14, Section V: p. 24-41, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstration for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 6: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VII: p. 44	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause this exceedance was emissions of PM<sub>10</sub> caused by pre-frontal storm winds on February 19, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 7: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VII: p. 44	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding both the nRCP and CCR requirements and also included a time series graph that included hourly PM<sub>10</sub>, hourly, wind speeds, and wind gusts showing that PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedance on February 19, 2011 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the pre-frontal storm winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 8: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 19, 2011	Section VI: p. 42-43	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 9 outlines EPA’s evaluation of these requirements.

Table 9: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1, App. A	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>5</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p.2, App. C	Yes

**Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by pre-frontal storm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 2 on February 19, 2011. EPA has determined that the flagged exceedances at this location on this day meet the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the pre-frontal storm provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedance, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

<sup>5</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## JULY 18, 2011

Table 10: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
July 18, 2011	Buckeye	04-013-4011-1	196
	Central Phoenix	04-013-3002-4	210
	Durango Complex	04-013-9812-1	267
	Dysart	04-013-4010-1	163
	Greenwood	04-013-3010-1	208
	South Phoenix	04-013-4003-1	303
	West 43 <sup>rd</sup>	04-013-4009-1	159
	West Phoenix	04-013-0019-1	244

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that, sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 25 mph with gusts of 37 mph and 29 mph with gusts of 38 mph were measured at Phoenix Sky Harbor International Airport and Casa Grande Municipal Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM<sub>10</sub> nonattainment area, specifically at Williams Gateway Airport, Chandler Municipal Airport, Glendale Municipal Airport, and Luke Air Force Base Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs and a few localized, low-impact violations of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Strong thunderstorm outflows with sustained winds typically ranging from 20-30 mph, and even greater nearest the source regions, were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provided strong evidence that the events and exceedances of July 18, 2011, recorded within the Phoenix PM<sub>10</sub> nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area

were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event is not reasonably controllable or preventable.

Table 11: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section IV: p.18-24, Section V: p.25-33	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages. ADEQ also stated that these figures show that “the event that occurred on July 18, 2011 resulted in one of the top ten highest 24-hour average PM<sub>10</sub> concentrations seen in the last five years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on July 18, 2011 were in excess of normal historical fluctuations.

Table 12: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section III: p. 14-17, App. A	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on July 18, 2011 and a time series graph for the event that included hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included satellite imagery, a time series graph for the event that included hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area, visibility, and sustained wind speed from Phoenix Sky Harbor International Airport, and a time series graph that included PM<sub>10</sub> concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Also, a time-lapse video of the event was included and can be found at the following location:

- South Mountain: [www.phoenixvis.net/videos/mpeg4/SOMT\\_07182011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_07182011.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on July 18, 2011 at 3:00 PM (central deserts) and 5:00 PM (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 3:00 PM to 6:45 PM, NWS Significant Weather Advisory for the period of 2:38 PM to 7:15 PM, and a NWS Dust Storm Warning for the period of 2:30 PM to 7:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS).

ADEQ stated that the evidence presented shows a “clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the satellite images, time series graphs, and meteorological data tables provided in this section show the temporal progression of the dust events from the development of the thunderstorms, to the increase in wind speeds, and to the rise in PM<sub>10</sub> concentrations. The combination of the PM<sub>10</sub> and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM<sub>10</sub> nonattainment area. This information supports the conclusion that the events were primarily drawing from emission sources outside of Maricopa County and were being transported into the Phoenix area.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, thunderstorms, blowing dust, haze and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the monitors identified in Table 10 of this document.

Table 13: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section II: p 4-13, Section V: p. 25-33, App. D	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 14: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section VII: p.35	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the events shown to cause these exceedances were emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundaries on July 18, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 15: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 18, 2011	Section VII: p.35	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provided no alternative that could tie the exceedances of July 18, 2011, to any other causal source but transported and re-entrained PM<sub>10</sub> generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” Also, PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS, providing further support of ADEQ’s conclusion. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 16: Documentation of NEBF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
July 18, 2011	Section VI: p. 34	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 17 outlines EPA’s evaluation of these requirements.

Table 17: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p.1 App. B	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>6</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p.2 App. D	Yes

<sup>6</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 10 on July 18, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

## August 3, 2011

Table 18: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
August 3, 2011	West Chandler	04-013-4004-1	249

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 20 mph. For example, maximum sustained wind speeds of 22 mph with maximum gusts of 25 mph were measured at Williams Gateway Airport, while sustained wind speeds of 20 mph were measured at other locations in Maricopa and Pinal Counties. For example, sustained wind speeds of 20 mph with gusts of 32 mph, 20 mph with gusts of 26, and 20 mph with gusts of 29 mph were measured at the Pinal County Housing, Higley, and West Chandler monitoring stations, respectively.

Due to the timing of the event, data from NWS stations that ADEQ typically uses in exceptional event demonstrations were not available. Some locations did not begin reporting meteorological measurements until after the event had occurred, which was approximately from 1:00 AM to 3:00 AM at the West Chandler monitor. For example, the Chandler Municipal Airport station began reporting meteorological measurement at 5:47 AM, and the Casa Grande Municipal Airport station began reporting measurements at 3:35 AM on August 3, 2011. Despite the lack of data from the early hours of the day, it is nevertheless plausible that higher wind speeds occurred in the source area where the thunderstorm outflows were strongest. ADEQ explains that “it is very likely the thunderstorm outflow generated dust storm developed in the area south of the PCH monitor [in Pinal County], but north of Pima County.”

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the nonattainment area. Strong thunderstorm outflows with gusts over 30 mph, were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations from the events. The fact that this was a natural event involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into Maricopa County from source regions outside of the nonattainment area provided strong evidence that the event and exceedance of August 3, 2011 recorded at the West Chandler monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, the timing of the event, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 19: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section IV: p. 16-22, Section V: p. 23-41, App. B	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> 24-hour averages and PM<sub>10</sub> daily maximum hourly averages in Figures 3-1 and 3-2 of the demonstration, respectively. ADEQ also stated that these figures “indicate that the PM<sub>10</sub> concentrations seen at the West Chandler monitor on August 3, 2011 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on August 3, 2011 were in excess of normal historical fluctuations.

Table 20: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section III: p. 14-15	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on August 3, 2011 and a time series graph for the event that included hourly PM<sub>10</sub> concentration.

Section V of the demonstration included a detailed and extensive GIS analysis that shows the spatial and temporal representation of the events as they move throughout Maricopa and Pinal Counties. The analysis included PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, visibility, and base velocity radar to track the transport of PM<sub>10</sub> throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time. The timing of the event is consistent with the issuance of a NWS Dust Storm Warning for the period of 1:00 AM to 2:00 AM, and the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of haze (HZ). While time-lapse videos of the event are not available, ADEQ included a number of visibility images looking northeast towards Camelback Mountain for 12:00 AM, 3:00 AM and 6:00 AM, and stated that “these images provide additional evidence for a clear causal connection between the transported windblown dust from thunderstorm outflow winds with the high PM<sub>10</sub> concentrations at monitors throughout the nonattainment area.”

ADEQ stated that the evidence presented “has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the West Chandler monitor.” ADEQ further stated that “the particular wind magnitudes and wind direction, and the proximity of the exceeding monitor to open and desert areas of Pinal County provide solid evidence as to why only one monitor within the Maricopa County nonattainment area recorded an exceedance. It is clear from these data that thunderstorm outflow winds transported uncontrollable windblown PM<sub>10</sub> emissions to the West Chandler monitor, demonstrating a clear causal connection between the event and the exceedance.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, GIS maps, visibility images, NWS advisories, and NWS station reports of reduced visibility, and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the West Chandler monitor. Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through 5-12) shows that the isolated spatial extent of the thunderstorm outflow and stronger wind speeds in the eastern portion of the nonattainment area are likely responsible for the isolated exceedance at the West Chandler monitoring station.

Table 21: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section V: p. 23-41, Section II: p. 4-13, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 22: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section VII: p. 44	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause this exceedance was emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundaries on August 3, 2011” and that “the events therefore qualifies as natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 23: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 3, 2011	Section VII: p. 44	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph that included hourly PM<sub>10</sub>, hourly wind speeds, and wind gusts showing that PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedance on August 3, 2011 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the thunderstorm outflow winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 24: Documentation of NEBF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
August 3, 2011	Section VI: p. 42-43	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 25 outlines EPA’s evaluation of these requirements.

Table 25: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p.1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>7</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p.2 App.C	Yes

<sup>7</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 18 on August 3, 2011. EPA has determined that the flagged exceedance at this location on this day meets the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, the timing of the event, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedance, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

## August 18, 2011

Table 26: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
August 18, 2011	Buckeye	04-013-4011-1	296
	Central Phoenix	04-013-3002-4	232
	South Phoenix	04-013-4003-1	179
	West Chandler	04-013-4004-1	186

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that, sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 32 mph with gusts of 41 mph and 28 mph with gusts of 39 mph were measured at Chandler Municipal Airport and Phoenix Sky Harbor International Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM<sub>10</sub> nonattainment area and Pinal County, specifically at Williams Gateway Airport, Glendale Municipal Airport, Luke Air Force Base Airport, Gila Bend Air Field, and Casa Grande Municipal Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high-wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread thunderstorm outflows with sustained winds in excess of 20 mph with gusts over 30 mph were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into and across the Phoenix area, with a majority of the PM<sub>10</sub> emissions recorded by Phoenix area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provided strong evidence that the exceedances of August 18, 2011 recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 27: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section V: p. 1-7, Section III: p. 1-6, App. A, App. B	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages. ADEQ also stated that these figures show that “the PM<sub>10</sub> concentrations...on August 18, 2011 were among the highest 24-hr averages measured over the five-year period” and “the PM<sub>10</sub> levels on August 18, 2011, were outside of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on August 18, 2011 were in excess of normal historical fluctuations

Table 28: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section IV: p. 1, App. C	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on August 18, 2011.

Section III and Appendix A of the demonstration included satellite imagery, radar base velocity data for 1806 LST, PM<sub>10</sub> and meteorological data for the time period of 6:00 PM to 8:00 PM, and time series graphs that included hourly PM<sub>10</sub> concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM<sub>10</sub> concentrations from Buckeye, Central Phoenix, South Phoenix, and West Chandler monitors, and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County. Also, time-lapse videos of the event were included in Appendix B of ADEQ’s demonstration and can be found at the following locations:

- South Mountain: [www.phoenixvis.net/videos/mpeg4/SOMT\\_08182011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_08182011.mp4)
- Superstition Mountains: [www.phoenixvis.net/videos/mpeg4/SUPM\\_08182011.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_08182011.mp4)
- Camelback Mountains: [www.phoenixvis.net/videos/mpeg4/CAME\\_08182011.mp4](http://www.phoenixvis.net/videos/mpeg4/CAME_08182011.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on August 18, 2011 at 4:00 PM (central deserts), and at 5:00 PM hours (greater Phoenix area). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Dust Storm Warning for the period of 4:45 PM to 8:00 PM and a NWS Severe Thunderstorm Warning for the period of 5:00 PM to 7:00 PM, observed increased PM<sub>10</sub> concentrations in the Phoenix area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS).

Again, while not included in the final documentation, it is important to note that hourly PM<sub>10</sub> concentrations at the southern monitoring sites (Pinal County Housing, Stanfield, and Casa Grande) in Pinal County began also to dramatically increase at 5:00 PM, while PM<sub>10</sub> concentrations at more northern monitoring sites (Cowntown, Combs School, and Maricopa) in the County began to increase at

6:00 PM. Sustained wind speeds above 25 mph that were associated with the increase in PM<sub>10</sub> in Pinal County were measured at Casa Grande Municipal Airport at 4:55, 5:15, 6:15, 6:35, and 6:55 PM. These data indicate that PM<sub>10</sub> was largely transported from outside of the nonattainment area from thunderstorm outflow winds. ADEQ stated that, “the information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM<sub>10</sub> exceedances measured at four Phoenix-area monitors on August 18, 2011.”

The analysis in Sections II, III and Appendix A, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, thunderstorms, blowing dust, haze, and dust storms, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the monitors identified in Table 26 of this document.

Table 29: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section III: p. 1-6, Section V: p. 1-7, App. A, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstration for both the CCR and HF requirements, “we can reasonably conclude the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 30: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VII: p. 1	Sufficient	Yes

### **Natural Event**

ADEQ provided adequate documentation for both the nRCP and CCR requirements and generally stated that, “the PM<sub>10</sub> exceedances on August 18, 2011, were shown to be caused by PM<sub>10</sub> transported into the Phoenix area by thunderstorm outflow” and that “the event therefore qualifies as a natural event.”

Table 31: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VII: p. 1	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information presented in the documentation that demonstrate both the nRCP and CCR requirements have been met and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedances of August 18, 2011, to any causal source except PM<sub>10</sub> transported by thunderstorm outflow, confirming that there would have been no exceedances but for the presence of this uncontrollable natural event.” Also, PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS, providing further support of ADEQ’s conclusion.

Table 32: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 18, 2011	Section VI: p. 1	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 33 outlines EPA’s evaluation of these requirements.

Table 33: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>8</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p. 2-3 App. E	Yes

**Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 26 on August 18, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

<sup>8</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## AUGUST 25, 2011 – AUGUST 28, 2011

Table 34: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
August 25, 2011	Buckeye	04-013-4011-1	235
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	436
	Dysart	04-013-4010-1	273
	Glendale	04-013-2001-1	240
	Buckeye	04-013-4011-1	388
	JLG Supersite	04-013-9997-3	227
	JLG Supersite	04-013-9997-4	228
	South Phoenix	04-013-4003-1	308
	West 43 <sup>rd</sup>	04-013-4009-1	369
	West Chandler	04-013-4004-1	278
	West Phoenix	04-013-0019-1	212
	Zuni Hills	04-013-4016-1	212
August 26, 2011	Apache Junction	04-021-3002-1	169
August 27, 2011	Buckeye	04-013-4011-1	225
	Central Phoenix	04-013-3002-4	233
	Durango Complex	04-013-9812-1	261
	Glendale	04-013-2001-1	219
	Greenwood	04-013-3010-1	207
	South Phoenix	04-013-4003-1	301
	West 43 <sup>rd</sup>	04-013-4009-1	292
	West Chandler	04-013-4004-1	228
	West Phoenix	04-013-0019-1	164
August 28, 2011	Apache Junction	04-021-3002-1	283
	Higley	04-013-4006-1	175

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph, including maximum sustained wind speeds of 26 mph with gusts of 33 mph at Phoenix Sky Harbor International Airport on August 25, 2011, 30 mph at Williams Gateway Airport on August 26, 2011, and 29 mph at Luke Air Force Base Airport on August 27, 2011. Sustained wind speeds greater than 25 mph were also measured at other locations in the Phoenix PM<sub>10</sub> nonattainment area throughout the three-day period. ADEQ also asserts that due to the timing of the August 27, 2011 late evening event, the conditions that led to nine exceedances in the Phoenix PM<sub>10</sub> nonattainment area on

August 27, 2011, were similarly responsible for the exceedances measured at Higley and Apache Junction on August 28, 2011.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs and a few localized, low-impact violations of the dust control rules, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Numerous strong thunderstorm outflows with sustained winds typically ranging from 20-30 mph, and even greater nearest the source regions, were enough to overwhelm all available efforts to limit PM<sub>10</sub> concentrations from the events. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into Maricopa County, with a majority of the PM<sub>10</sub> emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provided strong evidence that the events and exceedances of August 25-28, 2011, recorded within the Phoenix PM<sub>10</sub> nonattainment area, were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. For all events, the analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southeast of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, the timing of the August 25, 2011 event, and the wind speeds associated with the event sufficiently establishes that these events were not reasonably controllable or preventable.

Table 35: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section IV: p. 22-28, Section V: p. 29-37, p. 63, App. D	Sufficient	Yes
August 26, 2011	Section IV: p. 22-28, Section V: p. 38-46, p. 63, App. D	Sufficient	Yes
August 27, 2011	Section IV: p. 22-28, Section V: p. 47-62, p. 63, App. D	Sufficient	Yes
August 28, 2011	Section IV: p. 22-28, Section V: p. 47-62, p. 63, App. D	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages. ADEQ also stated that these figures show that for a number of monitors “the highest 24-hour averaged PM<sub>10</sub> concentrations measured in the last five years occurred on August 25” and that “the other events in the August 25<sup>th</sup>-28<sup>th</sup> period were generally among the top 12 events in the last five years.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on August 25 – 28, 2011 were in excess of normal historical fluctuations.

Table 36: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 26, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 27, 2011	Section III: p. 18-21, App. A	Sufficient	Yes
August 28, 2011	Section III: p. 18-21, App. A	Sufficient	Yes

## **Clear Causal Relationship (CCR)**

Section II of ADEQ's demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate information for Phoenix area. The conceptual model also included a very detailed discussion of each of the events that occurred in the August 25 – 28, 2011 time period and time series graphs for the events that included hourly PM<sub>10</sub> concentrations from monitors within the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included, for each of the event days, satellite imagery, metrological data from various NWS stations within the Phoenix PM<sub>10</sub> nonattainment area and Pinal County, time series graphs for the events that included hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area, visibility, and sustained wind speed from Phoenix Sky Harbor International Airport, and a time series graph that included PM<sub>10</sub> concentrations from monitors in Pinal County, visibility, and sustained wind speed from Casa Grande Municipal Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. Also, while not available for the August 25, 2011 event, time-lapse videos of the events on August 26, 2011 and August 27, 2011 can be found at the following locations:

- August 26, 2011: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_08262011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_08262011.mp4)
- August 26, 2011: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_08262011.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_08262011.mp4)
- August 27, 2011: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_08272011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_08272011.mp4)

The timing of the August 25, 2011 event is consistent with the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of haze (HZ). While not included in the demonstration, it is important to note that NOAA's National Climatic Data Center Storm events database included dust storm observations on August 26, 2011 at 4:15 PM (central deserts) and at 4:30 PM (greater Phoenix area). The timing of these dust storm reports for the August 26, 2011 event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 4:00 PM to 8:00 PM, NWS Dust Storm Warning for the period of 4:00 PM to 6:00 PM, NWS Significant Weather Advisory for the period of 12:52 PM to 6:45 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), haze (HZ), and dust storms (DS). The timing of the August 27, 2011 – August 28, 2011 event is consistent with the issuance of a NWS Severe Thunderstorm Warning for the period of 6:00 PM to 8:00 PM, NWS Dust Storm Warning for the period of 6:00 PM to 8:00 PM, NWS Significant Weather Advisory for the period 6:00 PM to 9:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of thunderstorms (TS), blowing dust (BLDU), and haze (HZ).

ADEQ stated that the evidence presented “has adequately demonstrated a clear causal relationship between the emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “the combination of the PM<sub>10</sub> and wind data from Maricopa and Pinal counties shows the transport of particulate matter from the south through Pinal County and into the Phoenix PM<sub>10</sub> nonattainment area.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graphs, winds speed and direction measurements, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports sufficiently establishes, for each of the events, that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedance measured at the monitors identified in Table 34 of this document.

Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the time series graphs (Figures 5-5 and 5-6) and NWS meteorological data tables showed that stronger wind speeds in the eastern portion of the nonattainment area that were followed a significant decrease in wind speed and a shift in wind direction from the west-southwest to south-southeast are likely responsible for the isolated exceedance at the Apache Junction monitoring station on August 26, 2011.

Table 37: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section V: p. 29-37, p. 63, App. D	Sufficient	Yes
August 26, 2011	Section V: p. 38-46, p. 63, App. D	Sufficient	Yes
August 27, 2011	Section V: p. 47-62, p. 63, App. D	Sufficient	Yes
August 28, 2011	Section V: p. 47-62, p. 63, App. D	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations, for both the CCR and HF requirements, “we can reasonably conclude the events in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 38: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section VII: p. 65	Sufficient	Yes
August 26, 2011	Section VII: p. 65	Sufficient	Yes
August 27, 2011	Section VII: p. 65	Sufficient	Yes
August 28, 2011	Section VII: p. 65	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the events shown to cause these exceedances were emissions of PM<sub>10</sub> driven by high winds caused by thunderstorm activity and related outflow boundaries during the period of August 25-28, 2011” and that “the events therefore qualify as natural events.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 39: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 25, 2011	Section VII: p. 65	Sufficient	Yes
August 26, 2011	Section VII: p. 65	Sufficient	Yes
August 27, 2011	Section VII: p. 65	Sufficient	Yes
August 28, 2011	Section VII: p. 65	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the body of evidence presented in this submittal provided no alternative that could tie the exceedances of August 25-28, 2011 to any other causal source but transported and re-entrained PM<sub>10</sub> generated from thunderstorm outflows, confirming that there would have been no exceedances but for the presence of these uncontrollable natural events.” Also, PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 40: Documentation of NEBF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
August 25, 2011	Section VI: p. 64	Sufficient	Yes
August 26, 2011	Section VI: p. 64	Sufficient	Yes
August 27, 2011	Section VI: p. 64	Sufficient	Yes
August 28, 2011	Section VI: p. 64	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 41 outlines EPA’s evaluation of these requirements.

Table 41: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I, p. 1 App. B	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I, p. 1	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>9</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I, p. 2 App. D	Yes

<sup>9</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 34 on August 25, August 26, August 27, and August 28, 2011. EPA has determined that the flagged exceedances at these locations on these days meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that events were not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, the timing of the events, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that these events were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the events and the measured exceedances, there would have been no exceedance but for the events, and the measured exceedances are in excess of normal historical fluctuations.

## September 2, 2011

Table 42: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
September 2, 2011	Apache Junction	04-021-3002-1	217
	Buckeye	04-013-4011-1	169
	Central Phoenix	04-013-3002-4	308
	Durango Complex	04-013-9812-1	225
	Greenwood	04-013-3010-1	198
	Higley	04-013-4006-1	213
	JLG Supersite	04-013-9997-4	208
	South Phoenix	04-013-4003-1	339
	West 43 <sup>rd</sup>	04-013-4009-1	219
	West Chandler	04-013-4004-1	387

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior-approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 28 mph with gusts of 34 mph and 31 mph with gusts of 37 mph were measured at Phoenix Sky Harbor International Airport and Williams Gateway Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at Casa Grande Municipal Airport in Pinal County.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with thunderstorms and thunderstorm outflows brought high concentrations of PM<sub>10</sub> into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread thunderstorm outflows with sustained winds in excess of 20 mph with gusts over 30 mph were enough to overwhelm available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong thunderstorm outflow winds that transported PM<sub>10</sub> emissions into and across the Phoenix area, with a majority of the PM<sub>10</sub> emissions recorded by Phoenix area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provided strong evidence that the exceedances of September 2, 2011 recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to

the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, the timing of the event, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 43: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section V: p. 1-8, Section III: p. 1-6, App. A, App. B	Sufficient	Yes

**Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages. ADEQ also explains that these figures show that “the PM<sub>10</sub> concentrations measured... on September 2, 2011 resulted in some of the highest 24-hr averages over the five year period” and “PM<sub>10</sub> concentrations measured at Phoenix area monitors on September 2, 2011 were... in excess of normal historical fluctuations.” ADEQ's analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on September 2, 2011 were in excess of normal historical fluctuations.

Table 44: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section IV: p. 1, App. C	Sufficient	Yes

**Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on September 2, 2011.

Section III and Appendix A of the demonstration included satellite imagery, a map of the Phoenix area that displays wind speed and direction at peak hours of PM<sub>10</sub> during the event, radar base velocity data for 0150 LST, PM<sub>10</sub> and meteorological data for the time period of 2:00 AM, and time series graphs that included hourly PM<sub>10</sub> concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM<sub>10</sub> concentrations from the Buckeye, Central Phoenix, Durango Complex, Greenwood, Higley, JLG supersite, North Phoenix, South Phoenix, West 43<sup>rd</sup> Avenue, and West Chandler monitors, and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County.

The timing of the September 2, 2011 event is consistent with the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU), dust (DU), and haze (HZ). Also, while not included in the final documentation, it is important to note that hourly PM<sub>10</sub> concentrations at the southern monitoring sites (Pinal County Housing, Stanfield, and Casa Grande) in Pinal County began also to dramatically increase at 1:00 AM, while PM<sub>10</sub> concentrations more northern monitoring sites (Cowtown, Combs School, Maricopa, and Apache Junction) in the County began to increase at 2:00 AM, and sustained wind speeds above 25 mph that were associated with the increase in PM<sub>10</sub> in Pinal County were measured at Casa Grande Municipal Airport at 1:15 AM. These data indicate that PM<sub>10</sub> was largely transported from outside of the nonattainment area from thunderstorm outflow winds.

ADEQ stated that, “the information presented in this section demonstrates a clear causal relationship between the windblown dust and the PM<sub>10</sub> exceedances measured at four Phoenix area monitors on September 2, 2011.” The analysis in Sections II, III and Appendix A, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, and NWS station reports of reduced visibility, blowing dust, dust, and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from thunderstorm outflow winds and the exceedances measured at the monitors identified in Table 10 of this document.

Table 45: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section III: p. 1-6, Section VII: p. 2, App. A, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations, “we can reasonably conclude the event in question affected air quality.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 46: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VII: p. 1	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the PM<sub>10</sub> exceedances on September 2, 2011, were shown to be caused by transport of PM<sub>10</sub> into the Phoenix area from thunderstorm outflow” and that “the event therefore qualifies as a natural event.” ADEQ's summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 47: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VII: p. 1	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding both the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedances of September 2, 2011, to any causal source except PM<sub>10</sub> transported by thunderstorm outflow, confirming that there would have been no exceedances but for the presence of this uncontrollable natural event.” Also, PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ's summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 48: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
September 2, 2011	Section VI: p. 1	Sufficient	Yes

## **Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 49 outlines EPA’s evaluation of these requirements.

Table 49: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>10</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 1-2 App. E	Yes

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by monsoonal thunderstorm high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 42 on September 2, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, the timing of the event, and the wind speeds associated with the thunderstorm outflows provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

<sup>10</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## OCTOBER 4, 2011

Table 50: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
October 4, 2011	Higley	04-013-4006-1	158
	West Chandler	04-013-4004-1	251

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre-existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered “reasonable” for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 34 mph with gusts of 46 mph, 30 mph, and 30 mph with gusts of 38 mph were measured at Chandler Municipal Airport, Williams Gateway Airport, and Casa Grande Municipal Airport, respectively.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the low pressure system generated and transported high concentrations of PM<sub>10</sub> emissions into, and also overwhelmed controls within, the nonattainment area. Sustained winds over 30 mph and gusts over 45 mph easily overwhelmed all available efforts to limit PM<sub>10</sub> concentrations from the event. The fact that this was a natural event involving a low pressure storm system that generated and transported PM<sub>10</sub> emissions in Maricopa County provided strong evidence that the exceedances on October 4, 2011 recorded at the West Chandler and Higley monitors were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the PM<sub>10</sub> transport described above. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area. In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 51: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section IV: p. 19-25, Section V: p. 26-48, App. B	Sufficient	Yes

## **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> 24-hour averages and PM<sub>10</sub> daily maximum hourly averages in Figures 3-1 and 3-2, respectively. ADEQ also stated that these figures “indicate that the PM<sub>10</sub> concentrations seen at the West Chandler and Higley monitors on October 4, 2011 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on October 4, 2011 were in excess of normal historical fluctuations.

Table 52: Documentation of HF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
October 4, 2011	Section III: p. 15-18	Sufficient	Yes

## **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate information, surface weather maps for the event, and a NOAA Storm Prediction Center mesoscale discussion figure for the Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on October 4, 2011 and a time series graph for the event that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, and visibility to track the transport of PM<sub>10</sub> throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time.

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on October 4, 2011 at 12:30 PM (south central Pinal County) and 2:00 PM (central deserts). The timing of these dust storm reports for this event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 1:00 PM to 7:00 PM, NWS Significant Weather Advisory for the period of 9:56 AM to 2:15 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_10042011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_10042011.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_10042011.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_10042011.mp4)

ADEQ stated that the evidence presented shows a clear causal relationship “between the windblown dust generated and transported by the low pressure system winds and the exceedance at the West Chandler and Higley monitors.” ADEQ further stated that “the particular wind magnitudes and wind direction, the proximity of the exceeding monitors to open and desert areas of Pinal County, and the delay in the low pressure system winds exiting the areas around the exceeding monitors provide solid evidence as to why only these monitors within the Maricopa County nonattainment area recorded exceedances.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, GIS analysis, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility and blowing dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from low pressure system winds and the exceedances measured at the monitors identified in Table 50 of this document.

Table 53: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section V: p. 26-48, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 54: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VII: p. 51	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause these exceedances were emissions of PM<sub>10</sub> caused by low pressure system winds on October 4, 2011” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 55: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VII: p. 51	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph included presenting hourly PM<sub>10</sub>, hourly wind speeds, and wind gusts that show that PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ further stated that “the body of evidence presented in this submittal confirms that the exceedances on October 4, 2011 were a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the low pressure system winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 56: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
October 4, 2011	Section VI: p. 49-50	Sufficient	Yes

## **Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 57 outlines EPA's evaluation of these requirements.

Table 57: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>11</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. C	Yes

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by low pressure system high winds were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 50 on October 4, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the low pressure system provide sufficient evidence to conclude that the event were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

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<sup>11</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## NOVEMBER 4, 2011

Table 58: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
November 4, 2011	Apache Junction	04-021-3002-1	225
	Buckeye	04-013-4011-1	284
	Central Phoenix	04-013-3002-4	223
	Durango Complex	04-013-9812-1	251
	Dysart	04-013-4010-1	224
	Glendale	04-013-2001-1	229
	Greenwood	04-013-3010-1	231
	Higley	04-013-4006-1	258
	JLG Supersite	04-013-9997-3	200
	JLG Supersite	04-013-9997-4	199
	North Phoenix	04-013-1004-1	186
	North Phoenix	04-013-1004-2	186
	South Phoenix	04-013-4003-1	231
	West 43 <sup>rd</sup>	04-013-4009-1	242
	West Chandler	04-013-4004-1	670
	West Phoenix	04-013-0019-1	279
Zuni Hills	04-013-4016-1	258	

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ states, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and proactive tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these previously approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph. For example, maximum sustained wind speeds of 34 mph with gusts of 40 mph and 31 mph with gusts of 37 mph were measured at Chandler Municipal Airport and Luke Air Force Base Airport, respectively. While not included in the final documentation, it is important to note that sustained wind speeds greater than 25 mph were also measured at other locations in the Maricopa and Pinal Counties, specifically at the Gila Bend Air Field, and Casa Grande Municipal Airport.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the approaching cold front transported high concentrations of PM<sub>10</sub> into, and also overwhelmed controls within, the Phoenix PM<sub>10</sub> nonattainment area. Widespread sustained winds in excess of 20 mph with some sustained winds as high as 32 mph and gusts frequently over 35 mph were strong enough to overwhelm available efforts to limit PM<sub>10</sub> concentrations during the event. The fact that these were natural events involving strong winds that transported PM<sub>10</sub> emissions into and across Maricopa County, with a majority of the PM<sub>10</sub>

emissions recorded by Maricopa County area monitors coming from sources outside of the Phoenix PM<sub>10</sub> nonattainment area, provided strong evidence that the exceedances of November 4, 2011, recorded within the Phoenix PM<sub>10</sub> nonattainment area were not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included further analysis of the event that supports the PM<sub>10</sub> transport described above.. This analysis indicates that monitors in the Phoenix PM<sub>10</sub> nonattainment area were affected by PM<sub>10</sub> transport from outside the nonattainment area, with the main source areas located to the south and southwest of the nonattainment area In addition to transport, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 59: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section V: p. 1-9, Section III: p. 1-5, App. A, B, and D	Sufficient	Yes

### **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> daily maximum hourly averages and PM<sub>10</sub> 24-hour averages. ADEQ also explains that these figures show that “PM<sub>10</sub> concentrations measured at Phoenix area monitors on November 4, 2011 were... in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on November 4, 2011 were in excess of normal historical fluctuations.

Table 60: Documentation of HF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section IV: p. 1, App. C	Sufficient	Yes

### **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, and climate for Phoenix area. The conceptual model also included a brief discussion of the event that occurred on November 4, 2011.

Section III and Appendix A of the demonstration included satellite imagery, a map of the Phoenix area that displays wind speed and direction at peak hours of PM<sub>10</sub> during the event, PM<sub>10</sub> and meteorological data for the time period of 3:00 PM to 6:00 PM, and time series graphs that include hourly PM<sub>10</sub> concentrations, hourly wind speed, and gusts. ADEQ also included a time series graph that shows hourly PM<sub>10</sub> concentrations from monitors in the Phoenix PM<sub>10</sub> nonattainment area and visibility from Phoenix Sky Harbor International Airport. These data show the spatial and temporal representation of the event as it moves throughout Maricopa County. Also, time-lapse videos of the event were included in Appendix B and can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_11042011.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_11042011.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_11042011.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_11042011.mp4)

While not included in the demonstration, it is important to note that NOAA’s National Climatic Data Center Storm events database included dust storm observations on November 4, 2011 at 1:15 PM (central deserts). The timing of the dust storm report for this event is consistent with the issuance of a NWS Wind Advisory for the period of 11:00 AM to 11:00 PM, NWS Blowing Dust Advisory for the period of 11:00 AM to 8:00 PM, NWS Dust Storm Warning for the period of 2:00 PM to 8:00 PM, observed increased PM<sub>10</sub> concentrations in the Phoenix area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU) and haze (HZ). Again, while not included in the final documentation, it is important to note that hourly PM<sub>10</sub> concentrations at the southern monitoring sites (Stanfield and Casa Grande) in Pinal County began to dramatically increase at 12:00 PM, while PM<sub>10</sub> concentrations monitoring sites located further north and east (Cowtown, Combs School, Maricopa, and Apache Junction) in the County began to increase at 1:00 PM and measured peak PM<sub>10</sub> concentrations at 3:00 PM. Also, sustained wind speeds above 25 mph that were associated with the increase in PM<sub>10</sub> in Pinal County were measured at Casa Grande Municipal Airport at 1:35, 2:15, 2:35, 2:55, and 3:35 PM. These data indicate that PM<sub>10</sub> was largely transported from outside of the nonattainment area from strong winds associated with an approaching cold front.

ADEQ stated that the evidence presented “demonstrates a clear causal relationship between the windblown dust and the PM<sub>10</sub> exceedances measured in the Phoenix PM<sub>10</sub> nonattainment area on November 4, 2011.” The analysis in Sections II, II, and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, the GIS map, time-lapse video evidence, NWS advisories, NOAA NCDC dust storm observations, and NWS station reports of reduced visibility, blowing dust and haze, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from winds associated with an approaching cold front and the exceedances measured at the monitors identified in Table 58 of this document.

Table 61: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section III: p. 1-5, App. A, B, and D	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “we can reasonably conclude the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 62: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VII: p. 1	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the PM<sub>10</sub> exceedances in the Phoenix area on November 4, 2011, were shown to be caused by transport of PM<sub>10</sub> into the Phoenix area from widespread strong winds associated with an approaching cold front” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 63: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VII: p. 1	Sufficient	Yes

**No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and stated that “the weight of evidence presented in this submittal provided no alternative that could tie the exceedance of November 4, 2011, to any causal source other than PM<sub>10</sub> transported by strong winds associated with an approaching cold front, confirming that there would have been no exceedance but for the presence of this uncontrollable natural event.” Also, PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 64: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
November 4, 2011	Section VI: p. 1	Sufficient	Yes

**Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 65 outlines EPA’s evaluation of these requirements.

Table 65: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 2 App. D	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p. 2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>12</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2-3 App. E	Yes

<sup>12</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by high winds associated with the passage of a cold front were transported into the Phoenix PM<sub>10</sub> nonattainment area from areas in Pinal County and caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 58 on November 4, 2011. EPA has determined that the flagged exceedances at these locations on this day meet the definition of an exceptional event: the exceedances affected air quality, were not reasonably controllable or preventable, and meet the definition of a natural event. Specifically, EPA has determined that the event was not reasonably controllable and preventable due to high wind conditions that transported PM<sub>10</sub> from sources outside of the nonattainment area and subsequently overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. Also, regardless of transport into the area, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the passing cold front provide sufficient evidence to conclude that the event was not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedances are in excess of normal historical fluctuations.

## FEBRUARY 27, 2012

Table 66: EPA PM<sub>10</sub> Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	24-hour Avg. (µg/m <sup>3</sup> )
February 27, 2012	West 43 <sup>rd</sup>	04-013-4009-1	167

### **Not Reasonably Controllable or Preventable (nRCP)**

In addressing reasonable controls, ADEQ provided detailed information on the current set of required controls in the Phoenix PM<sub>10</sub> nonattainment area, including information on rule implementation, rule effectiveness, compliance and enforcement, real-time monitoring alert systems and public notification activities that occurred on the event days. ADEQ stated, “BACM-approved control measures on significant anthropogenic sources were in place and enforced during the events, and pro-active tracking and response to the events by regulatory agencies and local governments confirmed the uncontrollable nature of the dust emissions; therefore, these pre existing/prior approved required controls are adequate for meeting the requirements of an exceptional event and should be considered ‘reasonable’ for these purposes.”

ADEQ provided documentation showing that sustained wind speeds associated with these events were above 25 mph in multiple locations throughout the Phoenix PM<sub>10</sub> nonattainment area and Pinal County. For example, maximum sustained wind speeds of 30 mph with gusts of 36 mph and 31 mph with gusts of 37 mph were measured at Luke Air Force Base Airport and Casa Grande Municipal Airport, respectively. Sustained wind speeds greater than 25 mph were also measured at other locations, specifically at Williams Gateway Airport, Chandler Municipal Airport, and Gila Bend Air Field.

ADEQ further explains that “despite the deployment of comprehensive control measures and sophisticated response programs, high wind conditions associated with the low pressure system generated high concentrations of PM<sub>10</sub> within the nonattainment area. Sustained winds up to 30 mph and gusts up to 43 mph easily overwhelmed all available efforts to limit PM<sub>10</sub> concentrations from the event. The fact that this was a natural event involving a low pressure storm system that generated PM<sub>10</sub> emissions in the nonattainment area provided strong evidence that the exceedance on February 27, 2012 recorded at the West 43<sup>rd</sup> Avenue monitor was not reasonably controllable or preventable.”

Section V of ADEQ’s documentation included a complex GIS analysis of the event that supports the statements described above. This analysis clearly demonstrates the “spatial and temporal representation of the low pressure system winds and associated windblown dust as they move throughout Maricopa and Pinal counties.” Information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations throughout the area, and the wind speeds associated with the event sufficiently establishes that the event was not reasonably controllable or preventable.

Table 67: Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section IV: p. 17-23, Section V: p. 25-51, App. B	Sufficient	Yes

## **Historical Fluctuations (HF)**

To demonstrate that this requirement was met, ADEQ provided 5-year time series plots of both PM<sub>10</sub> 24-hour averages and PM<sub>10</sub> daily maximum hourly averages in Figures 3-1 and 3-2, respectively. ADEQ also stated that these figures “indicate that the PM<sub>10</sub> concentrations seen at the West 43<sup>rd</sup> Avenue monitor on February 27, 2012 were in excess of normal historical fluctuations.” ADEQ’s analysis sufficiently establishes that the 24-hour PM<sub>10</sub> concentrations measured on February 27, 2012 were in excess of normal historical fluctuations.

Table 68: Documentation of HF

<b>Exceedance Date</b>	<b>Demonstration Citation</b>	<b>Quality of Evidence</b>	<b>Criterion Met?</b>
February 27, 2012	Section III: p. 15-16	Sufficient	Yes

## **Clear Causal Relationship (CCR)**

Section II of ADEQ’s demonstration included a comprehensive conceptual model of the events, including a general overview of the geographic setting of the monitors, climate, surface weather maps, and NOAA 500-Milibar wind fields for the Phoenix area. The conceptual model also included a very detailed discussion of the event that occurred on February 27, 2012, and a time series graph for the event that included hourly PM<sub>10</sub> concentrations for monitors in the Phoenix PM<sub>10</sub> nonattainment area.

Section V of the demonstration included a detailed and extensive GIS analysis and a number of visibility photos that show the spatial and temporal representation of the event as it moves throughout Maricopa and Pinal Counties. The analysis included PM<sub>10</sub> concentrations, sustained wind speeds, wind gusts, wind direction, and visibility to track the transport of PM<sub>10</sub> throughout the region. Accompanying the analysis, ADEQ provided a discussion for every map that described the conditions at that time.

The timing of the event is consistent with the issuance of a NWS Blowing Dust Advisory for the period of 12:30 PM to 11:00 PM, NWS Wind Advisory for the period of 4:00 PM to 11:00 PM, NWS Dust Storm Warning for the period of 1:00 PM to 3:00 PM, the observed increased PM<sub>10</sub> concentrations in the area, increased wind speed, reduced visibility, and NWS station reports of blowing dust (BLDU). Also, while direct links were not included in the final documentation, time-lapse videos of the event can be found at the following locations:

- South Mountain: [http://www.phoenixvis.net/videos/mpeg4/SOMT\\_02272012.mp4](http://www.phoenixvis.net/videos/mpeg4/SOMT_02272012.mp4)
- Superstition Mountains: [http://www.phoenixvis.net/videos/mpeg4/SUPM\\_02272012.mp4](http://www.phoenixvis.net/videos/mpeg4/SUPM_02272012.mp4)

ADEQ stated that the evidence presented demonstrated a clear causal relationship between the windblown dust emissions generated by uncontrollable natural events and the exceedances measured at the monitors.” ADEQ further stated that “It is clear from these data that sustained wind speeds of 30 mph and gusts of 43 mph were strong enough to generate uncontrollable windblown PM<sub>10</sub> emissions to the West 43<sup>rd</sup> Avenue monitor and demonstrates the clear causal relationship between the low pressure system winds and the recorded exceedance.”

The analysis in Sections II and V, specifically, the PM<sub>10</sub> time series graph, winds speed and direction measurements, GIS analysis, time-lapse video evidence, NWS advisories, and NWS station reports of reduced visibility and blowing dust, sufficiently establishes that there was a clear causal relationship between uncontrollable emissions generated from low pressure system winds and the exceedance measured at the West 43<sup>rd</sup> Avenue monitor. Furthermore, while exceedances occurring at only one monitor in the network are inherently more complex, the GIS analysis (Figures 5-1 through -5-21) shows stronger wind speeds in the western portion of the nonattainment area are likely responsible for the isolated exceedance at the West 43<sup>rd</sup> Avenue monitoring station.

Table 69: Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section V: p. 25-51, App. B	Sufficient	Yes

### **Affects Air Quality (AAQ)**

ADEQ stated that based on the information presented in the demonstrations for both the CCR and HF requirements, “it is reasonable to conclude that the event in question affected air quality.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event affected air quality.

Table 70: Documentation of AAQ

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VII: p. 54	Sufficient	Yes

### **Natural Event**

ADEQ stated that based on the documentation for both the nRCP and CCR requirements, “the event shown to cause the exceedance was emissions of PM<sub>10</sub> caused by low pressure system winds on February 27, 2012” and that “the event therefore qualifies as a natural event.” ADEQ’s summary regarding the CCR and HF requirements sufficiently establishes that the event was a natural event.

Table 71: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VII: p. 54	Sufficient	Yes

### **No Exceedance or Violation But For the Event (NEBF)**

ADEQ provided a summary of the analysis and information regarding the nRCP and CCR requirements and also included a time series graph included that presents hourly PM<sub>10</sub>, hourly, wind speeds, and wind gusts showing that PM<sub>10</sub> concentrations before the event were below the 24-hour PM<sub>10</sub> NAAQS. ADEQ further also stated that “the body of evidence presented in this submittal confirms that the exceedance on February 27, 2012 was a natural event and that there would have been no exceedance but for the presence of the uncontrollable windblown dust from the low pressure system winds.” ADEQ’s summary regarding the nRCP and CCR requirements sufficiently establishes that the NEBF criterion has been met.

Table 72: Documentation of NEBF

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
February 27, 2012	Section VI: p. 52-53	Sufficient	Yes

## **Schedule and Procedural Requirements**

In addition to technical demonstration requirements, 40 CFR §50.14 (c) specifies the schedule and procedural requirements an air agency must follow to request data exclusion. Table 73 outlines EPA’s evaluation of these requirements.

Table 73: Schedules and Procedural Criteria

	<b>Reference</b>	<b>Demonstration Citation</b>	<b>Criterion Met?</b>
Did the State provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section I: p. 1 App. A	Yes
Were flags and initial description placed on the data by July 1 <sup>st</sup> of the following year?	40 CFR §50.14 (c)(2)(iii)	Section I: p 1-2	Yes
Was the demonstration submitted within 3 years of the end of the quarter in which the event occurred and 12 months prior to the date that any regulatory decision must be made by EPA?	40 CFR §50.14 (c)(3)(i)	January 28, 2013 letter <sup>13</sup>	Yes
Was the public comment process followed and documented?	40 CFR §50.14 (c)(3)(v)	Section I: p. 2 App. C	Yes

## **Conclusion**

EPA has reviewed documentation provided by ADEQ to support claims that dust emissions generated by low pressure system high winds caused exceedances of the 24-hour PM<sub>10</sub> NAAQS at the locations outlined in Table 66 on February 27, 2012. EPA has determined that the flagged exceedances at this location on this day meet the definition of an exceptional event: the exceedance affected air quality, was not reasonably controllable or preventable, and meets the definition of a natural event. Specifically, EPA has determined that event was not reasonably controllable and preventable due to high wind conditions that overwhelmed reasonable controls within the Phoenix PM<sub>10</sub> nonattainment area. In reviewing the GIS analysis included in Section V of the demonstration and time series of PM<sub>10</sub> for the Phoenix PM<sub>10</sub> nonattainment area in conjunction with the time-lapse video evidence for the event, it is plausible that the elevated PM<sub>10</sub> from the hours of 11:00 AM to 2:00 PM was caused by transported PM<sub>10</sub> from sources outside of the nonattainment area, which indicates that the emissions causing the exceedance at West 43<sup>rd</sup> Avenue monitor were not reasonably controllable or preventable. Also, information pertaining to the controls implemented within the nonattainment area, the spatial extent of elevated PM<sub>10</sub> concentrations measured in the area, and the wind speeds associated with the low pressure system provide sufficient evidence to conclude that the event were not reasonably controllable or preventable. Furthermore, EPA has determined that there is a clear causal relationship between the event and the measured exceedances, there would have been no exceedance but for the event, and the measured exceedance is in excess of normal historical fluctuations.

<sup>13</sup>See letter from Eric Massey, Director, Air Quality Division, ADEQ to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated January 28, 2013.

## **CONCLUSION**

EPA finds that the weight of evidence is sufficient for concurrence on the flagging of the data for the monitors identified in Table 1 on February 19, July 18, August 3, August 18, August 25-28, September 2, October 4, November 4, 2011 and February 27, 2012. These concurrences do not constitute final EPA action to exclude these data from consideration for purposes of determining the attainment status of the area. Final actions will come only after EPA completes notice and comment rulemaking on any such determinations.