SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

PLANNING, RULE DEVELOPMENT, AND AREA SOURCES

ANALYSIS OF EXCEPTIONAL EVENTS CONTRIBUTING TO HIGH PM10 CONCENTRATIONS IN THE SOUTH COAST AIR BASIN ON OCTOBER 13, 2008

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ANALYSIS OF EXCEPTIONAL EVENTS CONTRIBUTING TO HIGH PM10 CONCENTRATIONS IN THE SOUTH COAST AIR BASIN ON OCTOBER 13, 2008

1 INTRODUCTION

1.1 Purpose

This document substantiates the request by the South Coast Air Quality Management District (AQMD) to flag a violation of the 150 μg/m^3 PM10 24-hour National Ambient Air Quality Standard (NAAQS) in the South Coast Air Basin (Basin) as exceptional events under the U.S. Environmental Protection Agency (U.S. EPA) Regulation for the Treatment of Data Influenced by Exceptional Events (40 CFR, sections 50.1 & 51.14)[1]. Natural events caused exceedances of the federal standard at one Federal Equivalent Method (FEM) Tapered Element Oscillating Microbalance (TEOM) continuous monitor on Monday, October 13, 2008, with a midnight-to-midnight 24-hour average concentration of 199 μg/m^3 at the Anaheim air monitoring station in Orange County (AQS Site Code 060590007). This was not a sampling day for the Federal Reference Method (FRM) filter samplers. The measured PM10 was primarily crustal material from windblown dust due to a strong Santa Ana wind event; the PM2.5 24-hour NAAQS was not exceeded with the AQMD FRM filter samplers on this day.

AQMD began submitting PM10 data from Beta Attenuation Monitor (BAM) and TEOM continuous instruments to the U.S. EPA Air Quality System (AQS) database, starting with 2008. The Anaheim TEOM event on October 13, 2008 was the only PM10 NAAQS violation recorded at any station in the South Coast Air Basin, in either the FRM or FEM monitoring, during 2008 or in 2009 and 2010. A PM10 exceedance was recorded at Anaheim and several other stations in 2007. This data was flagged as an exceptional event by AQMD and that analysis is pending review by U.S. EPA. AQMD has also requested that U.S. EPA redesignate the Basin to attainment for PM10 and flagging this data in AQS will alleviate any potential concerns in the redesignation evaluation.

[1] EPA 2007. Treatment of Data Influenced by Exceptional Events; Final Rule. 40 CFR Parts 50 and 51; Federal Register Vol. 72, No. 55; March 22, 2007. http://www.smartpdf.com/register/2007/Mar/22/13560A.pdf

The elevated particulate matter concentration observed on October 13, 2008 occurred as a result of entrainment of fugitive windblown dust from very high winds that impacted much of the Basin. AQMD has submitted the hourly PM10 data from the Anaheim monitor on this day to the U.S. EPA AQS database and has placed the appropriate AQS flags throughout the day to indicate that the data was affected by exceptional events due to high winds. This flagging indicates that the ambient air quality data was influenced by the windblown dust related emissions and insures that the data is properly represented in the regulatory process.

This Amended Final Report is nearly the same in substance to the previous Final Report of the same title, dated August 5, 2010. It was amended to address language and formatting consistent with U.S. EPA Region IX comments and draft guidance to help create national consistency in the preparation and review of exceptional event documentation.

1.2 Organization of this Document

This document is designed to provide summary information to the public as well as the specific detailed analyses to meet the requirements of Exceptional Events Rule. Section 1, Introduction, describes the purpose, exceptional event criteria, background of the Exceptional Event Rule and background information related to high wind events in the Basin, including:

- the geographic setting;
- the regulatory measures, showing that continuing reasonable controls are in effect in the Basin and that ongoing public education programs and event forecasting and notification plans are in place;
- an overview of high PM10 events in the Basin, including a historical perspective of PM10 exceptional events.

Section 2 describes the analysis of the high wind exceptional event that caused the PM10 NAAQS violation on October 13, 2008. The Description of Exceedance, Section 2.1, presents the PM10 measurements related to the NAAQS exceedance. Section 2.2, the Conceptual Model, describes how the event unfolded to cause the NAAQS violation. Section 2.3, Technical Criteria for High Wind Dust Exceptional Event Demonstration, details how the natural event/episode satisfies the criteria of the Exceptional Events Rule, that is,

- the event is not reasonable controllable or preventable;
- there is a clear causal connection between the PM measurement and the high wind event;

- there is evidence that the event is associated with a PM concentration in excess of normal historical fluctuations, including background;
- the event affects air quality;
- the event was caused by human activity unlikely to recur at a particular location, or that it was a natural event; and
- the exceedance or violation would not have occurred "but for" the causal event (i.e., due to the high wind event in this case).

Section 3 contains Procedural Requirements, including the Flagging of Data and the Public Notification process and a checklist of the exceptional event demonstration requirements. Section 4 describes the Mitigation of these air quality events, including the issuance of high wind and windblown dust and air quality forecasts and alerts, as well as the availability of public information on health effects and activity recommendations during such air pollution episodes.

Supporting materials for the October 13, 2008 PM10 analysis beyond what is included in the Section 2 are provided in a separate Appendix. This includes:

A.1 Meteorological Observations
A.2 National Weather Service Weather Forecast Discussions
A.3 National Weather Service Short Term Forecasts
A.4 National Weather Service Fire Weather Forecast
A.5 National Weather Service Non-Precipitation Warnings
A.6 National Climatic Data Center Event Records
A.7 Links and Press Articles
A.8 Wildfire Information
A.9 NOAA Satellite Services Division Smoke Text Products
A.10 AQMD Forecasts and Advisories
A.11 National Weather Service 500 MB Analyses
A.12 National Weather Service Mean Sea Level Pressure/Surface Analyses

1.3 Exceptional Events Rule Background

Since 1977, U.S. EPA has implemented policies to address the treatment of ambient air quality monitoring data that has been affected by exceptional or natural events. In July 1986, U.S. EPA issued a document entitled *Guideline on the Identification and Use of Air Quality Data Affected by Exceptional Events*, introducing a flagging system to identify air quality measurements influenced by exceptional events that, if left unidentified, could lead to possible misinterpretation or misuse of the data. In 1996, U.S. EPA developed a guidance document entitled *Areas Affected by PM-10 Natural Events*, which provided criteria and procedures for States to request special treatment (i.e., flagging for exclusion from standard compliance consideration) for data affected by

natural events (e.g., wildfire, high wind events, and volcanic and seismic activities). U.S. EPA approved several requests made by AQMD, through the California Air Resources Board (CARB), to apply the Natural Events Policy in order to flag violations of the 24-Hour PM10 NAAQS in the Coachella Valley for natural events that involved uncontrollable high winds. Air quality has continued to improve through implementation of best available control measures, required by AQMD rules. AQMD also protects the public through the issuance of area-specific air quality forecasts and episode notifications in the South Coast Air Basin and the portions Riverside County under AQMD jurisdiction in the Salton Sea Air Basin (Coachella Valley) and the Mojave Desert Air Basin.

On March 14, 2007, U.S. EPA promulgated a formal rule, entitled: *The Treatment of Data Influenced by Exceptional Events*, known as the Exceptional Events Rule. Exceptional events are events caused by human activity that are unlikely to recur at a particular location or caused by natural events, which may recur, sometimes frequently. These exceptional events must affect air quality and are not reasonably controllable or preventable using techniques that tribal, state or local air agencies may implement in order to attain and maintain the NAAQS. After an event is determined by U.S. EPA to be an exceptional event through the process established in the regulation, it is flagged as such in the U.S. EPA AQS database. The flagged data remains available to the public but are not counted toward attainment status. The U.S. EPA rulemaking:

- ensures that air quality measurements are properly evaluated and characterized with regard to their causes;
- identifies reasonable actions that should be taken to address the air quality and public health impacts caused by these types of events;
- avoids imposing unreasonable planning requirements on state, local and tribal air quality agencies related to violations of the NAAQS due to exceptional events;
- ensures that the use of air quality data, whether afforded special treatment or not, is subject to full public disclosure and review.

Demonstration packages to address high wind dust exceptional events are required to address the following technical criteria:

- The event affected air quality;
- The event was not reasonably controllable or preventable;
- The event is unlikely to reoccur at a particular location or was a natural event;
- There was a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
- Evidence that the event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
- There would have been no exceedance or violation but for the event.

The Exceptional Events Rule does not require States to submit formal mitigation plans; however, States must provide public notice, public education, and must provide for implementation of reasonable measures to protect public health when an event occurs.

In the preamble of the Exceptional Event Rule, U.S. EPA specifically includes *High Wind Events* in the list of examples of exceptional events, classified as *Natural Events*. The Rule defines Natural Events as follows:

> *It is important to note that natural events, which are one form of exceptional events according to this definition, may recur, sometimes frequently (e.g., western wildfires). For the purposes of this rule, EPA is defining ''natural event'' as an event in which human activity plays little or no direct causal role to the event in question. We recognize that over time, certain human activities may have had some impact on the conditions which later give rise to a ''natural'' air pollution event. However, we do not believe that small historical human contributions should preclude an event from being deemed ''natural.''*

1.4 Geographic Setting

Southern California's South Coast Air Basin (Basin), shown in Figures 1-1 and 1-2, consists of 10,743 square miles and consists of Orange County and the non-desert portions of Los Angeles, Riverside and San Bernardino Counties. The population of the Basin is approximately 16 million people, with approximately 11 million gasoline powered vehicles and 300,000 diesel vehicles. The coastal plain contains most of the population of the Basin, which is surrounded by tall mountains, including the San Gabriel Mountains to the north, the San Bernardino Mountains to the northeast, and the San Jacinto Mountains to the east. The coastal range of the Santa Ana Mountains separates the inland part of Orange County from Riverside County. The proximity of the Pacific Ocean to the west has a strong influence on the climate, weather patterns and air quality of the Basin. The mountains also have a significant impact on the wind patterns of the Basin. Offshore winds flow down slope and are warmed and dried by compressional heating, gaining momentum through the passes and canyons. Northeasterly winds, known as Santa Ana winds, typically account for the highest wind events in the Basin, occurring several times each year. Onshore high-wind events also occur with the strongest winds typically occurring in the mountains and deserts.

Figure 1-3 shows the PM10 monitors in the Basin, including the 24-hour FRM SSI samplers and the continuous Beta Attenuation Monitor (BAM) and Tapered Element Oscillating Microbalance (TEOM) samplers.

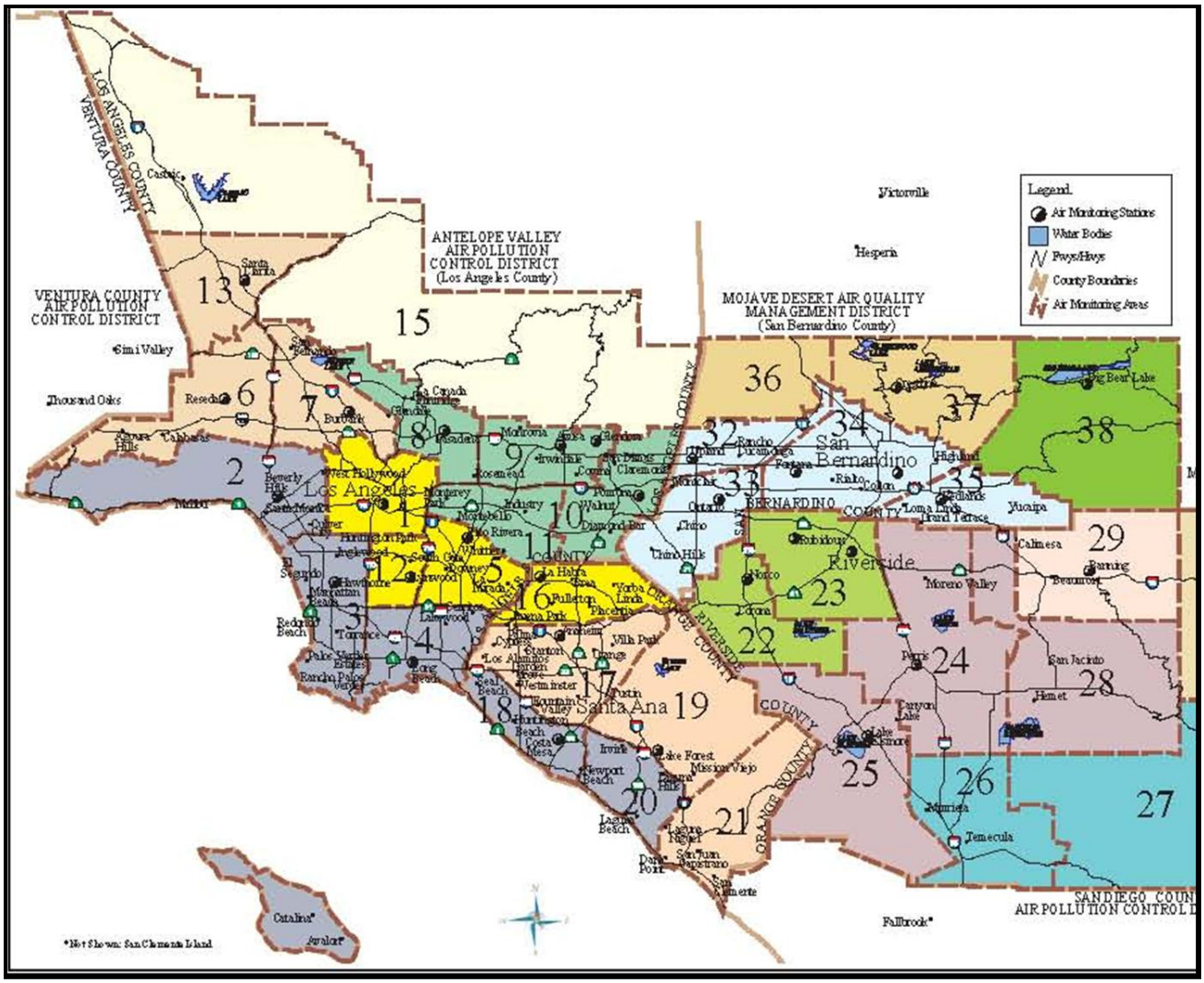

FIGURE 1-1

Map of the South Coast Air Basin Showing Air Monitoring Stations and Forecast Areas

FIGURE 1-2

Map of South Coast Air Basin with Selected Cities and Topography

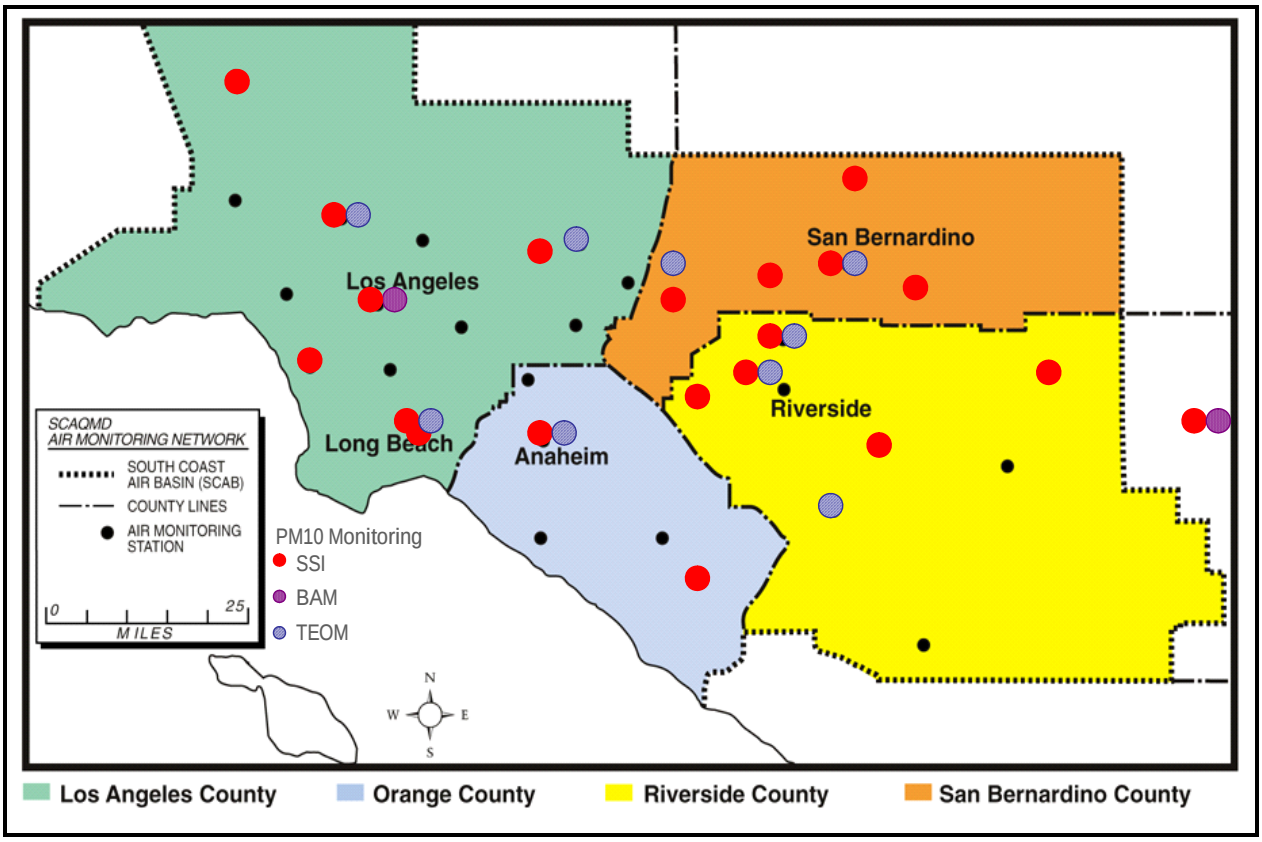

FIGURE 1-3

Map of South Coast Air Basin PM10 Monitors

1.5 Regulatory Measures

AQMD has implemented regulatory measures to control emissions from fugitive dust sources and open burning in the South Coast Air Basin. Implementation of Best Available Control Measures (BACM) in the Basin has been carried out through AQMD Rule 403 (Fugitive Dust), as well as source-specific rules. With its approvals of the South Coast PM10 Attainment Plans in the State Implementation Plan (SIP), U.S. EPA has concluded that this control strategy represents BACM and Most Stringent Measures (MSM) for each significant source category, and that the implementation schedule was as expeditious as practicable.

AQMD Rule 403 establishes best available fugitive dust control measures to reduce fugitive dust emissions associated with agricultural operations, construction/demolition activities (including grading, excavation, loading, crushing, cutting, planing, shaping or ground breaking), earth-moving activities, track-out of bulk material onto public paved roadways, and open storage piles or disturbed surface areas.

AQMD Rule 1156, Further Reductions of Particulate Emissions from Cement Manufacturing Facilities, is a source-specific rule that applies to all operations, including material handling, storage and transport at cement manufacturing facilities. It restricts visible emissions from facility operations, open piles, roadways and unpaved areas and requires enclosed systems for loading, unloading and transfer of materials. Other operations must employ wind fencing and wet suppression systems or be enclosed with permitted control equipment.

AQMD Rule 1157, PM10 Emissions Reductions from Aggregate and Related Operations, is a source-specific rule applicable to all permanent and temporary aggregate and related operations that produce sand, gravel, crushed stone or quarried rocks. Like Rule 1156, this rule restricts the discharge of fugitive dust emissions into the atmosphere through plume opacity tests and limiting visible plume travel to within 100 feet of the operation. This rule requires: prompt removal of material spillage; stabilization of piles with dust suppressants; the control of loading, unloading, transferring, conveyors, and crushing or screening activities with dust suppressants or other control methods; stabilization of unpaved roads, parking and staging areas; sweeping of paved roads; and the use of track-out control systems.

AQMD Rule 1158, Storage, Handling, and Transport of Coke, Coal and Sulfur, is a source-specific rule that applies to any facility that produces, stores, handles, transports or uses these materials. This rule restricts visible emissions and requires that piles be maintained in enclosed storage and that unloading operations be conducted in enclosed structures with water spray systems or venting to permitted air pollution control equipment. It also has specific requirements to control emissions from roadways, other facility areas, and conveyors and the loading of materials.

AQMD Rule 1186, PM10 Emissions from Paved and Unpaved Roads and Livestock Operations, requires rapid removal of paved road dust accumulations and establishes a treatment schedule for unpaved roads, street sweeper procurement standards, and design standards for new road construction. AQMD Rule 1186.1, Less-Polluting Sweepers, requires procurement of alternative-fueled equipment when governmental agencies replace street sweepers.

AQMD Rule 444, Open Burning, ensures that open burning is conducted in a manner that minimizes emissions and impacts, and that smoke is managed to protect public health and safety. This rule requires authorization for agricultural and prescribed fire, limited to days that are predicted to be meteorologically conducive to smoke dispersion and that will not contribute to air quality that is unhealthy for sensitive groups or worse. It also restricts residential and waste burning.

AQMD Rule 445, Wood Burning Devices, reduces pollution from wood-burning fireplaces and other devices through requirements for new construction, curtailment of wintertime wood burning in specified areas when poor air quality is forecast and

restriction of the sale of unseasoned firewood. The AQMD Healthy Hearths program provides public education on how to reduce air pollution from wood burning and encourages the conversion to natural gas burning fireplaces through an incentive program.

1.6 Historical Perspective of PM10 in the South Coast Air Basin

Table 1-1 summarizes the days with high PM10 in the South Coast Air Basin, defined as days exceeding 150 $\mu g/m^3$, between January 1, 2000 and December 31, 2008. The events prior to 2007 were not flagged for exclusion under the U.S. EPA Natural Events Policy, except for August 17, 2001 at Banning Airport which was flagged as a high wind natural event along with the Coachella Valley stations (Indio and Palm Springs) due to thunderstorm winds. All the 24-hour PM10 NAAQS violations that occurred in 2007 have been flagged as requesting exclusion under the U.S. EPA Exceptional Events Policy. Since 2000, no 24-hour NAAQS violations occurred in the South Coast Air Basin that were not associated with strong winds, wildfire or Independence Day fireworks events. Throughout the nine-year period, seven days exceeded the 150 $\mu g/m^3$ NAAQS concentration at air monitoring stations in the Basin, for an overall average of just under 0.8 violations per year basin-wide. Except for the exceedances on July 5, 2003 and July 5, 2007, related to fireworks (cultural events), all NAAQS violations in the Basin were associated with high wind natural events, several of which fanned large wildfires.

TABLE 1-1

Historical Summary of South Coast Air Basin FRM SSI PM10 24-Hour High Concentrations Exceeding 150 μg/m^3 between January 1, 2000 and December 31, 2009 with Primary Causal Event

Event Date*	Station	FRM PM10 (μg/m^3)	Cause
January 2, 2001	Ontario Fire Station	**166**	High Winds
August 17, 2001	Banning Airport	**219**	High Wind Natural Event**
July 5, 2003	Rubidoux	**159**	Fireworks (Cultural Event)
October 27, 2003	Rubidoux	**164**	High Winds/Wildfire
April 12, 2007	Perris	**167**	High Winds**
July 5, 2007	Azusa	**165**	Fireworks (Cultural Event)**
July 5, 2007	Fontana	**155**	Fireworks (Cultural Event)**
October 21, 2007	Perris	**1212**	High Winds/Wildfire**
October 21, 2007	Mira Loma	**681**	High Winds/Wildfire**
October 21, 2007	Rubidoux	**559**	High Winds/Wildfire**
October 21, 2007	Anaheim	**489**	High Winds/Wildfire**
October 21, 2007	South Long Beach	**432**	High Winds/Wildfire**
October 21, 2007	Norco	**332**	High Winds/Wildfire**
October 21, 2007	Fontana	**276**	High Winds/Wildfire**
October 21, 2007	Ontario Fire Station	**275**	High Winds/Wildfire**
October 21, 2007	North Long Beach	**232**	High Winds/Wildfire**
October 21, 2007	San Bernardino	**219**	High Winds/Wildfire**
October 21, 2007	Santa Clarita	**167**	High Winds/Wildfire**
October, 13, 2008	Anaheim (TEOM)	**199**	High Winds/Wildfire**

* 1-in-6 day FRM SSI sampling for all stations except 1-in-3 day sampling at Rubidoux.

** All 2007 and 2008 events have been flagged by AQMD under the Exceptional Events Rule. Prior events in the South Coast Air Basin were not flagged due to ongoing violation of the now-revoked annual PM10 NAAQS, except August 17, 2001 at Banning which was flagged along with Coachella Valley stations during a thunderstorm-related high wind natural event. Note that AQMD BAM and TEOM data prior to 2007 was not considered FEM and not submitted to AQS.

2 HIGH WIND EXCEPTIONAL EVENT ANALYSIS

2.1 Description of Exceedance: October 13, 2008

Violations of the PM10 NAAQS were recorded at the South Coast Air Basin Anaheim monitoring station on October 13, 2008, due to high winds. The 24-hour mass concentration at Anaheim was measured with a federal equivalent method (FEM) Tapered Element Oscillating Microbalance (TEOM) continuous monitor, with a midnight-to-midnight 24-hour average concentration of 199 $\mu g/m^3$. This was not a sampling day for the Federal Reference Method (FRM) filter measurements in the Basin. While no other PM10 measurements exceeded the federal standard level (150 $\mu g/m^3$), other stations in the Basin had elevated concentrations during the same period.

On October 13, 2008, the FEM TEOM PM10 sampler at Anaheim measured high concentrations for several consecutive hours in the morning, causing an exceptionally high 24-hour average concentration of 199 $\mu g/m^3$ for the day (midnight to midnight). Table 2-1 summarizes the hourly and 24-hour averaged continuous PM10 concentrations at Anaheim and the nearby Long Beach and Central Los Angeles stations on October 12 and 13. Figure 2-1 shows this data graphically for all FEM stations in the South Coast Air Basin from 1200 PST on October 12 through October 13, and also includes the Rubidoux and Lake Elsinore stations in Riverside County and the San Bernardino station in San Bernardino County. As compared to the previous day, the hourly PM10 at Anaheim on October 13 was elevated from the start of the day and first reached over 150 $\mu g/m^3$ for the 0300 PST hour. The concentrations remained over 150 $\mu g/m^3$ through the 1000 PST hour, with a peak of 767 $\mu g/m^3$ during the 0900 PST hour. The Anaheim hourly PM10 concentrations were somewhat elevated through the rest of the day, but did not exceed 150 $\mu g/m^3$.

At Long Beach, the nearest monitoring station to Anaheim, the TEOM PM10 peaked during the same time period, but only exceeded 150 $\mu g/m^3$ for five hours with a peak of 386 $\mu g/m^3$ and no 24-hour NAAQS violation. Central Los Angeles also peaked to 266 $\mu g/m^3$ during this period, but only exceeded 150 $\mu g/m^3$ for two hours with no 24-hour violation. In Riverside and San Bernardino Counties, Lake Elsinore, the City of San Bernardino and, to a lesser extent, Rubidoux had PM10 spikes during the same morning period. Unlike the Orange and Los Angeles County stations, the Inland Empire stations also had elevated concentrations with gusty winds in the afternoon. None of these stations exceeded the 24-hour NAAQS, although San Bernardino was close, with midnight-to-midnight averaged concentration of 144 $\mu g/m^3$.

TABLE 2-1

Hourly BAM and TEOM PM10 Measurements at the AQMD Anaheim, Long Beach and Central Los Angeles Air Monitoring Stations Between 0000 PST October 12 and 1200 PST October 14, 2008

		Anaheim Monitoring Station		Long Beach Monitoring Station		Los Angeles Monitoring Station	
DATE	**HOUR (PST)**	**TEOM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**	**TEOM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**	**BAM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**
10/12/08	0000	28	45.0	36	28.9	29	37.4
	0100	31		28		62	
	0200	21		15		50	
	0300	23		24		25	
	0400	25		26		29	
	0500	45		27		20	
	0600	102		24		13	
	0700	113		30		39	
	0800	139		29		102	
	0900	76		24		72	
	1000	48		35		55	
	1100	24		23		71	
	1200	21		26		57	
	1300	8		29		58	
	1400	32		28		54	
	1500	28		31		16	
	1600	40		42		0	
	1700	37		35		0	
	1800	33		30		6	
	1900	36		30		3	
	2000	42		30		24	
	2100	28		29		22	
	2200	51		31		32	
	2300	48		31		59	
10/13/08	0000	98	**199.1**	28	124.4	28	85.4
	0100	121		28		32	
	0200	114		31		27	
	0300	**249**		36		22	
	0400	**296**		100		39	
	0500	**329**		**248**		55	
	0600	**579**		**308**		107	
	0700	**519**		**386**		**225**	
	0800	**566**		**368**		**266**	
	0900	**767**		**213**		137	
	1000	**273**		135		99	
	1100	137		115		90	
	1200	99		79		118	
	1300	58		68		128	
	1400	44		78		119	
	1500	126		80		96	
	1600	48		97		68	
	1700	38		101		65	
	1800	40		89		47	
	1900	44		82		40	
	2000	48		86		56	
	2100	90		69		72	

TABLE 2-1 (continued)
Hourly BAM and TEOM PM10 Measurements at the AQMD Anaheim, Long Beach and Los Angeles Air Monitoring Stations Between 0000 PST October 12 and 1200 PST October 14, 2008

		Anaheim Monitoring Station		Long Beach Monitoring Station		Los Angeles Monitoring Station	
DATE	**HOUR (PST)**	**BAM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**	**BAM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**	**BAM Hourly PM10 (μg/m^3)**	**24-Hour PM10 (μg/m^3) (midnight to midnight)**
	2200	56		77		60	
	2300	39		83		53	
10/14/08	0000	31	55.9	76	52.9	62	74.5
	0100	34		57		74	
	0200	65		55		94	
	0300	53		50		85	
	0400	49		51		73	
	0500	76		55		84	
	0600	69		79		87	
	0700	104		88		100	
	0800	52		80		**168**	
	0900	46		58		127	
	1000	46		57		113	
	1100	42		44		117	
	1200	36		27		87	

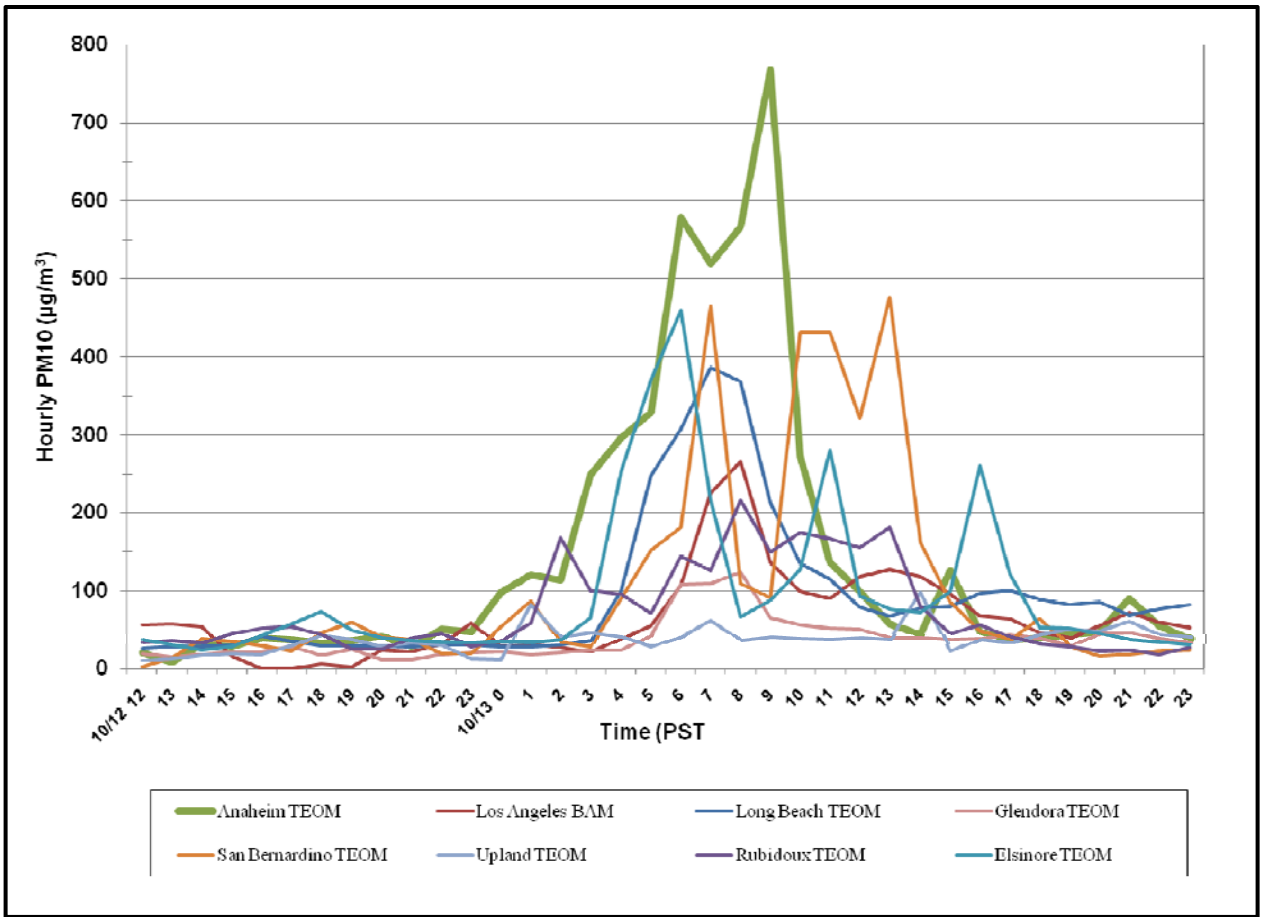

FIGURE 2-1

Time Series of South Coast Air Basin Hourly BAM/TEOM FEM PM10 (µg/m3) from 1200 PST October 12 through October 13, 2008

2.2 Conceptual Model: How the Event Unfolded

A strong Santa Ana wind event developed on October 13th, causing very high northerly through easterly winds in the mountains and deserts, especially through and below the wind-favored passes and canyons in the Basin. The hourly averaged speeds at the AQMD Anaheim air monitoring station peaked at 16 mph for the hour beginning at 0400 PST and remained at 16 mph through the 0900 PST hour. During this period, the Anaheim maximum 1-minute averaged wind speeds peaked at 23 mph, during both the 0500 and 0900 PST hours. Instantaneous wind gusts are not recorded at the Anaheim station, but they would have been above 25 mph at this time. The winds at Anaheim do not appear strong enough to locally entrain sufficient dust to cause the monitored PM10 concentrations from the natural and reasonably controlled sources at, and immediately upwind of, the Anaheim station. However, in areas upwind of Anaheim, very high winds were observed, especially in the Santa Ana Mountains where sources are predominantly open, natural lands.

The analysis of the meteorological setting, including weather charts, pressure gradients and satellite imagery, indicates the potential for very strong winds in the Basin on October 13, 2008. Wind speeds in the Basin, including those measured in Orange, Riverside and San Bernardino Counties upwind of Anaheim were very high throughout the morning on this day causing high PM10 concentrations at Anaheim. Anaheim lies downwind of a geographic corridor for strong Santa Ana wind events, where entrainment of windblown particulates is most likely. This first Santa Ana wind event of the season brought unusually strong winds. Soil moisture was very dry due to rainfall well below normal for the year to date, providing dust to blow and contributing to the wildfire potential.

National Weather Service (NWS) and Federal Aviation Administration (FAA) weather stations measured extremely high peak wind gusts (defined as 3-second running averages) on this day in areas upwind of the high AQMD PM10 stations, especially in the mountains of Los Angeles and Orange Counties, including: 87 mph by in the Santa Ana Mountains of Orange County (Fremont Canyon RAWS); 87 mph in the San Gabriel Mountains of Los Angeles County (Chilao RAWS); 79 mph in the Malibu Hills of Los Angeles County; 61 mph at Ontario International Airport in San Bernardino County; 55 mph at Corona Airport in Riverside County; 51 mph at Chino Airport in San Bernardino County and 41 mph at the Santa Ana – John Wayne Airport in Orange County.

Sustained high wind speeds that were recorded at the NWS stations reached: 55 mph at the Chilao RAWS station; 48 mph at the Fremont Canyon RAWS; 40 mph at Corona Airport; 29 mph at Chino Airport; 37 mph at Ontario International Airport; 36 mph at the Malibu Hills RAWS; and 26 mph at the Santa Ana – John Wayne Airport. *(The NWS/FAA airport stations measure sustained winds as the 2-minute average before the observation time. The NWS RAWS stations measure sustained winds as a 10-minute average.)* The weather observations support the presence of windblown dust through the

morning with blowing dust and visibilities as low as 1.75 miles reported. In addition, NWS forecast discussions and wind warnings, NCDC storm event record reports and newspaper articles also describe strong winds and blowing dust in southern California, providing substantial weight-of-evidence for the sequence of events.

Figure 2-2 shows a snapshot of the Basin sustained winds near 0900 PST on October 13, i.e., near the time of the peak hourly PM10 measurement at Anaheim. Northeasterly winds entered the Basin in San Bernardino County, primarily through the Cajon Pass, and continued through the passes of the Santa Ana Mountains, into Orange County toward Anaheim. The strong northeasterly winds surfaced at the AQMD Fontana air monitoring station with an hourly averaged wind speed of 28 mph at 0900 PST and peak 1-minute speeds of 35 mph. Further downwind, the NWS weather station at Ontario International Airport measured 2-minute average sustained winds of 32 mph at 0853 PST with 3-second gusts to 52 mph and reports of haze and blowing dust. The AQMD Mira Loma station measured an hourly averaged wind speed of 24 mph at this time with a peak 1-minute speed of 32 mph. Chino Airport 2-minute sustained winds were 29 mph with gusts to 51 mph and reported haze and blowing dust with visibilities reduced to 1 mile. Riverside Municipal Airport measured 2-minute sustained speeds of 17 mph and gusts of 38 mph. Corona Airport 2-minute sustained winds were 22 mph with gusts of 46 mph and it, along with Riverside Municipal, was apparently near the edge of the corridor where the strongest winds surfaced. The 0900 PST 10-minute sustained winds at the NWS RAWS station in Fremont Canyon were 47 mph with gusts reaching 87 mph. As the northeasterly winds continued into the coastal plain, the winds speeds decreased, with the AQMD Anaheim air monitoring station measuring 16 mph for the hourly average and 23 mph for the highest 1-minute average during the 0900 PST hour. The lighter winds at Anaheim are indicative of the lack of terrain forcing in the coastal plain and there were likely stronger winds aloft that did not surface in that location. The lower wind speeds of the coastal plain allowed for greater deposition at the Anaheim monitoring station.

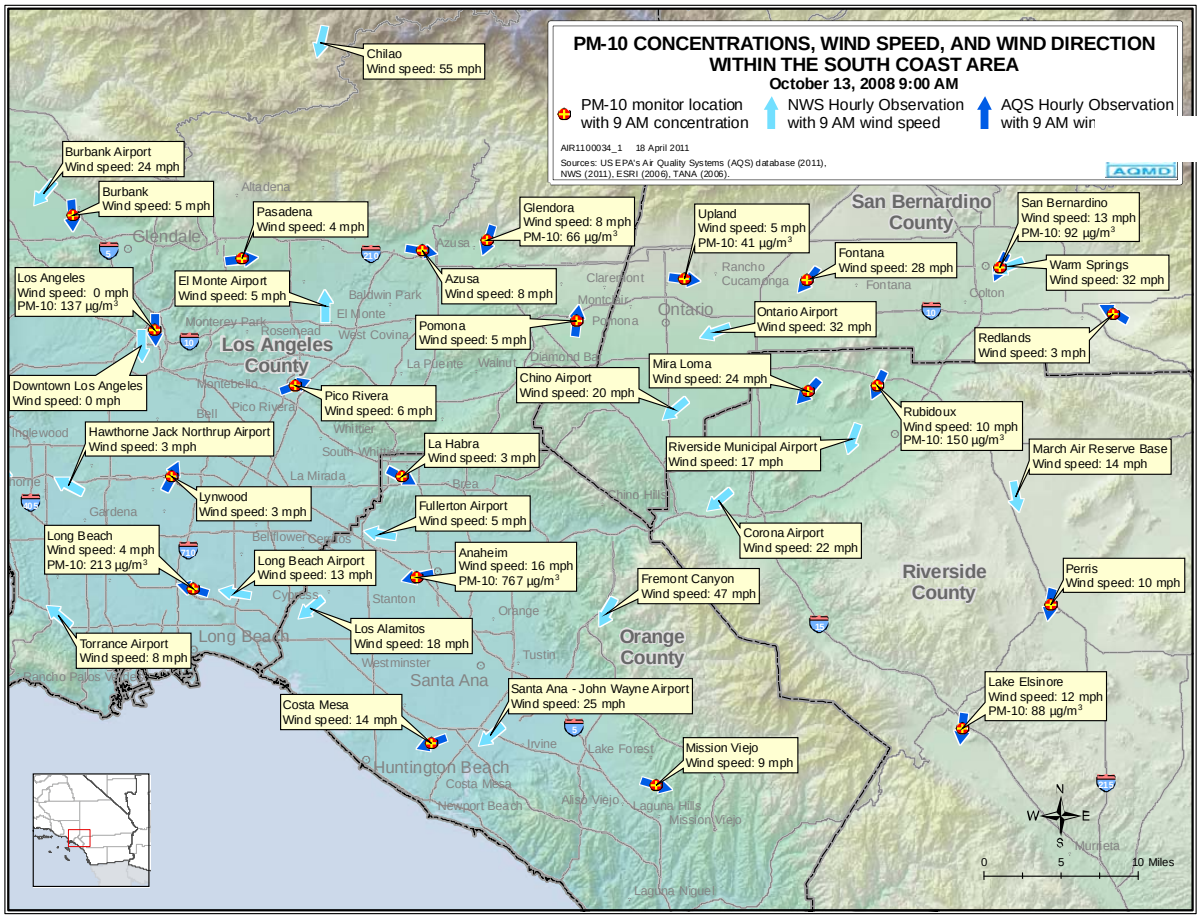

FIGURE 2-2

Map Showing Geography and Sustained Winds Affecting the South Coast Air Basin and the Anaheim PM10 Measurements at approximately 0900 PST October 13, 2008

(Sustained winds are 2-minute averages for NWS Airport METAR stations, 10-minute averages for NWS RAWS and 1-hour averages for AQMD air monitoring stations.)

Due to the widespread high winds, sources of the windblown dust were both natural areas, particularly from the mountains and deserts, and BACM-controlled anthropogenic sources. The timing of this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly TEOM and BAM PM10 measurement data from nearby monitors in the Basin. With the weight of evidence provided, AQMD concludes that the PM10 exceedances would not have occurred without the high winds and wind-entrained dust from sources that were not reasonably controllable or preventable.

2.3 Technical Criteria for a High Wind Dust Exceptional Event Demonstration

Exceptional Event Criteria Summary

The technical criteria outlined in the Exceptional Event Rule for this high wind and windblown dust exceptional event demonstration are addressed in the order set forth in Table 2-2. The following sections describe how the technical criteria are met for the October 13, 2008 natural event.

TABLE 2-2

Technical Criteria for High Wind PM10 Exceptional Event Demonstration

Technical Criteria	Document Section
Not reasonably controllable or preventable	2.3.1
Clear causal relationship between the measurement and the event	2.3.2
Evidence that the event is associated with a concentration in excess of normal historical fluctuations, including background	2.3.2.1
Affects air quality	2.3.3
Caused by human activity unlikely to recur at a particular location OR a natural event	2.3.4
No exceedance or violation but for the event	2.3.5

2.3.1 Is Not Reasonably Controllable or Preventable

This demonstration identifies the sources that were expected to have contributed to the event, both natural and anthropogenic, and indicates how they were not reasonably controllable or preventable.

2.3.1.1 Source areas and categories expected to have contributed to the exceedance

The area upwind of the monitor includes portions of the Santa Ana Mountains and areas of San Bernardino, Riverside and Orange County to the east and northeast of the Anaheim station. This area is mapped in Figure 2-3. Sources of windblown dust were

both natural areas, particularly from the mountains and deserts, and BACM-controlled anthropogenic sources. The primary sources with the potential to contribute PM10 in this area include undeveloped public and privately held lands. Other potential sources are construction activities, landfill operations, freeways and other roadways, light industry and some agricultural operations. These and all sources are subject to strict AQMD regulatory controls. While there was wildfire activity in the western part of the South Coast Air Basin on this day, smoke and ash contributions to the Anaheim PM10 were not significant.

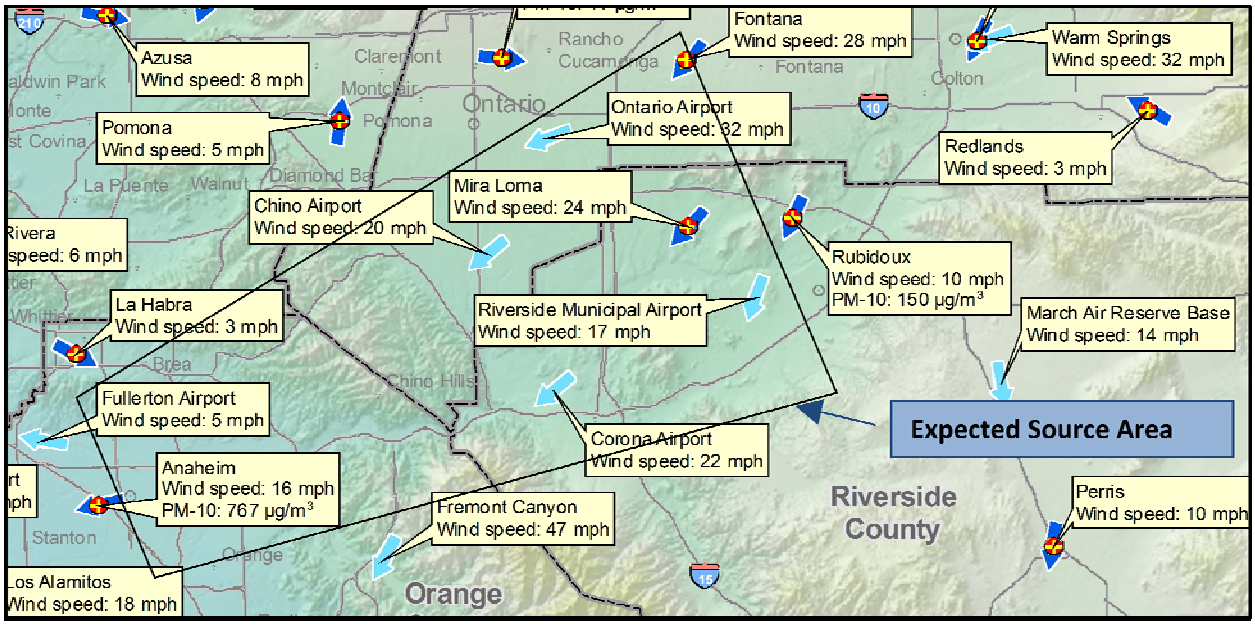

FIGURE 2-3

Map Showing Geography and Primary PM10 Source Areas in the South Coast Air Basin Upwind of Anaheim at approximately 0900 PST October 13, 2008

2.3.1.2 Analysis of wind speed

Sustained wind speeds upwind of the Anaheim PM10 monitor exceeded 25 mph during the event, concurrent with the highest hourly PM10 concentrations at Anaheim that occurred in the morning between 0400 and 1200 PST and peaked for the hour beginning at 0900 PST. For example, the highest sustained wind speeds at the NWS stations at Ontario Airport, Chino Airport, and Fremont Canyon before the hour of 0900 PST were 37, 29, and 55 mph, respectively, with significantly higher gust measurements. Table 2-3 shows the highest sustained winds and gusts through the day at Southern California stations, along with the times they occurred. Fremont Canyon measured sustained 10-

minute wind speeds over 25 mph during every hour of the day on October 13, except the hour beginning at 2300 PST that night. Wind speeds in excess of 25 mph are commonly used as a threshold for when undisturbed natural lands will allow wind entrainment of PM10 dust or when BACM controls on anthropogenic PM10 sources dust sources are likely to be overwhelmed. This threshold is appropriate for the purpose of this analysis. While not all wind monitors in areas upwind of the Anaheim monitor exceeded sustained winds of 25 mph due to the complex terrain of this area, it is clear that winds in the general upwind vicinity reached sustained speeds high enough to overwhelm controls on anthropogenic sources and entrain dust from natural sources and then transport it to the Anaheim PM10 monitor.

TABLE 2-3

Peak Wind Gusts and Sustained Wind Speeds (mph) Measured in Southern California on October 13, 2008 with Time of Occurrence (PST)

(Peak wind gusts at these NWS stations are typically defined as the highest 3-second running average during the hour preceding the observation time. Sustained winds at the NWS airport stations are 2-minute averages preceding the observation time. Sustained winds at the NWS RAWS stations are 10-minute averages preceding the observation time.)

Station Location	Peak Wind Gust (mph)	Time of Peak Gust (PST)	Peak Sustained Wind Speed (mph)	Time of Peak Sustained Wind (PST)
Chilao RAWS (Angeles National Forest)	**87**	0900	**55**	0900
Fremont Canyon RAWS (Santa Ana Mountains, Orange County)	**87**	0900	**55**	0800
Malibu Hills RAWS (north coastal Los Angeles County)	**79**	0900	**36**	0700
Camp Nine RAWS (Angeles National Forest, Los Angeles County)	**73**	0600 0800	**32**	0400
Warm Springs RAWS (north of Castaic, Los Angeles County)	**67**	0200	**40**	0100
Leo Carrillo RAWS (north coastal Los Angeles County at Ventura County border)	**65**	1000	**25**	0900
Whitaker Peak RAWS (LA County Mountains, south of Pyramid Lake)	**61**	1000	**37**	0800
Ontario International Airport (San Bernardino County)	**61**	0700	**37**	0800
Corona Airport (Riverside County)	**55**	1016	**40**	0900
Newhall Pass RAWS (Santa Clarita area, Los Angeles County)	**53**	1100 1300	**26**	1000
Saugus RAWS (Santa Clarita area, Los Angeles County)	**53**	1300	**28**	1100
Chino Airport (San Bernardino County)	**51**	1000	**29**	0900
Devore RAWS (near Cajon Pass, San Bernardino County)	**50**	0500	**25**	1000
Sandberg (northern LA County Mountains, near Gorman)	**46**	1100	**31**	0200 0500
Santa Ana – John Wayne Airport (Orange County)	**41**	0900	**26**	0200 0800
Riverside Municipal Airport (Riverside County)	**38**	0900	18	0400 0800
Fullerton Airport (Orange County)	**25**	0600	17	0600

2.3.1.3 Recurrence frequency

Since the year 2000, only one PM10 federal standard violation has been measured at Anaheim besides this event on October 13, 2008, that was October 21, 2007. AQMD has also requested the exclusion of the 2007 high wind PM10 exceptional event, which was associated with a severe, widespread Santa Ana wind event that caused many stations to exceed in the Basin. While high wind natural events may recur, sometimes frequently, natural events at Anaheim have not recurred frequently.

2.3.1.4 Controls analysis

This requirement is met by demonstrating that despite having reasonable and appropriate measures in place, the October 13, 2008 wind event caused the NAAQS violation. During this event, there were no other unusual PM10-producing activities occurring in the Basin and anthropogenic emissions were approximately constant before, during and after the event. Reasonable and appropriate measures were in place, as has been described in Section 1.5, Regulatory Measures. October 13 was designated an agricultural and prescribed wildland "no-burn" day, in accordance with AQMD Rule 444. The PM2.5 24-hour averages at all stations in the Basin, including Anaheim, were well below the 24-hour PM2.5 NAAQS and the PM10 was estimated to be composed of 87% PM-Coarse particles (PM10-2.5) and only 13 percent PM2.5. This shows that mostly crustal material comprised the PM10 mass and not transported or locally generated urban pollution or combustion sources.

Three wildfires were reported in southern California on October 13, fanned by the strong, dry Santa Ana winds, two in the San Gabriel Mountains north of the San Fernando Valley and one at Camp Pendleton in the north coastal part of San Diego County. Only one of these, the Marek Fire, was active during the early morning hours when the hourly PM10 concentrations spiked at Anaheim. With the northeasterly wind flows throughout the period, it is unlikely that the smoke or ash from the fires contributed significantly to the PM10 measured at Anaheim. The PM2.5 portion of PM10, which would indicate combustion sources, was very small throughout the Basin. Crustal material from windblown dust was the primary component of the measured PM10 at Anaheim, as confirmed by comparing with the PM2.5 measured on this day. Prescribed, agricultural or residential burning did not appear to have added any significant amount of PM10 to the concentrations measured in the Basin; these activities were not permitted on this day.

Wind speeds were high enough to entrain dust from natural areas including undisturbed mountain and desert areas upwind of the monitor. Natural particulate source areas contributed heavily to the measured PM10 at Anaheim on October 13, from the upwind mountain and desert areas and especially through the undeveloped terrain of the Santa

Ana Mountains. Dust from these sources was not reasonable controllable or preventable during this event, due to the cost of applying controls over such a large land area and potential detrimental effects that controls could have on the natural ecosystems. PM10 was emitted from some BACM-controlled sources (mainly construction, landfill and agricultural activities) as BACM controls were locally overwhelmed by the high winds. BACM measures can be overwhelmed when sustained wind speeds reach 25 mph. These BACM-controlled sources are mainly in the San Bernardino and Riverside County Valleys from Fontana to the Santa Ana Mountains and in the foothill area between Anaheim and the Santa Ana Mountains, as outlined in Figure 2-3.

A survey of the AQMD complaint records and inspection reports for Anaheim and all other areas of the Basin indicated no evidence of unusual particulate emissions on October 13, 2008 other than related to the strong winds. The complaints are summarized in Table 2-4 from the AQMD Clean Air Support System (CLASS) database for complaints and compliance actions. Due to the windy conditions, AQMD compliance staff responded to 14 complaints related to windblown dust on October 13, including one in Anaheim. Most were in Riverside and San Bernardino County, but two were in Orange County with no further compliance action taken. No Notices of Violation or Notices to Comply were issued in the Basin for fugitive dust on this day. Several complaints were directly related to the strong winds and windblown dust that overwhelmed the strict fugitive dust controls that are enforced in the Basin. The control methods were generally effective throughout the Basin, but were apparently overwhelmed in several instances by the strong, gusty winds, causing windblown dust and sand to be entrained in the atmosphere.

TABLE 2-4

Summary of PM-Related Complaints in the South Coast Air Basin on October 13, 2008

Complaint Date/Time	Location	Complaint Description	Disposition
10/13/08 0725 PST	Anaheim Orange County	Dust in air covering the south part of Irvine. Not watering	Inspector reported the complaint as "weak" with landfill possible source but high winds. No violations observed or citations issued.
10/13/08 0820 PST	Lytle Creek San Bernardino County near Cajon Pass	Anonymous complaint of 2 acres of land blowing dust	No specific source identified on follow-up. High winds were noted as a factor. No violations observed or citations issued.
10/13/08 0851 PST	Fontana San Bernardino County	Excessive dust from construction site	At later inspection visit, water truck was operating and no fugitive dust emissions were observed. No violations observed or citations issued.
10/13/08 0901 PST	Torrance Los Angeles County	Excessive dust from construction site, not enough watering	Active Rule 403 dust control measures in place (shaker grates, paved exits, watering, fencing, tarps). Inspector reported the entire site being watered – active sprinklers and 2 water hoses in use. No trackout observed. No enforcement action taken.
10/13/08 0920 PST	Mira Loma Riverside County	Excessive dust from work site; no watering seen	Inspector did not observe blowing dust and found 2 water trucks onsite. No enforcement action taken.
10/13/08 0937 PST	Mira Loma Riverside County	Dust blowing. Not watered.	Large expanse of farm land with water sprinklers operating. Inspector did not observe blowing dust. No violations observed or further action taken.
10/13/08 0941 PST	Yorba Linda Orange County	Excessive dust from open lots	Inspection on 10/14 did not find fugitive dust, but the Santa Ana winds had subsided. Could not identify specific source among several construction projects. Later follow-ups noted hydroseeding and watering. In compliance.
10/13/08 1015 PST	Rubidoux Riverside County	Dust blowing from open land	Inspector visited on 10/14 and did not find fugitive dust. No enforcement action taken.
10/13/08 1047 PST	Corona Riverside County	Dust blowing north of 91 freeway	Inspector found no construction activity. Wind was blowing very hard but very little blowing dust was observed. No violations seen.
10/13/08 1146 PST	El Monte Los Angeles County	Excessive Dust from grading, not watering	Anonymous complainant. Inspector did not observe any construction or blowing dust at follow-up on 10/14/08.
10/13/08 1326 PST	San Bernardino San Bernardino County	Dust blowing from unpaved construction yard and strong odors	Yard appeared dusty but no fugitive dust was observed at inspection on 10/14. Spots in the yard had burned the previous day due to embers from a small brush and factory fire across the freeway the previous day. Some plastic wrapping, cardboard boxes and spools of rope had burned in the yard. Operator watered yard. No further action taken.
10/13/08 1406 PST	Riverside Riverside County	Excessive dust from construction, not watering	No Rule 403 violations found.
10/13/08 1506 PST	Riverside Riverside County	Excessive dust from construction site, not watering	At visit on same day, inspector observed no construction activity and no dust movement. Site operator said they had been watering, but had a problem when the winds were strongest for a short time.
10/13/08 1512 PST	Sylmar Los Angeles County	Excessive Dust from construction site; not watering enough	Anonymous complaint. No further enforcement action taken.

2.3.2 Causal Connection

This demonstration shows a clear causal connection between the PM10 measured at the Anaheim air monitoring station and the high wind event. In this case, there is a clear causal connection between the onset of the strong, gusty winds upwind of the Anaheim station in the early morning of October 13, 2008 and coinciding increases in the hourly PM10 concentrations at Anaheim.

2.3.2.1 Historical fluctuations

While high wind natural events may recur, sometimes frequently, and qualify for exclusion under the exceptional events rule, information on the historical fluctuations of the particulate concentrations and the winds can give insight as to the frequency of events that may be expected in a given area. This also helps to demonstrate that the event affected air quality. Figure 2-4 shows time series of the available FRM and TEOM 24-hour PM10 concentrations at Anaheim for the 5-year period of 2005 through 2009. Note that before 2008, the TEOM PM10 data was not considered FEM and not submitted to AQS or certified. Two days during this period exceeded the federal standard level of 150 $\mu g/m^3$ at Anaheim: (1) October 21, 2007, with 489 $\mu g/m^3$ (FRM) during an extreme Santa Ana high wind natural event that affected numerous stations in southern California; and (2) this event on October 13, 2008, with 199 $\mu g/m^3$ (FEM TEOM). For the combined FRM and FEM annual 2005 to 2009 Anaheim dataset, the 199 $\mu g/m^3$ concentration in 2008 represents the 99.9^{th} percentile value. If looking at the three-month seasonal period of September through November for the same five years, it represents the 99.7^{th} percentile value. Besides the two validated federal standard exceedances in 2007 and 2008, no others have been measured at Anaheim since before the year 2000 through 2010. The 199 $\mu g/m^3$ concentration on October 13, 2008 is clearly in excess of normal historical fluctuations and the federal standard exceedances do not recur frequently.

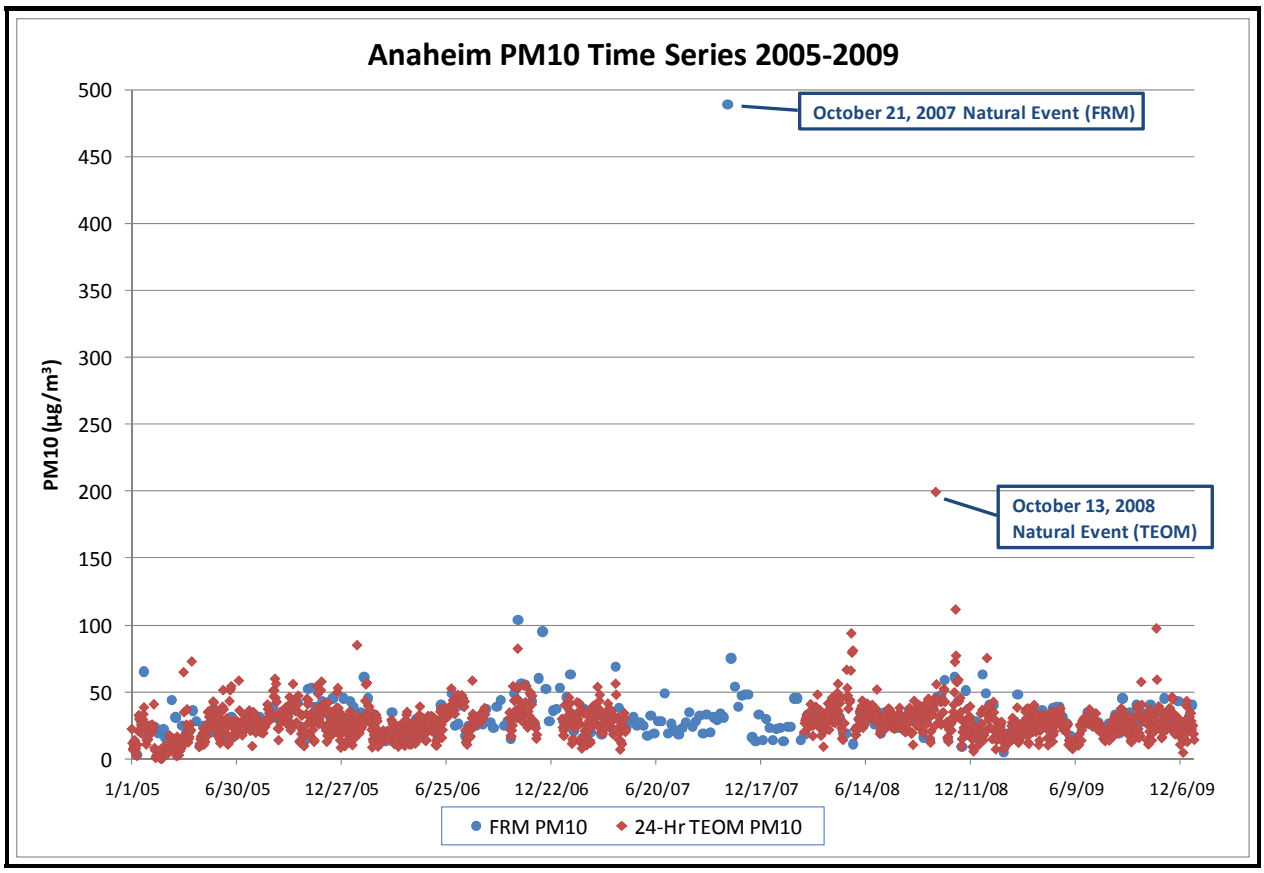

FIGURE 2-4

Time Series of Anaheim 24-Hour Averaged TEOM and FRM PM10 (µg/m^3), 2005 through 2009

Climatological summaries of high winds from the Western Regional Climate Center for the NWS wind stations at some of the stations of significance to this Santa Ana event are presented in Table 2-5. These illustrate that the wind speeds observed during this event occur relatively infrequently. For example, sustained winds exceeding 40 mph at the Fremont Canyon RAWS station, the windiest station associated with this event, occur only in 0.5% of the measurements, on average, over the 10 years of data analyzed. While strong winds do recur in this area, the strong winds observed on October 13, 2008 are in excess of the normal historical fluctuations.

TABLE 2-5

Annual Sustained Wind Speeds reaching thresholds of 30 and 40 mph at Several Stations Typically Influenced by Santa Ana Events

(Based on Western Regional Climate Center data summaries with data from 1999 through 2008. The percentages of maximum sustained winds are based on the highest daily 2-minute average winds for the NWS/FAA stations and 10-minute averages for the RAWS Stations.)

Station Location	Observed Maximum Sustained Wind Speed	Percentage of Days with Sustained Wind Speed:	
	10/13/2008	≥ 30 mph	≥ 40 mph
Fremont Canyon RAWS (Santa Ana Mountains, Orange County)	48	1.80	0.50
Ontario International Airport (San Bernardino County)	37	2.93	0.71
Santa Ana – John Wayne Airport (Orange County)	26	0.44	0.03
Riverside Municipal Airport (Riverside County)	18	1.95	0.11
Fullerton Airport (Orange County)	17	0.19	0

2.3.2.2 Event occurrence and geographic extent

This section contains details of the high-wind natural event occurrence on October 13, 2008, including a description meteorological conditions that led to the high wind event along with details of the sequence of events. Wind measurements, weather analysis charts, reports of blowing dust and reduced visibilities, wind advisories, news reports, and satellite images were all analyzed for this evaluation. Detailed weather observations and other supporting documentation can be found in the Appendix. Figure 2-1 illustrates the geographic extent of this PM10 event with the time series of hourly FEM PM10 measurements at several South Coast stations. Figure 2-2 shows the geographic extent of the wind near the time of the peak hourly PM10 measurement at Anaheim. While Anaheim was the only station to exceed the 24-hour midnight-to-midnight federal standard, several stations recorded high hourly values for a portion of the day associated with this relatively widespread wind event that affected southern California.

Meteorological Setting

The meteorological mechanism that led to the natural event on October 13 is the classic Santa Ana wind pattern that brings strong winds to southern California. During Santa

Ana wind events, high pressure builds over the Great Basin desert region of the western United States in the cold air behind the front with lower pressure off the southern California coast. This pressure gradient creates strong north through northeasterly winds, enhanced by thermal gradients due to denser cold air over the Great Basin. The relatively cool air from the Great Basin deserts flows over the southern California mountains, gaining momentum on the lee side. The downslope flow causes compressional warming and drying of the air in the South Coast Air Basin. This combination of strong wind, high temperatures and low relative humidities make these Santa Ana conditions highly conducive to wildfires in southern California.

An upper level trough of low pressure moved through California, between October 9 and 11. The low pressure system did not create much rain in California during this period, but temperatures were cool throughout the state. The National Weather Service (NWS) 500 millibar (MB) analyses every 12 hours between 0400 PST on October 12 and 0400 PST on October 14 are shown in the Appendix, Section A.11. By Sunday, October 12, the backside of the trough was over California, providing upper level support for a developing strong Santa Ana wind event. The strong pressure gradients that developed between the high and low pressure areas aloft created strong winds. The winds over California at the 500 MB pressure level started out northwesterly in the morning of October 12 with speeds to 81 mph (70 knots), then became more northerly by the morning of Monday, October 13 with speeds to 57 mph (50 knots). The strong northerly flows aloft, coupled with strong northeasterly surface pressure gradients, enhanced the offshore flows at the surface across southern California.

The passage of the low pressure trough aloft brought the first strong cold front of the season at the surface. Section A.12 in the Appendix shows the NWS sea-level pressure analyses, every three hours between 1600 PST on October 12 and 0100 PST on October 14. By 1600 PST October 12, the surface low and cold front was over the northeastern border of New Mexico and high pressure was building over northern Nevada, increasing the northerly gradients from the Great Basin. By 0100 PST on October 13, the high pressure over Nevada had increased to 1033 MB, strengthening the gradient flows across California. By 0700 PST, the area of high pressure had expanded and peaked at 1037 MB. The strength of the high pressure remained nearly the same through the rest of the day, while the broad area of high pressure slowly moved to the east, causing the winds to shift from northerly to northeasterly, then easterly throughout the day. The strong pressure gradients caused strong winds, especially in southern California as the flow of cold air from the area of high pressure further enhanced the winds as it flowed across the mountains. Some gusty winds had already been observed on October 12, but they increased considerably in the early morning of October 13.

Temperature profiles through this period of high winds from the San Diego and Point Mugu radiosondes and the AQMD Radar Wind Profiler (RWP) Radio Acoustic Sounding Systems (RASS) indicate surface-based temperature inversions, which are

common with offshore wind events. This allowed winds aloft to more readily mix to the surface. The surface winds on October 13 started out northerly in the morning, shifting to the northeast through the day and more easterly by the end of the day as the surface high pressure over the Great Basin shifted eastward behind the trough. Temperatures in southern California on October 13 were warm for this time of year, reaching the low 80˚F range even along the coast. The air was very dry, especially in the windy areas; relative humidities in the Basin fell into the teens even in coastal areas. One wildfire started on October 12 and two more would start throughout the day on October 13. Although lighter, the offshore winds continued for the next few days and the temperatures increased further. With hot, dry and breezy conditions contributing to the growth of these wildfires and others over the next several days, the largest fires were not controlled for nearly two weeks.

The AQMD Meteorology Section routinely analyzes sea-level pressure gradients in southern California to assess winds and air pollution potential. The Summation Pressure Gradient (SPG) is a good indicator of the strength of the flow and whether it is onshore (positive) or offshore (negative), where

$$SPG = (SAN\text{-}LAS)^2 + (LGB\text{-}DAG)^3 + (RIV\text{-}DAG)^4$$

In the morning of October 12, the 0700 PST SPG was –5.5 MB, indicating moderate offshore flow. At the same time in the morning of October 13, the SPG strengthened to –14.7 MB, indicating a stronger offshore gradient. The gradient was enhanced by the upper level pattern and thermal gradient as described above, to create a strong wind event, especially for several hours through the morning of October 13.

The AQMD Meteorology Section predicted high winds for October 13 in the Coachella Valley for AQMD Rule 403.1, which requires specific actions in this area when wind gusts exceed 25 mph. While there are no other AQMD rule requirements to forecast winds in the South Coast Air Basin, the daily forecast discussion by AQMD issued on October 12 for Monday, October 13 predicted the strong winds. A smoke advisory was already in effect in the morning of October 12 and the strong winds were prominent in the forecast discussion, as follows:

> *SMOKE ADVISORY for Sunday: Concentrations of fine particulates may reach Unhealthy for Sensitive Groups or higher in areas of Los Angeles County directly impacted by smoke from a wildfire in the Angeles National Forest north of Pacoima.*
>
> *Monday will be mostly clear, windy and warmer as the offshore Santa Ana winds strengthen. Gusty winds through and below canyons and passes will cause elevated*

[2] Sea Level Pressure difference between San Diego and Las Vegas
[3] Sea Level Pressure difference between Long Beach and Daggett
[4] Sea Level Pressure difference between Riverside and Daggett

> *particulate concentrations due to windblown dust and possibly continued wildfire activity.*

AQMD's PM10 predictions were increased throughout the Basin for October 13 and agricultural and prescribed burning was prohibited with a No-Burn declaration for the entire Basin. AQMD issued a Smoke and Windblown Dust Advisory in the morning of October 13, reproduced in the Appendix, Section A.10, that warned of the likelihood of strong Santa Ana winds causing high PM10 concentrations in several areas of the Basin, including Central Orange County (Forecast Area 17, including Anaheim), as follows:

> *In addition, strong Santa Ana winds will likely cause PM10 concentrations to reach Unhealthy for Sensitive Groups concentrations or higher in areas throughout the Basin downwind of the windy areas. This includes any areas where windblown dust is visible, especially through and below passes and canyons, until the winds subside. Wind prone areas are likely to include: the San Bernardino Valley (Areas 32, 33, 34, 35), Riverside County Valleys (Areas 22, 23, 24, 25, 26), Orange County (Areas 16, 17, 18, 19, 20) and the Los Angeles County northern and southern coastal areas (Areas 2 and 4).*

The Appendix to this document (Sections A.2 through A.6) contains the forecast discussions, short-term forecasts (nowcasts), fire weather forecasts, warnings and significant wind reports, as available from the NWS Los Angeles/Oxnard and San Diego Forecast Offices, whose areas of responsibility cover the Basin and much of southern California. These show that the strong Santa Ana wind event was well predicted in advance, warning the public of potentially damaging winds and windblown dust and sand, along with reduced visibilities. Governor Schwarzenegger issued a press release on October 10 to prepare the state for the pending Santa Ana winds, the first significant offshore wind event of the season, and the associated wildfire potential (see Appendix A.7).

NWS advisories and warnings for high winds (Appendix, Section A.5) were already in place on October 12, extending through Tuesday, October 14, or longer. A Wind Advisory is issued by NWS when sustained winds of 30 to 39 mph are expected for 1 hour or longer. A High Wind Warning is issued when sustained winds of 40 mph or more are expected for 1 hour or longer, or for wind gusts of 58 mph or more with no time limit. NWS Oxnard issued High Wind Warnings on October 12, extending through the period for the Los Angeles and Ventura County Mountains and Wind Advisories for the Santa Monica Mountains, the Ventura County coastal and interior valleys, the Santa Clarita Valley, the Los Angeles County San Fernando Valley, and the Ventura and Los Angeles County coasts, including Downtown Los Angeles.

NWS San Diego issued High Wind Warnings for the San Bernardino and Riverside County valleys (Inland Empire) and the Santa Ana mountains and foothills and Wind Advisories for the San Bernardino County mountains, Orange County coastal areas, the Riverside County mountains, the San Diego County mountains, and the San Diego County valleys, In short, High Wind Advisories and Warnings were in place for most of

the South Coast Air Basin and much of southern California to warn the public of this high wind event. Northeasterly winds with sustained speeds in the 35 to 45 mph range were predicted throughout the region, along with damaging gusts to 70 mph, especially in the mountains and below passes and canyons in the Inland Empire. Hazardous driving conditions were predicted, especially through and below canyons and passes, as well as blowing dust and sand with reduced visibility, broken tree limbs and downed power lines.

NWS routine METAR and RAWS weather stations reported very high peak wind gusts and sustained winds at numerous locations throughout the morning of October 13. Table 2-3 summarizes the highest winds of October 13. Complete weather observations through the period are listed in the Appendix, Section A.1. The winds were high throughout the day, but nearly all stations measured the highest speeds in the morning, near the time when the peak PM10 hourly values were measured in the Basin. As is typical of strong Santa Ana wind events, the highest wind speeds were in the San Gabriel and San Bernardino Mountains in the north part of the Basin, the Santa Monica Mountains, and the Santa Ana Mountains in Orange County, as well as the passes and canyons on the lee side of the mountains. The strongest gusts recorded on October 13 were 87 mph at both Chilao in the San Gabriel Mountains and Fremont Canyon in the Santa Ana mountains of Orange County, with sustained winds to 55, at both Chilao and Fremont Canyon.

Several of the METAR stations that report visibility and weather conditions noted reduced visibilities and either haze or blowing dust. The Ontario International Airport, in San Bernardino County below Cajon Pass, reported reduced visibilities down to 1.75 miles along with strong, gusty winds, haze and blowing dust between the 0153 and 1053 PST observation times. Chino Airport, upwind of Anaheim in southwestern San Bernardino County, reported restricted visibility to one mile with haze, dust and windblown dust, along with gusty winds between the 0253 PST and 1453 PST observations. Corona Airport, in Riverside County to the east of Anaheim, reported restricted visibility to 2.5 miles with haze between the 0456 and 1056 PST observations. Fullerton Airport, in Orange County to the north of Anaheim, reported haze with visibilities as low as 4 miles between the 0453 and 0853 observations with wind gusts to 25 mph.

Figure 2-5 shows the NASA MODIS Aqua high-resolution satellite image at approximately 1330 PST in the afternoon of October 12. Smoke in the image appears more white or grey while dust appears more brown. The offshore flow is clearly seen in this image in the smoke and dust blowing from the land over the ocean. Smoke is visible from the Marek fire, blowing from the northeast and over the ocean past Santa Catalina, San Nicolas and San Clemente Islands. Some windblown dust appears to be accompanying the smoke offshore. Some smoke is also evident from a fire north of

Point Piedras Blancas near San Simeon. Windblown dust is evident offshore of Point Conception, San Diego County and Baja California.

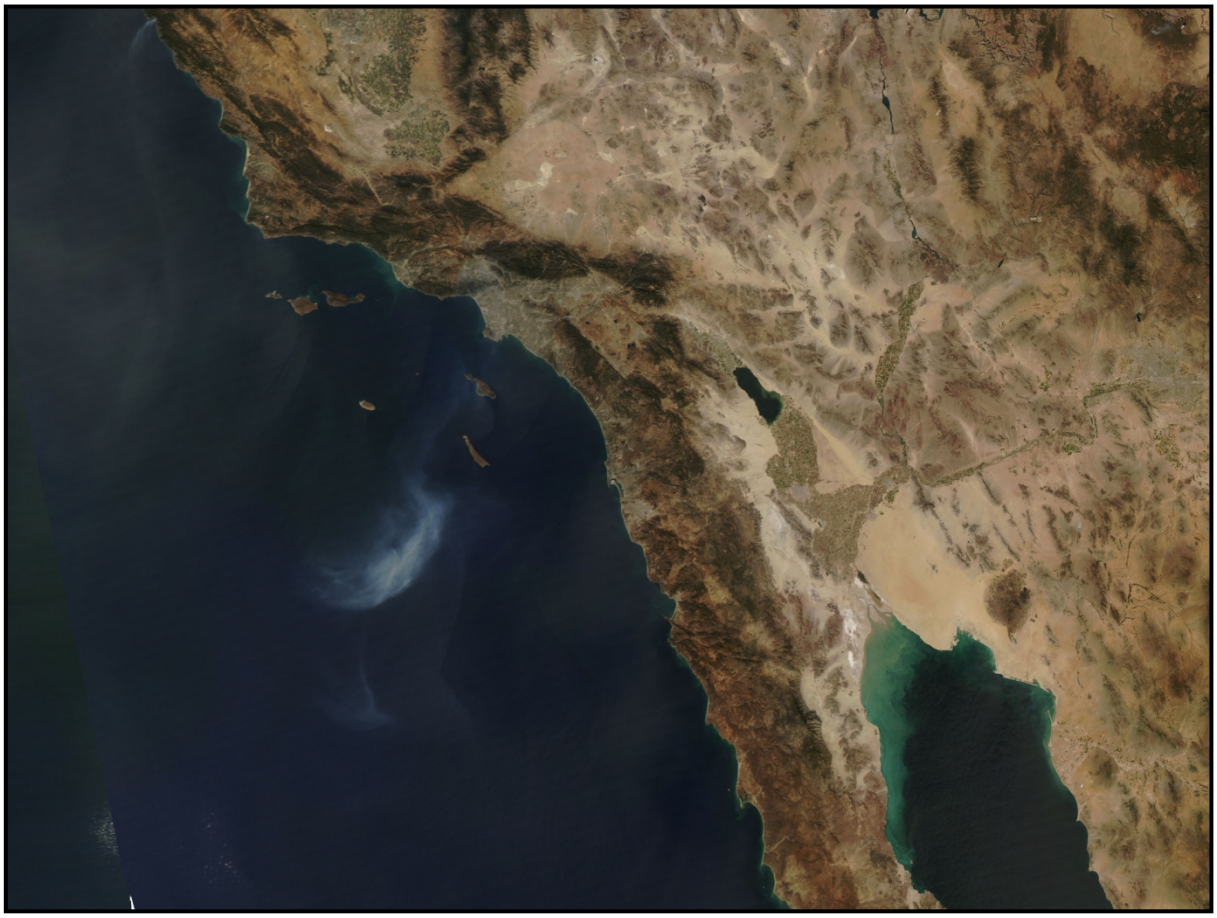

FIGURE 2-5

NASA MODIS Aqua True Color Satellite Image near 1330 PST on October 12, 2008

Figure 2-6 shows the MODIS Terra satellite image from approximately 1030 PST in the morning of October 13. A more significant narrow plume of smoke and windblown dust is seen from the area of the Marek and Sesnon Fires, blowing toward the southwest over the California Bight and curling in the outer waters. A significant plume of windblown dust is visible, blowing to the southwest across San Pedro, Long Beach, Anaheim, and offshore to Santa Catalina Island. The hourly PM10 concentrations at Anaheim and other nearby stations peaked about an hour before this image. Smoke from the Juliet Fire in San Diego is not evident; that fire had just starting at this time. Any dust blowing in Riverside or San Bernardino County cannot be distinguished from the land background at this time.

FIGURE 2-6

NASA MODIS Terra True Color Satellite Image at approximately 1030 PST on October 13, 2008

Diagonal line through offshore due to composite of two passes

Figure 2-7 shows the MODIS Aqua satellite image from approximately 1330 PST in the afternoon of October 13, with the Marek and Sesnon fires mapped in red. The fires have grown considerably at this time and a long plume of smoke is blowing toward the southwest over Malibu and widening downwind in the California Bight. A windblown dust plume is still evident south of Long Beach, but it has widened and is not as dense as it was at 1030 PST, consistent with the reduction in wind speeds and PM10 measured in the Basin by this time. A faint, broad plume of smoke and windblown dust is evident off the coast near Camp Pendleton.

FIGURE 2-7

NASA MODIS Aqua True Color Satellite Image at approximately 1330 PST on October 13, 2008

2.3.2.3 Transport of emissions related to the event

The mapped winds in Figures 2-2 and 2-3 in section 2.3.1 provide wind direction data showing that emissions from sources identified as part of the "not reasonably controllable or preventable" demonstration were upwind of the Anaheim monitor in question. The transport of emissions related to the event were in the direction of the monitor at Anaheim where the PM10 federal standard exceedance was recorded.

2.3.2.4 Temporal relationship between the high wind and elevated PM concentrations

Figure 2-8 shows the hourly TEOM data from the Anaheim air monitoring station, along with the wind speeds from Anaheim and the Fremont Canyon RAWS site in the Santa Ana Mountains of Orange County. This clearly shows that the peak hourly PM10 concentrations occurred in the morning associated with the upwind peak wind speeds and gusts. It establishes the temporal relationship between the high winds and the elevated PM10 concentrations at the Anaheim monitor. High winds were recorded throughout the wind corridor from the Cajon Pass in the San Bernardino Mountains and through the San Bernardino and Riverside Counties and the Santa Ana Mountains into Orange County. Note that while the Anaheim air monitoring station wind speeds are elevated at this time, all the sustained Anaheim wind speeds are below 25 mph. This indicates that the PM10 was mainly transported from the windier mountains passes and canyons and not locally generated in the immediate vicinity of the Anaheim station.

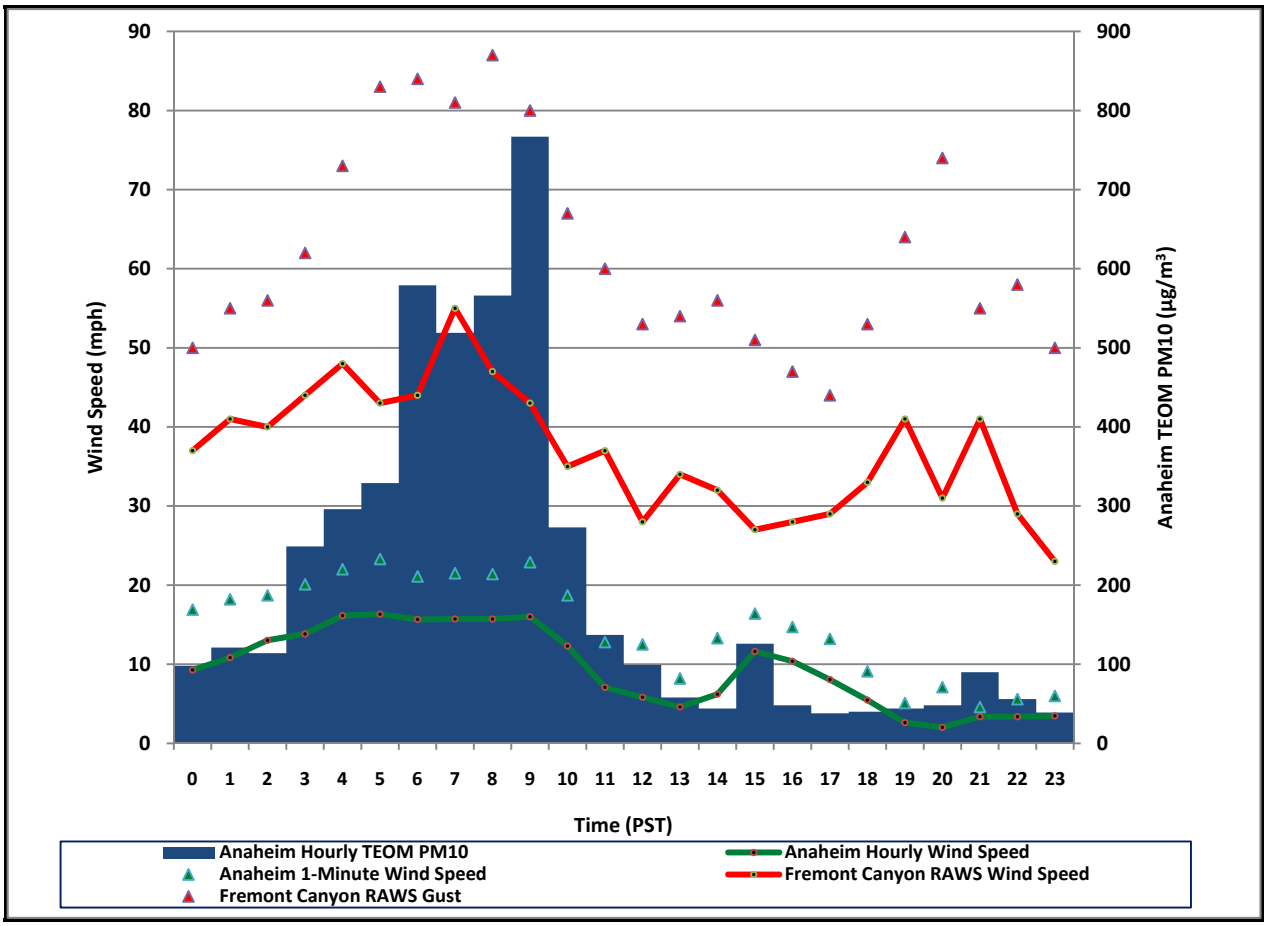

FIGURE 2-8

Hourly TEOM PM10 (µg/m^3) from Anaheim with Sustained Speeds (mph) from Anaheim (hourly averaged) and the Fremont Canyon RAWs (10-minute averaged) with Peak Hourly Gusts (Fremont) or Peak 1-minute Average Wind Speed Winds (Anaheim) on October 13, 2008

2.3.2.5 Chemical composition of measured pollution with that expected from sources identified as upwind

Table 2-6 shows BAM and FRM 24-hour PM2.5 measurements from October 7 through 19, 2008, at Basin stations throughout Los Angeles and Orange Counties. The PM2.5 concentrations were relatively low on October 13, with Anaheim FRM and BAM PM2.5 concentrations of 10.0 and 25.0 $\mu g/m^3$, respectively. During the week before and after October 13, he 24-hour BAM PM2.5 only exceeded the federal 24-hour standard on October 9 at Los Angeles and Burbank. This was due to smoke from a fire at Camp Pendleton in San Diego County on that day that was transported to the north by a coastal eddy offshore. Also, persistent dense fog through the morning of October 9 contributed to some artificially high BAM/TEOM hourly readings on October 9 (note that the FRM PM2.5 was much lower at Anaheim, Los Angeles and Burbank). The fires in the northern San Fernando Valley and later at Camp Pendleton in San Diego County on October 13 did not cause very high PM2.5 at the Basin monitoring stations. During this period of Santa Ana winds, the offshore flows brought air with low PM2.5 from the high deserts and any smoke from the fires in the Basin blew toward the west and offshore.

The relatively low PM2.5 measurements on October 13 provide evidence that the high PM10 measured at Anaheim was due to coarse particles, with a relatively small contribution from smoke and other fine particles in the PM2.5 size range. By comparing the 24-hour PM10 and PM2.5 mass from the same stations, the percentage of PM10 attributed to PM-Coarse (PM10-2.5) is high on October 13 and higher than the surrounding days (Table 2-7). PM-Coarse accounts for 87 percent of the Anaheim PM10, indicating that the source of the high PM10 throughout the Basin on October 13 was primarily crustal material due to windblown dust and not combustion related particles.

TABLE 2-6
24-hour FRM and BAM PM2.5 Measurements in Los Angeles and Orange Counties between October 7 and October 19, 2008
(concentrations exceeding 35 μg/m^3 are highlighted in bold type)

Monitoring Site		**24-Hour PM2.5 (μg/m^3)**												
		Date (October 2008)												
Location	**Type**	07	08	09	10	11	12	**13**	14	15	16	17	18	19
Anaheim	FRM		12.6	17.9	13.6	6.5	7.4	10.0		9.2	9.9	11.6	14.8	
Anaheim	BAM	23.5	24.6	33.6	27.9	18.0	19.0	25.0	27.2	22.9	16.4	18.3	17.1	16.8
Central Los Angeles	FRM	10.4	15.5	18.5	12.6	3.4	7.3	13.0	20.8	11.5	12.8	14.7	12.4	17.0
Central Los Angeles	BAM	20.3	27.8	**36.4**	31.4	11.4	13.0	18.5	31.7	22.1	16.5	18.0	18.4	23.0
Lynwood	FRM			17.2			9.7			16.8			10.4	
Pico Rivera	FRM			17.0			8.1			12.8			14.0	
Burbank	FRM			16.6			7.0			9.6			14.2	
Burbank	BAM	21.4	24.6	**36.0**	28.9	15.5	18.0	18.2	31.5	24.8	15.0	17.0	19.4	23.0
Reseda	FRM			16.5			3.3			10.3			10.6	
Pasadena	FRM			16.0			6.6			3.3			12.1	
Azusa	FRM	6.3	8.5	19.8	14.3	3.8						11.1	14.5	17.3
Glendora	BAM	4.9	5.9	21.0	16.4	3.5	3.4	6.0	11.2	6.8	7.5	11.4	17.4	17.2
North Long Beach	FRM	13.0	14.7	16.5	13.0	5.8	9.2	17.2	16.8	14.8	13.5	14.5	9.2	13.1
South Long Beach	FRM	12.4	14.6		11.5	5.0	8.0	15.0	17.4	15.8	15.5	16.7	8.8	13.9
Mission Viejo	FRM			17.5			6.5			5.4			9.3	

* October 13 was not a scheduled 1-in-3 FRM PM2.5 sampling day. Central Los Angeles, North Long Beach, South Long Beach and Anaheim FRM samplers measure every day.

TABLE 2-7

Percentage of 24-Hour PM10 Attributed to PM-Coarse (PM10-2.5) from Collocated BAM/TEOM Measurements between October 6 and October 19, 2008

Monitoring Site		24-Hour PM-Coarse (PM10-PM2.5)/PM10 (%)												
		Date (October 2008)												
Location	**Type**	07	08	09	10	11	12	**13**	14	15	16	17	18	19
Anaheim	TEOM/ BAM	29.2	38.6	22.6	24.2	27.2	57.8	87.4	51.4	47.6	63.9	58.4	45.1	39.7
Central Los Angeles	BAM/ BAM	54.2	48.8	38.4	51.1	67.3	65.3	69.4	57.5	57.8	69.4	70.5	58.7	50.5
Glendora	TEOM/ BAM				62.6	81.0	80.1	87.5	63.7	56.9	66.6	56.4	41.0	38.3

Since October 13 was not a 1-in-6 routine FRM PM10 filter sampling day, no speciated chemical analysis of the sulfate, nitrate and chloride components of PM10 filter is available on this day. Likewise, no potassium or other smoke indicators were available to gain additional insight on the smoke contribution. Table 2-8 shows the hourly BAM PM2.5 concentrations at Anaheim. The hourly PM2.5 values increased to greater than 35 $\mu g/m^3$ for four hours from 0700 through 1000 PST in the morning of October 13. The hourly BAM PM2.5 peaked at 62 $\mu g/m^3$ at 1000 PST, when the PM10 concentration was 273 $\mu g/m^3$. At this time the hourly PM10 was still 77% coarse particles. This is consistent with the period of high PM10 when the windblown dust increased the PM10, but PM2.5 remained a small fraction of the hourly PM10 throughout the day. While smoke from the fire that started the previous day in the northern San Fernando Valley may have contributed to the PM10 NAAQS violation, it is unlikely that the smoke contribution was significant.

TABLE 2-8

Hourly BAM PM2.5 Measurements at the AQMD Anaheim Air Monitoring Station Between 1200 PST October 12 and 0000 PST October 14, 2008

(concentrations exceeding 35 μg/m^3 are highlighted in bold type)

		Anaheim Monitoring Station	
DATE	**HOUR (PST)**	**BAM Hourly PM2.5 (μg/m^3)**	**24-Hour PM2.5 (μg/m^3) (midnight to midnight)**
10/12/08	1200	13	
	1300	11	
	1400	11	
	1500	13	
	1600	17	
	1700	21	
	1800	18	
	1900	17	
	2000	20	
	2100	22	
	2200	23	
	2300	20	
10/13/08	0000	15	25.0
	0100	15	
	0200	18	
	0300	17	
	0400	17	
	0500	17	
	0600	27	
	0700	**44**	
	0800	**41**	
	0900	**41**	
	1000	**62**	
	1100	32	
	1200	21	
	1300	21	
	1400	18	
	1500	17	
	1600	29	
	1700	16	
	1800	16	
	1900	16	
	2000	27	
	2100	21	
	2200	26	
	2300	27	
10/14/08	0000	20	

2.3.2.6 Comparison of event-affected day(s) to specific non-event days

Table 2-9 shows the daily 24-hour averaged PM10 concentrations from daily FRM and hourly FEM (BAM or TEOM) measurements for air monitoring stations in the Basin with available data from October 7 through 19. The AQMD FRM PM10 filter samples are collected on a 1-in-6 day schedule, except at Riverside-Rubidoux and Indio where 1-in-3 day data is collected. Figure 2-9 shows the time series of the FEM BAM/TEOM daily 24-hour average PM10 concentrations for the Basin monitoring stations for the same period, illustrating the concentration peaks at all locations on October 13, 2008 due to the high winds. The only PM10 concentration in excess of the federal standard measured during this period throughout the South Coast Air Basin was the 199 $\mu g/m^3$ TEOM PM10 on October 13 at Anaheim. However, several other areas of the Basin had elevated PM10 concentrations on this day, indicating that those areas that are prone to high winds during Santa Ana events were also affected by this wind event. The FEM PM10 concentrations at Anaheim on October 13 were nearly 4 times that measured on the sampling days before and after that day. This indicates the impact of the natural event on the October 13 PM10 air quality, resulting in the higher than typical PM10 concentrations above the federal standard level at Anaheim.

TABLE 2-9

24-Hour FRM and FEM (BAM or TEOM) PM10 Measurements (μg/m^3) for Anaheim and other South Coast Air Basin Stations Before and After October 13, 2008

Monitoring Site		**24-Hour PM10 (μg/m^3)**												
		Date (October 2008)												
Station	**Type**	07	08	09	10	11	12	**13**	14	15	16	17	18	19
Anaheim	FRM			38						46				
Anaheim	TEOM	33.1	40.1	43.4	36.8	24.7	45.0	**199.1**	55.9	43.7	45.4	44.0	31.2	27.8
Mission Viejo	FRM			38						17				
Los Angeles	FRM			43						36				
Los Angeles	BAM	44.3	54.3	59.2	64.1	34.8	37.4	85.4	74.5	52.3	53.9	61.0	44.5	46.4
Long Beach	FRM			32						45				
Long Beach	TEOM	26.8	35.2	33.5	45.6	26.9	28.9	124.4	52.9	37.4	37.1	43.3	22.8	25.4
Glendora	TEOM				43.9	18.2	17.2	48.0	30.8	15.8	22.4	26.2	29.5	27.9
Rubidoux	FRM			73			64			66			61	
Rubidoux	TEOM	61.9	62.2	70.6	46.1	41.2	54.8	92.6	39.4	53.8	60.5	62.9	57.0	53.7
Lake Elsinore	TEOM	49.2	56.9	68.0	46.6	36.0	39.8	125.5	37.1	54.8	51.0	67.1	39.6	36.2
Upland	TEOM	21.3	26.1	41.1	36.3	24.5	20.1	44.5	32.4	31.8	32.6	27.5	33.9	29.9
San Bernardino	FRM			49						42				
San Bernardino	TEOM	34.2	38.5	51.5	57.7	31.1	32.5	144.2	26.0	36.3	46.3	49.4	47.3	48.0

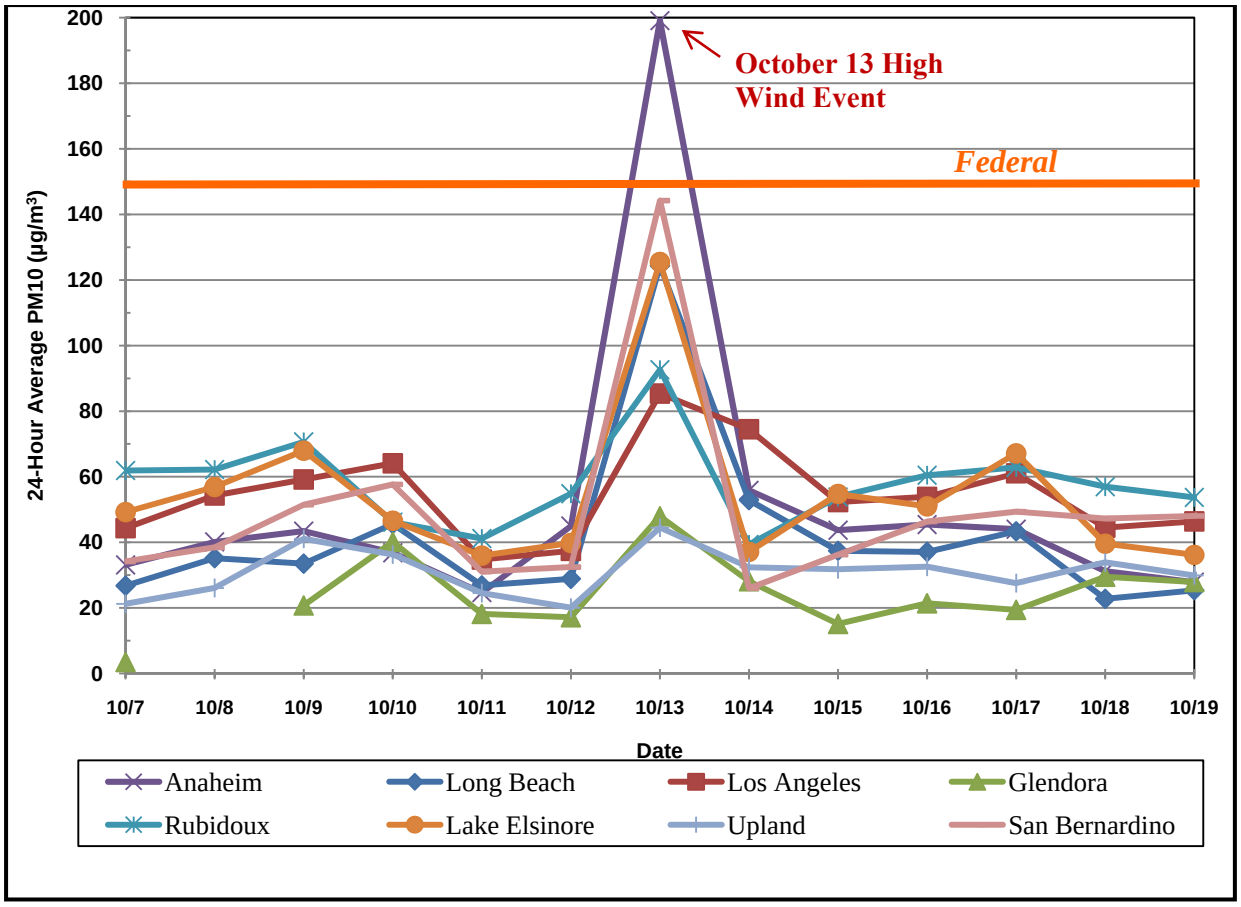

FIGURE 2-9

BAM/TEOM Daily 24-Hour PM10 Concentrations (µg/m3) Measured in the South Coast Air Basin between October 7 and October 19, 2008

2.3.2.7 Alternative hypotheses

Wildfire Analysis

Three significant wildfires burned in Southern California on October 13. The Marek Fire had started at approximately 0100 PST on Sunday, October 12 in the Angeles National Forest in Little Tujunga and Kagel Canyons and Lakeview Terrace (north of the San Fernando Valley in Los Angeles County). In the morning of October 13 the Skyview Terrace Mobile Home Park burned, destroying 38 residences and damaging 6 others. In Dexter Canyon two residences were destroyed and two more were damaged. In Lower Lopez Canyon, one residence was damaged, two commercial buildings were destroyed and another damaged. When it was contained on October 16, 4,824 acres had burned.

The Sesnon Fire started at approximately 0930 PST in the morning of October 13 on Oat Mountain north of Porter Ranch, from a downed electrical distribution line. It quickly grew to the Twin Lakes and Indian Hills areas, crossing from Los Angeles County into Ventura County. When it was contained on October 18, 14,703 acres had burned, 15 residences and 63 outbuildings were destroyed and 11 residences were damaged. On October 13, Governor Schwarzenegger declared a State of Emergency in Los Angeles and Ventura Counties due to these wildfires.

The Juliet Fire started at approximately 0949 PST on October 13 on the southeast portion of Camp Pendleton Marine Base, near Oceanside in San Diego County. This brush fire quickly burned 4,026 acres and was fully contained in the morning of October 14.

The fires burned hot initially, sending smoke high into the atmosphere to be blown offshore by the strong northeasterly Santa Ana winds. Air quality degradation measured by the AQMD air monitoring stations was small, but there were reports of smoke from the communities of the San Fernando Valley near the fires. AQMD issued Smoke Advisories starting on October 12 for nearly two weeks as these and other fires burned on the following days. These are can be found in the Appendix, Section A.10. Satellite imagery show the smoke being blown toward the west with the strong winds and out over the ocean on both October 12 and 13, with little recirculation apparent to Anaheim. While some contribution to the PM10 measured at Anaheim is possible from the smoke and ash from the fires, especially the Marek Fire that started on October 12, the Sesnon and Juliet fires did not start until after the peak hourly PM10 was measured.

2.3.3 Affects Air Quality

This criteria is supported by historical concentration data and demonstrated as part of the clear causal relationship. AQMD has provided evidence for the clear causal relationship which serves also to demonstrate that the event affected air quality.

2.3.4 Was a Natural Event

A high wind dust event can be considered a natural event, even when a portion of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event was not reasonably controllable or preventable, in spite of the strong and enforced AQMD BACM-based control program. It has also established a clear causal relationship between the

exceedance and the high wind event timeline and geographic location. This event can be treated as a natural event under the exceptional event rule.

2.3.5 The "But For" Test

To qualify as an exceptional event, it is necessary to demonstrate that there would have been no exceedance "but for" the event. To meet this "but for" requirement, it must first be shown that no unusual anthropogenic activities occurred in the affected area that could have resulted in the exceedances, besides the high wind event. Activities that generate anthropogenic PM10 were approximately constant in the Basin immediately preceding, during and after the event. Activity levels in the Basin were typical for the time of year and PM10 emissions control programs were being implemented, not only for fugitive dust-generating activities, but also for agricultural burning and other activities in the Basin. Furthermore, due to the forecasts for high winds on October 13, the AQMD compliance teams were ready to act quickly to fugitive dust complaints to minimize emissions and to enforce mitigation methods like watering and soil stabilization.

Vehicular traffic, cooking and residential fires do not directly cause PM10 24-hour NAAQS violations in the Basin. Activity levels in the Basin were typical for the time of year and PM10 emissions control programs were being implemented, for fugitive dust-generating activities, as well as open burning. With the unsettled windy conditions on October 13, such emissions would not contribute significantly to the PM10 measured. There were reasonable and appropriate measures in place to control PM10 in the Basin on October 13, 2008, including AQMD Rules 403, 444, 445, 1156, 1157, 1158 and 1186. Moreover, U.S. EPA has approved AQMD's BACM demonstration for all significant sources of PM10 in the Basin.

Examining the make-up of the PM10 in the Basin on this day using PM2.5 data, the coarse particles (PM10-2.5), which are associated with windblown dust, represent well over 75% of the total PM10 mass collected in the Basin. The three wildfires that were burning in the Basin, one of which started on October 12 and two other after the high hourly PM10 concentrations started, were not the primary cause of the high PM10. PM2.5 remained relatively low throughout the Basin on this day with no exceedance of the 24-hour NAAQS. While there were no PM10 filters collected on this day for laboratory analyses for soluble potassium, an indicator of wood smoke, the predominance of coarse particles, the timing of the fires and the lack of supporting wind directions to bring smoke to Anaheim provide support the conclusion that the contribution from the wildfires was a relatively minor portion of the PM10 measured.

Based on the data provided in this report, AQMD concludes that there would not have been exceedances of the PM10 NAAQS in the Basin on October 13, 2008 if high winds

were not present. The causal connection of the measured PM10 and the strong winds in the Basin, and throughout southern California, along with the high contribution of fugitive dust to the PM10 mass indicate that but for the high wind event this NAAQS violation would not have occurred.

2.3.6 Conclusion

There is a strong causal connection between the high PM10 measured in the Basin on October 13 and the strong Santa Ana high wind event, supported by the meteorological conditions. An upper level trough and frontal system preceded the development of a strong pressure gradient between the high pressure that developed in the northwestern United States and the low pressure in southern California. This brought strong northerly winds in the evening of October 12 that shifted to northerly through easterly directions through the day on October 13, as the Great Basin high expanded eastward. The pressure gradients were very strong and extremely high wind gusts were measured throughout the day in the areas that favor northeasterly winds, especially the mountains surrounding the Basin and through and below canyons and passes. The synoptic weather pattern aloft and thermal structure also supported the strong Santa Ana wind event.

The 24-hour PM10 concentrations at Anaheim were extreme for this station and for the Basin – in the top 99.5 percentile of the Anaheim data considering five years of data either annually or by season. Peak wind gusts to 87 mph were recorded in the San Gabriel Mountains in Los Angeles County (Chilao RAWS) and in the Santa Ana Mountains in Orange County (Fremont Canyon RAWS), with 10-minute average sustained winds as high as 55 mph at Chilao and 48 mph at Fremont Canyon. Wind gusts in the low land areas of the Basin on the lee side of the mountains and upwind of Anaheim reached 61 mph at Ontario, 55 mph at Corona Airport and 41 mph at Santa Ana – John Wayne Airport with sustained winds in excess of 25 mph at these and several other stations. NWS observations of reduced airport visibilities, blowing dust, news accounts and National Climatic Data Center (NCDC) storm damage event reports also support the windblown dust analysis. Due to the widespread winds, sources of the windblown dust included both natural, undisturbed areas, particularly in the mountains and high deserts, and BACM-controlled anthropogenic sources. The timing of this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly TEOM PM10 measurements from available monitors. These show a strong correlation between the high winds and high hourly PM10 concentrations.

The strong winds on October 13 fanned a total of 3 wildfires. These were analyzed for their contribution to the PM10 measurements. Overall, the fires contributed only a small fraction to the PM10 measured as shown by the relatively low concentrations of PM2.5. The wind direction in relation to the fires and the timing of the fires in relation to the

timing of the high hourly PM10 concentrations at Anaheim shows that it is unlikely that the smoke had a large impact at this station. The contribution of the larger crustal particles (PM-Coarse) was significantly greater than that from the smaller combustion particles (PM2.5). Much of the smoke on this day was blown offshore by the strong winds.

If not for the high wind event and the associated wind-entrained dust, the PM10 NAAQS violations measured at Anaheim on October 13 would not have occurred. Therefore, with the weight of evidence provided, AQMD staff recommends the flagging of the PM10 NAAQS violation on October 13, 2008 as an exceptional event due to high winds in the U.S. EPA Air Quality System (AQS) database.

3 Procedural Requirements

3.1 Flagging of Data

AQMD has submitted the PM10 data from this monitor to the U.S. EPA AQS database and has placed the appropriate flags on the data indicating that the data was affected by exceptional events due to high winds (Flag RJ, requesting exclusion due to high winds). To exclude the midnight to midnight 24 hour average, each individual hour of the Anaheim TEOM data was flagged individually. While wildfires also may have contributed to this exceedance, windblown dust was the primary contributor to the measured PM10 at Anaheim. Since only one flag can be submitted for each station exceedance, this is most appropriate for the PM10 on this day. Such flagging ensures that the air quality data is properly represented in the overall air quality planning process.

3.2 Public Notification

The South Coast Air Quality Management District (AQMD) has prepared this documentation to demonstrate that this exceedance was due to high-wind natural events, in accordance with the U.S. EPA Exceptional Event Rule. The documentation in support of this demonstration and request for the treatment of the data associated with this exceedance as an exceptional event has been posted on the AQMD website for public hearings, notices and meetings (http://www.aqmd.gov/pubinfo/public_notices.htm), requesting review and comment by the public for a minimum of 30 days. Public comments should be directed to:

Mr. Kevin Durkee, Senior Meteorologist
South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765
Email: kdurkee@aqmd.gov.

Checklist of Exceptional Event Requirements

Exceptional Event Technical Criteria:	
Not reasonably controllable or preventable	✓
Clear causal connection between the measurement and the event	✓
Evidence that the event is associated with a concentration in excess of normal historical fluctuations, including background	✓
Affects air quality	✓
Caused by human activity unlikely to recur at a particular location OR a natural event	✓
No exceedance or violation but for the event	✓
Procedural Requirements:	
Flagging of Data	✓
Public Notification	✓

4 Mitigation

AQMD issued daily air quality forecasts on October 12 and 13, 2008, each valid for the following day, with same-day updates. The air quality forecast for October 13 issued in the morning of October 12 warned of high-Moderate and Unhealthy for Sensitive Groups Air Quality Index (AQI) levels due to windblown dust in the favored areas through and below canyons and passes. The same-day forecast update issued in the morning of October 13 warned the public of the air quality in the Basin and the Coachella Valley that was predicted to reach the Unhealthy for Sensitive Groups AQI level in 25 forecast areas and the Unhealthy AQI level in four forecast areas, due to increased PM10 particulates in association with the windblown dust and increased PM2.5 in the vicinity of the wildfires (see Appendix, Section A.10). Good ventilation and deep afternoon mixing were predicted for the Basin and, given the time of year, air quality would be expected to be in the Good range, except for the wind event and the fires.

AQMD issued a Smoke Advisory for degraded air quality (Appendix, A.10) on October 12 due to the Marek Fire. In the morning of October 13, AQMD issued a Smoke and Windblown Dust Advisory for the ongoing wildfire and the windblown dust that had already been measured early in the morning. Smoke Advisories were issued through the next week as new fires started in the following days and wildfire smoke continued to impact the Basin. AQMD encourages public awareness of the health impacts of particulate matter through the AQMD website, informational brochures, public meetings and conferences, and press releases. Real-time air quality data, AQI maps, daily air quality forecasts and episode notifications are available through the AQMD website (http://www.aqmd.gov), smart-phone applications and through the Interactive Voice Response (IVR) telephone system (1-800-CUT-SMOG). Forecasts and air quality notifications can be received by FAX, or by email, twitter and RSS feeds through the AQMD Air Alerts subscription system that utilizes the U.S. EPA EnviroFlash framework (http://airalerts.org). Many schools, recreational facilities, sports organizations and individuals subscribe to these services. AQMD forecasts and current data are also available through the U.S. EPA AirNow system (http://www.airnow.gov) and data is available through the California Air Resources Board website (http://www.arb.ca.gov/aqd/aqmoninca.htm).