SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

PLANNING, RULE DEVELOPMENT, AND AREA SOURCES

ANALYSIS OF EXCEPTIONAL EVENTS CONTRIBUTING TO HIGH PM10 CONCENTRATIONS IN THE COACHELLA VALLEY IN 2008

Final Report
May 27, 2011

Authors
Kevin R. Durkee
Senior Meteorologist

Shoreh Cohanim
Air Quality Specialist

Mark Bassett
Air Quality Specialist

Reviewed By:
Michael Laybourn, Air Quality Specialist
Tracy A. Goss, P.E., Program Supervisor, PM Strategies
Joseph C. Cassmassi, Planning and Rules Manager
Elaine Chang, Deputy Executive Officer

TABLE OF CONTENTS

List of Figures

List of Tables

ANALYSIS OF NATURAL EVENTS CONTRIBUTING TO HIGH PM10 CONCENTRATIONS IN THE COACHELLA VALLEY IN 2008

1 INTRODUCTION

1.1 Purpose

This document substantiates the request by the South Coast Air Quality Management District (AQMD) to flag three days that violated the 150 µg/m^3 PM10 24-hour National Ambient Air Quality Standard (NAAQS) in the Coachella Valley portion of the Salton Sea Air Basin as high-wind natural 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]. The PM10 NAAQS violations occurred at both the Coachella Valley 1 (Palm Springs – AQS Site Code 060655001) and the Coachella Valley 2 (Indio – AQS Site Code 060652002) air monitoring stations, as measured by the Federal Equivalent Method (FEM) Beta Attenuation Monitor (BAM) continuous PM10 instruments using the midnight to midnight 24-hour average. The dates of the 24-hour PM10 exceedances that were influenced by high wind natural events are as follows:

- April 30, 2008
  - 212 µg/m^3 at Indio
  - 169 µg/m^3 at Palm Springs
- May 21, 2008
  - 180 µg/m^3 at Indio
  - 170 µg/m^3 at Palm Springs
- June 4, 2008
  - 337 µg/m^3 at Indio
  - 236 µg/m^3 at Palm Springs

The elevated particulate matter concentrations observed on April 30, May 21 and June 4, 2008 occurred as a result of entrainment of fugitive windblown dust from very high

[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

winds that impacted Coachella Valley. AQMD has submitted the hourly PM10 data from the Indio and Palm Springs monitors on these days to the U.S. EPA Air Quality System (AQS) database and has placed the appropriate AQS flags throughout each 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.

AQMD began submitting PM10 data from FEM BAM and Tapered Element Oscillating Microbalance (TEOM) continuous instruments to the U.S. EPA AQS database, starting with 2008. The FEM BAM exeedances on these three days are the only days in the Coachella Valley with NAAQS violations in 2008. Only one of the violating days in 2008, on April 30, fell on a routine sampling day for the Federal Reference Method (FRM) filter-based PM10 samplers, on the 1-in-6-day measurements at Indio and Palm Springs. No exceedances of the federal standard were measured with the FRM PM10 samplers in 2008. In 2007, two days exceeded the PM10 federal standard with FRM measurements at Indio: March 22 and April 6, 2007. Data from these two days was flagged as high wind PM10 exceptional events by AQMD and those analyses are pending review by U.S. EPA. One day in 2009, April 3 at Indio, exceeded the PM10 NAAQS in the Coachella Valley. That FEM BAM data was flagged as an exceptional event by AQMD and that analysis will be submitted separately. No PM10 exceedances were measured in the Coachella Valley in 2010, in either the FRM or FEM sampling. AQMD has requested that U.S. EPA redesignate the Coachella Valley to attainment for PM10 and flagging this data in AQS will alleviate any potential concerns in the redesignation evaluation.

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:

- geographic setting;
- regulatory measures, showing that continuing reasonable controls are in effect in the Coachella Valley and that ongoing public education programs and event forecasting and notification plans are in place;
- an overview of high wind and PM10 events in the Coachella Valley:
    - the natural blowsand process;
    - meteorological mechanisms that influence Coachella Valley windblown PM10; and

  - a historical perspective of high-wind PM10 natural events in the Valley, including information on historical fluctuations and recurrence frequency of these events.

- procedural requirements related to the three 2008 Coachella Valley natural events, including the flagging of data, and the public notification process, along with a checklist of the exceptional event demonstration requirements.
- mitigation of these air quality events under the AQMD Coachella Valley Natural Event Action Plan (NEAP). This summarizes AQMD's programs for 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.

Sections 2 through 4 of this document describe the analysis of each high wind natural event that occurred in the Coachella Valley in 2008, respectively:

- Section 2 – Wednesday, April 30, 2008;
- Section 3 – Wednesday, May 21, 2008;
- Section 4 – Friday, June 6, 2008.

In each of these sections, the Description of Exceedance section, presents the PM10 measurements related to the NAAQS exceedance. The Conceptual Model section, describes how the event unfolded to cause the NAAQS violation. The next section, 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).

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 Coachella Valley, shown in Figure 1-1, consists of approximately 2,500 square miles in central Riverside County, aligned northwest-southeast from the San Gorgonio Pass (often referred to as the Banning Pass) to the Salton Sea and bounded by the Little San Bernardino Mountains to the northeast and the San Jacinto Mountains to the southwest. The Santa Rosa Mountains are to the west of the northern part of the Salton Sea. The Coachella Valley is part of the Salton Sea Air Basin, under the jurisdiction of the South Coast Air Quality Management District (AQMD). The AQMD air quality monitoring stations in the Coachella Valley are located at Palm Springs and Indio. The nearest South Coast Air Basin station to the Coachella Valley is located at Banning Airport in the San Gorgonio Pass to the west of the Coachella Valley.

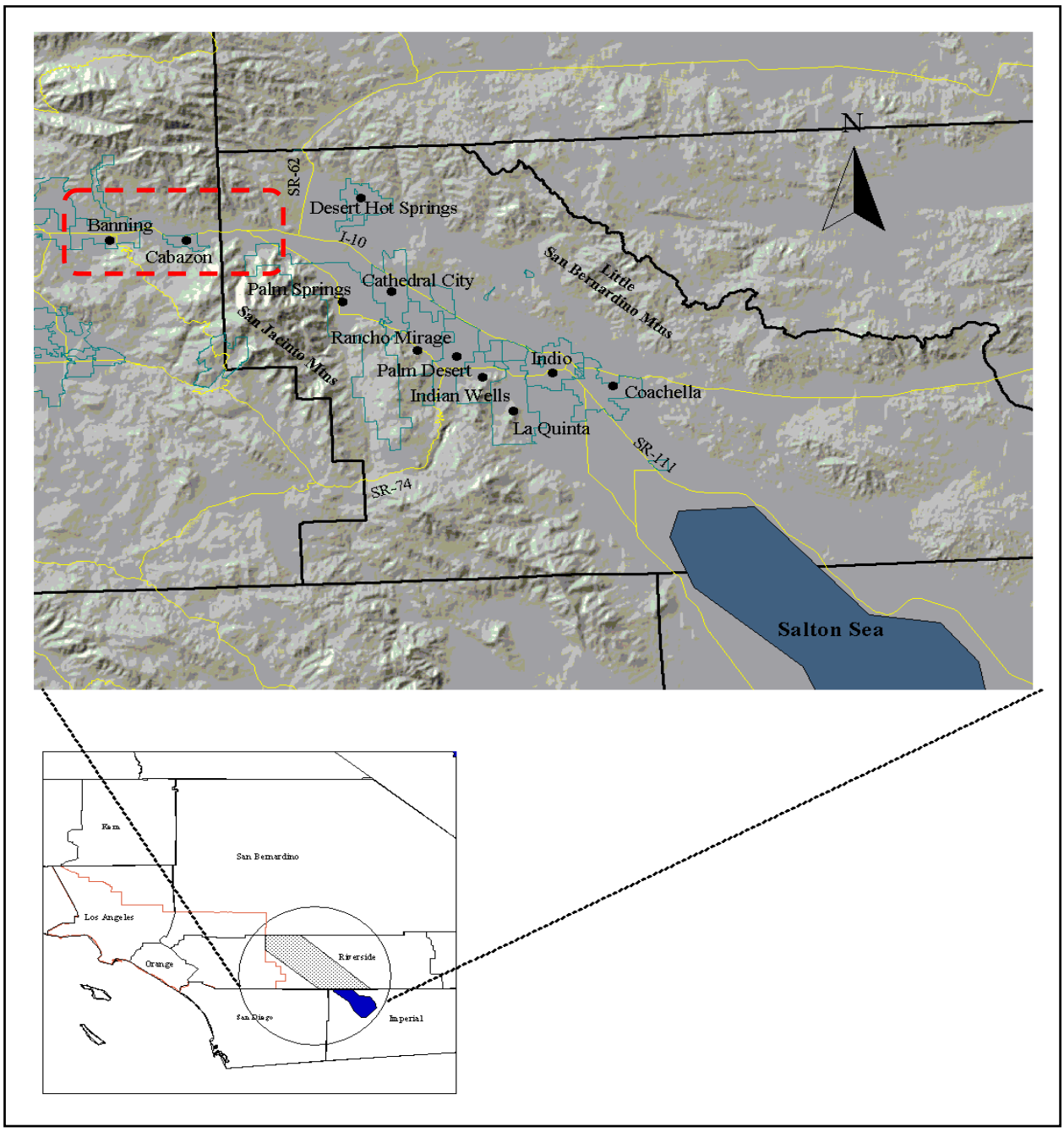

FIGURE 1-1

Location and Topography of the Coachella Valley

Dashed red box outlines the San Gorgonio Pass

Figure 1-2 shows a broader view around the Coachella Valley to show the desert areas of southern California and stations used in the analysis of windblown dust due to thunderstorm activity in the southwestern deserts of the United States. Figure 1-3 shows the Coachella Valley with sand areas mapped along with the Coachella Valley Preserve

system that are undisturbed for ecological purposes, such as the Fringe-Toed Lizard habitat. The sand areas along the Whitewater Wash to the north of Palm Springs and the preserve system are the main source areas for natural blowsand in the Coachella Valley. The urban sprawl has covered much of the former sand areas from Palm Springs down the Valley to Indio.

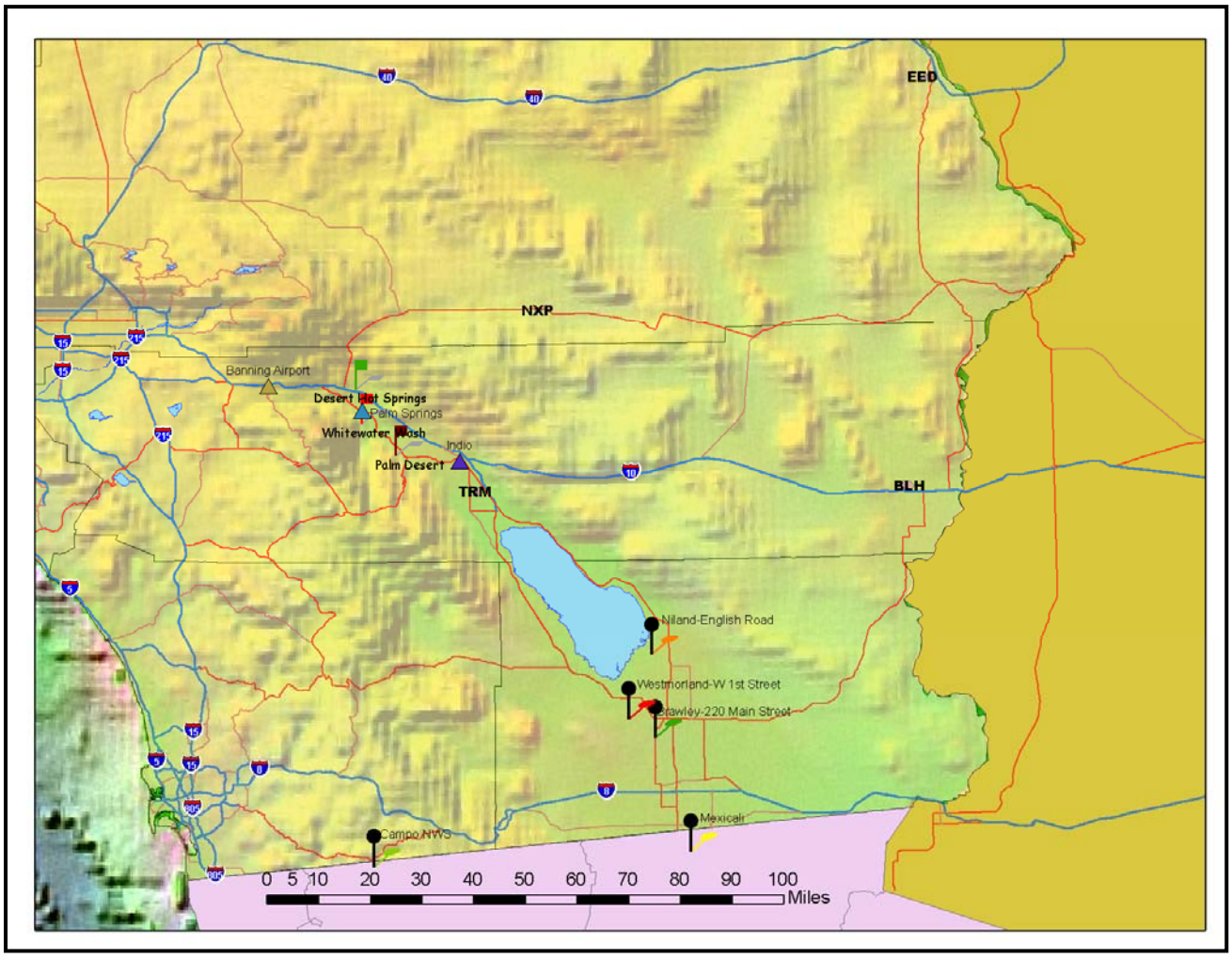

FIGURE 1-2

Map of Southern California Desert Areas Showing AQMD Air Quality Monitoring Stations (triangles), AQMD Coachella Valley Wind Network (flags), Imperial County Air Quality Monitoring Stations (circles), and NWS/FAA Airport Weather Stations

(TRM = Thermal Airport; BLH = Blythe Airport; EED = Needles Airport; NXP = Twentynine Palms MCAS; and PSP, not shown, is between the Palm Springs Air Monitoring Station and the Whitewater Wash Wind Station)

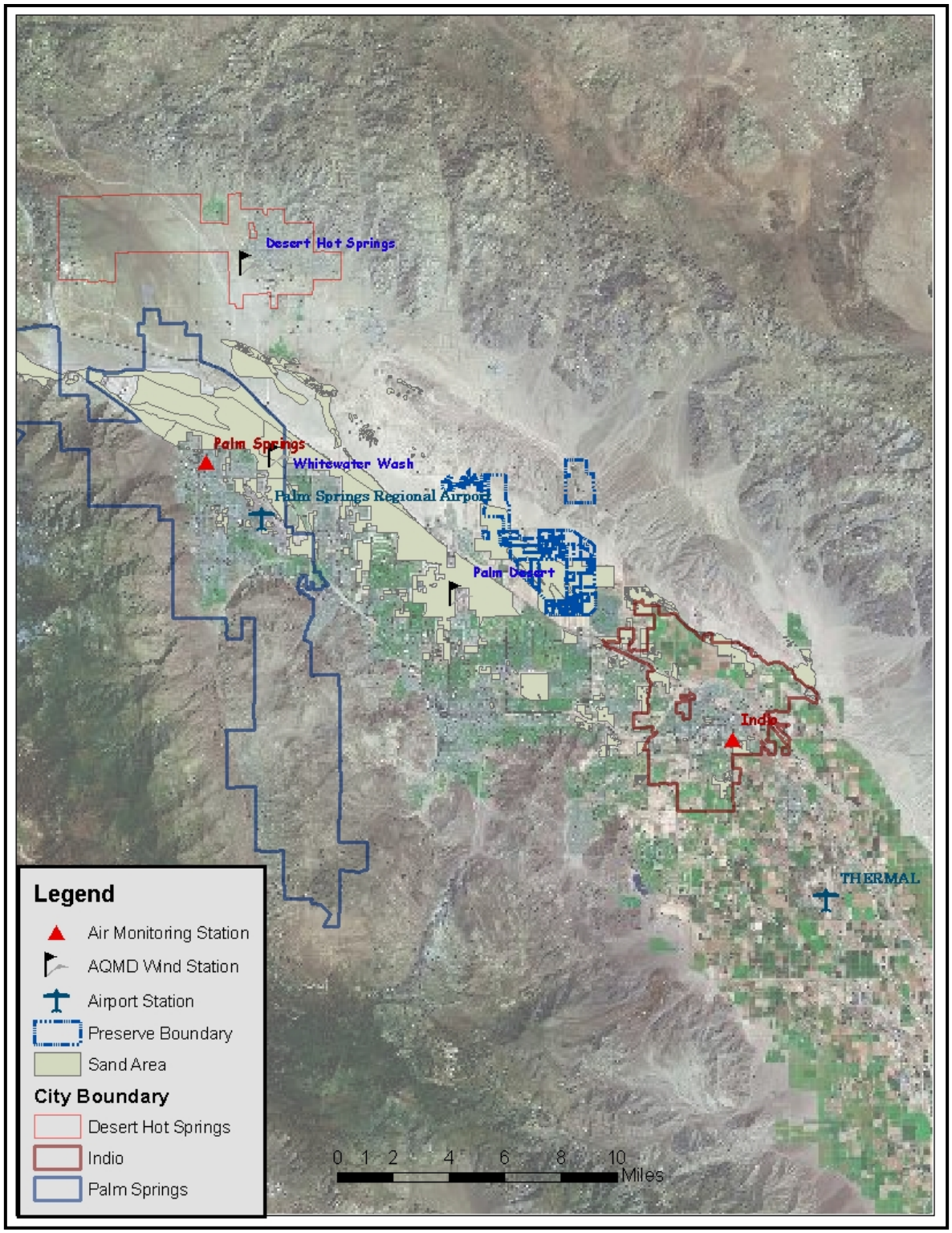

FIGURE 1-3

Map of Coachella Valley Showing Desert Sand Areas; Protected, Natural Preserve Areas; AQMD Air Quality Monitoring Stations (triangles); AQMD Coachella Valley Wind Network (flags); and NWS/FAA Airport Weather Stations

1.5 Regulatory Measures

AQMD has implemented regulatory measures to control emissions from fugitive dust sources in both the South Coast Air Basin and the Coachella Valley. Implementation of Best Available Control Measures (BACM) in the Coachella Valley has been carried out through dust control ordinances adopted by the local jurisdictions, along with AQMD Rules 403 (Fugitive Dust) and 403.1 (Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources) serving as backstop regulations for the Valley's construction and agricultural activities. With its approvals of the South Coast and Coachella Valley PM10 Attainment Plans, U.S. EPA has concluded that this control strategy represented BACM and Most Stringent Measures (MSM) for each significant source category, and that the implementation schedule was as expeditious as practicable.[2,3]

The local dust control ordinances developed by Riverside County, Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs and Rancho Mirage are based on a model fugitive dust control ordinance developed by the Coachella Valley Association of Governments (CVAG), local governments and AQMD. The ordinances typically require: (1) dust control plans for each construction project needing a grading permit; (2) plans to pave or chemically treat unpaved surfaces if daily vehicle trips exceed 150; (3) imposition of 15 mph speed limits for unpaved surfaces if daily vehicle trips do not exceed 150; (4) paving or chemical treatment of unpaved parking lots; and (5) actions to discourage use of unimproved property by off-highway vehicles.

AQMD Rule 403, Fugitive Dust, helps to establish performance criteria for the local dust ordinances and also serves as a backstop rule for the Valley. The rule 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 403.1, Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources, establishes dust control requirements under high wind conditions in the

[2] 40 CFR Parts 52 and 81, Federal Register Vol. 67, No. 242, December 17, 2002, 77204-77212, http://frwebgate4.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=901786489055+3+2+0&WAISaction=retrieve;

[3] CFR Part 52, Federal Register Vol. 70, No. 218, November 14, 2005, 69081-69085, http://frwebgate4.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=900986476034+3+2+0&WAISaction=retrieve

Valley and requires AQMD-approved dust control plans for projects not under local jurisdictional control. The rule consists of additional fugitive dust measures for agriculture, abandoned disturbed surface areas, and bulk material deposits entrained by high winds within the Valley.

AQMD Rule 1186, PM10 Emissions from Paved and Unpaved Roads and Livestock Operations, requires rapid removal of paved road dust accumulations and establishes street sweeper procurement standards (including PM10-efficient sweepers), 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 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 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 prohibits most waste burning, including all residential waste burning.

1.6 High-Wind Events and PM10 in the Coachella Valley

1.6.1 Blowsand

In the Coachella Valley, there is a natural sand migration, called the blowsand process, caused by the action of winds on the vast areas of sand. This process produces PM10 in two ways: (1) by direct particle erosion and fragmentation (natural PM10), and (2) by secondary effects, as sand deposits on road surfaces are ground into PM10 by moving vehicles and resuspended in the air (anthropogenic PM10). Although the sand migration progress is somewhat disrupted by urban growth in the valley, the overall region of blowsand activity encompasses approximately 130 square miles extending from near Cabazon, in the San Gorgonio Pass, to Indio. The sand is supplied by weather erosion of

the surrounding mountains and foothills. Transporting winds emanate from the San Gorgonio Pass and occur most frequently and with the greatest intensity during the spring and early summer months. The primary blowsand source areas, mainly in the alluvial floodplain of the Whitewater River (i.e., the Whitewater Wash), presently contain over two billion cubic yards of wind-deposited sand. The blowsand process varies considerably over time, depending on the availability of flood-provided sand, fluctuations in the transporting wind regime, and to a lesser extent, changes in vegetative cover within the Valley. On average, 180,000 cubic yards of sand are transported by wind sources annually.[4] The California desert areas to the east and south of the Coachella Valley, as well as desert areas of northern Mexico, Arizona and Nevada, also have significant natural processes that produce windblown PM10. In particular, high winds associated with gust fronts from thunderstorms over the deserts of the southwestern U.S. and northern Mexico create windblown dust that is entrained in the atmosphere and transported to the Coachella Valley, under flow regimes from the east and south.

1.6.2 Meteorological Mechanisms: Coachella Valley High-Wind PM10 Events

For high PM10 events to occur in the Coachella Valley, widespread high winds must be sustained to suspend and transport the blowsand. These exceptional wind events occur relatively infrequently in the Coachella Valley but are likely to be associated with unhealthful PM10 levels due to windblown dust. The strongest and most persistent winds typically occur in the eastern end of the San Gorgonio Pass, in an area used primarily for wind power generation. Wind conditions in the remainder of the Coachella Valley are geographically distinct, with stronger winds in the open, middle portion of the valley and lighter winds closer to the foothills. Further to the southeast near Indio where the valley widens, wind velocities decrease. The lower wind velocities allow more deposition of the entrained particles to the surface in this area.

Three primary meteorological mechanisms were initially identified that lead to high winds and windblown dust in the Coachella Valley[5]. A relatively rare additional mechanism was identified in 2004. The four mechanisms are summarized as follows:

Type 1. Strong pressure and density gradients between the marine-modified coastal air mass and the desert air mass;

[4] Weaver, Donald, Initial Blowsand Study for the Coachella Valley, October 1992. Included as Appendix A to the Coachella Valley PM10 Attainment Redesignation Request and Maintenance Plan, SCAQMD, December, 1996. http://www.aqmd.gov/aqmp/cvves/#download

[5] Durkee, K.R. The EPA Natural Events Policy as Applied to High-Wind PM10 Exceedances in the Coachella Valley. Proceedings of the Air and Waste Management Assn. Annual Meeting, June 1998.

Type 2. Storm system/frontal passages (mainly associated with winter storms);
Type 3. Strong downbursts and gust fronts from thunderstorm activity (mainly summertime);
Type 4. Strong Santa Ana wind event (mainly in fall or early winter).

In Type 1 high-wind events, low surface pressures in the desert cause cooler and denser ocean-modified air to move through the San Gorgonio Pass into the Coachella Valley. As synoptic weather patterns reinforce the localized regime through wind-inducing surface pressure gradients, strong and widespread winds result that frequently exceed 30 mph. These winds can persist for many hours and are predominantly from the west-northwest. Type 1 events are most prevalent in the spring, but can occur at other times of the year.

In Type 2 events, the passage of storm systems can similarly induce strong winds through the San Gorgonio Pass, as frontal passages cause surface wind shifts (wind shear) and wind speed increases that can be reinforced by strong winds aloft. These storm passages often produce little or no precipitation in the Coachella Valley. The winds typically last only a few hours and are most prevalent with dynamic, fast-moving winter storms, but are also seen in other seasons. At times, considerable overlap of the meteorological mechanisms can occur, as the Type 1 and Type 2 mechanisms combine to cause some high wind events in the Coachella Valley.

Type 3 wind events involve strong winds generated by summertime thunderstorms. The convective activity produces strong downdrafts of cooler air, causing wind gusts that can exceed 60 mph. While the thunderstorms are usually localized events of short duration, the associated downbursts and outflows can suspend large amounts of natural desert soil in the atmosphere that can be transported over large distances, even though the gustiness subsides. Also, numerous thunderstorm cells can form thunderstorm complexes over the deserts of the southwestern U.S. and northern Mexico to produce widespread areas of windblown dust and sand, along with complicated wind flows. The entrained dust can be deeply suspended to transport particulates to the Coachella Valley from significant distances, even under relatively weak local wind regimes in the Coachella Valley. The typical weather pattern for producing such thunderstorms in the southwestern U.S. and transport to the Coachella Valley is one in which tropical moisture is advected (transported) into the deserts from the south and southeast. Therefore, these Type 3 events are most often associated with the mid- to late-summer “monsoonal” conditions that bring light southeasterly winds to the Coachella Valley.

Type 4 wind events involve very strong Santa Ana wind events where high pressure and cold temperatures over the Great Basin cause strong northerly or north-northeasterly winds that accelerate downhill on the lee side of the San Bernardino Mountains. These relatively uncommon events move blowsand from the Morongo Valley and the northern Coachella Valley and can cause very high PM10 concentrations at both the Palm Springs

and Indio air monitoring stations. These strong Santa Ana wind events mainly occur in fall or early winter.

1.6.3 Historical Perspective

Table 1-1 summarizes the days with high PM10 in the Coachella Valley, defined as days exceeding the 150 $\mu g/m^3$ PM10 NAAQS, between January 1, 1993 and December 31, 2010. The start year of 1993 was the beginning of the period considered when the U.S. EPA Natural Events policy was first implemented. Since 1993, all the NAAQS violations that occurred in the Coachella Valley were associated with high wind events. In all cases, Indio had higher PM10 concentrations than Palm Springs, on the 1-in-6 sampling days when data was available from both stations. Throughout the 18 year period, 27 days exceeded PM10 NAAQS at Indio, for an overall average of 1.5 violations per year. Starting March 22, 2000, the frequency of FRM filter samples at Indio was increased to every three days to better capture the windblown dust events that occur in the Coachella Valley. During the 11 years with 1-in-3-day data through 2010, 17 days exceeded the 24-hour PM10 NAAQS, for an average of 1.54 violations per year in the FRM sampling. Starting in 2008, monitoring with BAM and TEOM instruments at Indio and Palm Springs was conducted in accordance with FEM requirements and the hourly data has been submitted to AQS[6]. In three years of this FEM data, four exceedances of the NAAQS were recorded at Indio for an average of 1.33 exceedances per year (no exceedances were recorded in the FRM measurements during this period). Palms Springs only recorded five days exceeding the PM10 NAAQS through the entire 18-year period; three of these were measured in 2008 with the FEM daily monitoring.

[6] Before 2008, the AQMD BAM and TEOM PM10 data was not considered FEM and not submitted to AQS or certified.

TABLE 1-1

Historical Summary of Coachella Valley PM10 24-Hour High Concentrations (exceeding 150 μg/m^3) since January 1, 1993, with Primary Meteorological Mechanisms associated with High-Wind Natural Events

Event Date	Indio PM10 (μg/m^3)	Palm Springs PM10 (μg/m^3)	Primary Meteorological Mechanism
June 2, 1995	**199**	39	1
January 16, 1996	**155**	88	2
July 26, 1996	**215**	130	3
March 17, 1997	**157**	35	2
April 28, 1997	**182**	32	1
June 16, 1998	**158**	53	1
April 21, 2000	**190**	*	1
May 15, 2000	**201**	*	2
September 21, 2000	**183**	*	1
June 3, 2001	**245**	*	1
June 12, 2001	**180**	*	1
July 3, 2001	**155**	*	3
August 17, 2001^{+++}	**604**	**432**	3
August 20, 2001	149^{+}	*	1
September 13, 2001	**165**	*	3
May 8, 2002	**177**	**	1
November 25, 2002	**276**	*	4
January 6, 2003	**178**	*	4
May 15, 2003	**227**	47	1
June 20, 2003	148++	28	1
June 23, 2003	**309**	*	1
October 9, 2004	**161**	*	2
July 16, 2006	**313**	**226**	3
March 22, 2007	**210**	*	3
April 6, 2007	**157**	64	1
April 12, 2007	146++	83	2
April 30, 2008	**212**$^{\#}$	**169**$^{\#}$	1
May 21, 2008	**180**$^{\#}$	**170**$^{\#}$	2
June 4, 2008	**337**$^{\#}$	**236**$^{\#}$	1
April 3, 2009	**169**$^{\#}$		TBD

$^{+}$ High PM10 concentration below PM10 24-hour NAAQS; submitted but not approved for natural event flagging (U.S. EPA Region 9 policy at the time).

$^{++}$ High PM10 concentration below 150 μg/m^3 24-hour NAAQS; not submitted for natural event flagging.

$^{+++}$ On August 17, 2001 Banning Airport also measured 219 μg/m^3.

* 1-in-3 sampling day for Indio; no Palm Springs 1-in-6 day sample.

** 1-in-6 sampling day for Palm Springs, but sample did not run.

$^{\#}$ Continuous BAM FEM PM10 sampler – submittal to AQS started 1/1/2008.

Transport of air pollution from the South Coast Air Basin does occur through the San Gorgonio Pass to the Coachella Valley. This is particularly seen in summertime ozone, as the onshore sea-breezes from the South Coast bring ozone to Banning and, to a lesser extent, into the Coachella Valley late in the day. Transport of particulates to the Coachella Valley from the South Coast is less evident. PM2.5 is always relatively low in the Coachella Valley with no exceedances of the federal standards in recent years. PM10 sulfate and nitrate measurements are also low, as compared to such measurements in the South Coast Air Basin. This indicates that primarily crustal material contributes to PM10 in the Coachella Valley, with minimal transport from the urban areas of the South Coast.

For the 17-year period through the end of 2008 (analysis of the April 2009 event is not complete), 13 of the 26 days that exceeded 150 $\mu g/m^3$ had Type 1 meteorological mechanisms as the primary cause of the high winds and windblown PM10. On these days, strong onshore flow and a deep marine layer over the South Coast Air Basin led to winds through the San Gorgonio Pass, suspending sand and dust from the natural blowsand source areas. Five days during this period were primarily caused by Type 2 meteorological mechanisms, where fast-moving storm systems and frontal passages created strong winds through the San Gorgonio Pass. Due to the geography of the Coachella Valley, these mechanisms that lead to flows through the San Gorgonio Pass do not lead to Palm Springs PM10 concentrations as high as Indio, since Palm Springs is somewhat sheltered from the strongest flows by the San Jacinto mountains and more removed from the blowsand source areas. The Type 3 meteorological mechanism, where thunderstorm outflows created strong winds in the desert, caused six high PM10 days, including the highest 24-hour average PM10 (604 $\mu g/m^3$) measured in the Coachella Valley during this period since 1993. Dust generated from thunderstorm outflows was responsible for the three high PM10 concentrations measured with the Palm Springs FRM monitor prior to 2008, as relatively light southeasterly "monsoonal" wind flows brought dust generated from thunderstorm outflows over the deserts of northern Mexico and Arizona to the entire Coachella Valley. Two events were associated with the Type 4 mechanism, where strong Santa Ana winds brought high winds to the Coachella Valley, entraining dust and sand from the Morongo Valley and the northwestern Coachella Valley natural areas.

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 an event affected air quality. 5-year time series of the available FRM PM10 (2005-2009) concentrations and the FEM BAM 24-hour PM10 concentrations (2008-2009), since submittal of the FEM data to AQS, are shown in Figures 1-4 and 1-5 for Indio and Palms Springs, respectively.

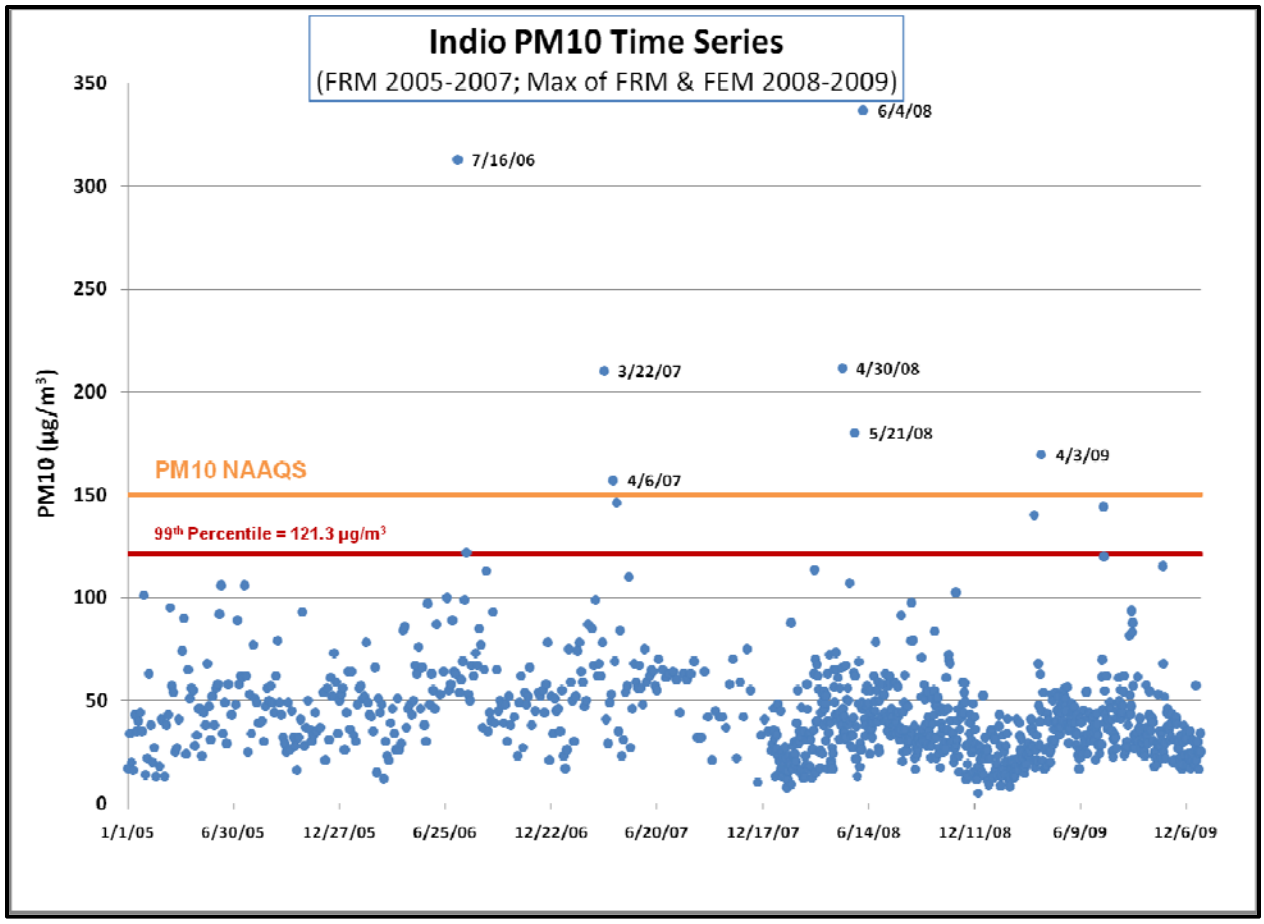

FIGURE 1-4

5-Year Time Series of Indio PM10 (µg/m^3)

[FRM (2005-2007) and Maximum of FRM and 24-Hour Averaged FEM (2008-2009)]
(Dates of High Wind Natural Events are shown)

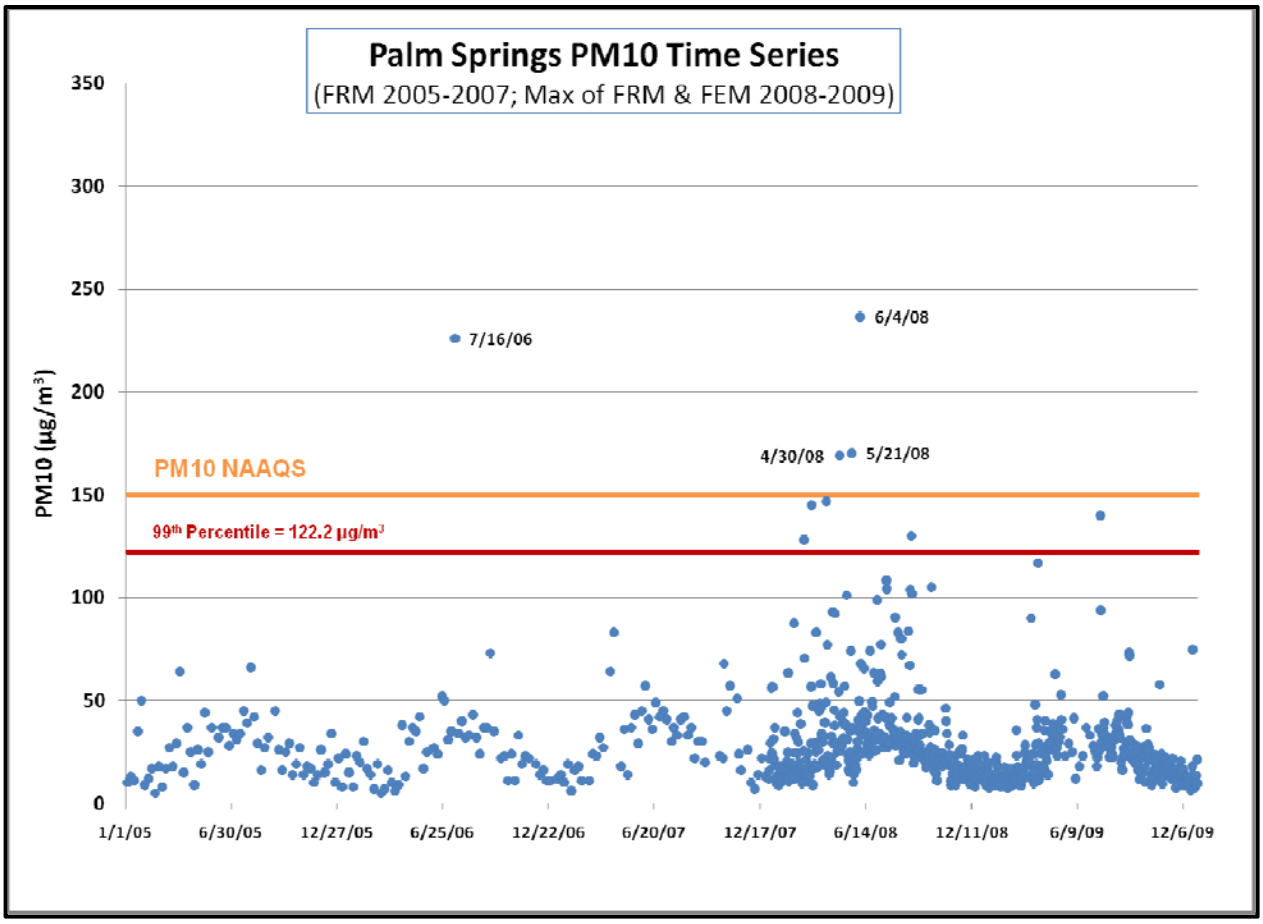

FIGURE 1-5

5-Year Time Series of Palm Springs PM10 (µg/m^3)

[FRM (2005-2007) and Maximum of FRM and 24-Hour Averaged FEM (2008-2009)]
(Dates of High Wind Natural Events are shown)

Figure 1-6 shows the time series of daily maximum hourly-averaged sustained wind speeds for the five-year period from 2005 through 2009. Seven days during this five year period exceeded the federal PM10 standard level of 150 µg/m^3 at Indio and four of these also exceeded at Palm Springs. On average over this five year period, the federal PM10 standard is exceeded approximately 1.4 times per year at Indio and less than once per year (0.8 times/year) at Palm Springs. Two of the PM10 NAAQS exceedances during this period (7/16/06 and 3/22/07) were associated with entrained dust from thunderstorm activity outside the Coachella Valley that was transported to the monitors. These were not associated with particularly high winds at the Whitewater Wash wind monitor, but strong winds occurred in other locations. The remaining five exceedance days in the 2005 to 2009 period were all associated with very high winds at Whitewater Wash, with sustained winds well in excess of 25 mph and higher gusts that persisted for

several hours of the day or longer. The three PM10 exceedance days in 2008 were associated with the highest hourly sustained winds measured at Whitewater Wash in the 2005 through 2009 period, with peak hourly averaged sustained winds to 44 mph, or higher, and peak gusts to 64 mph, or higher.

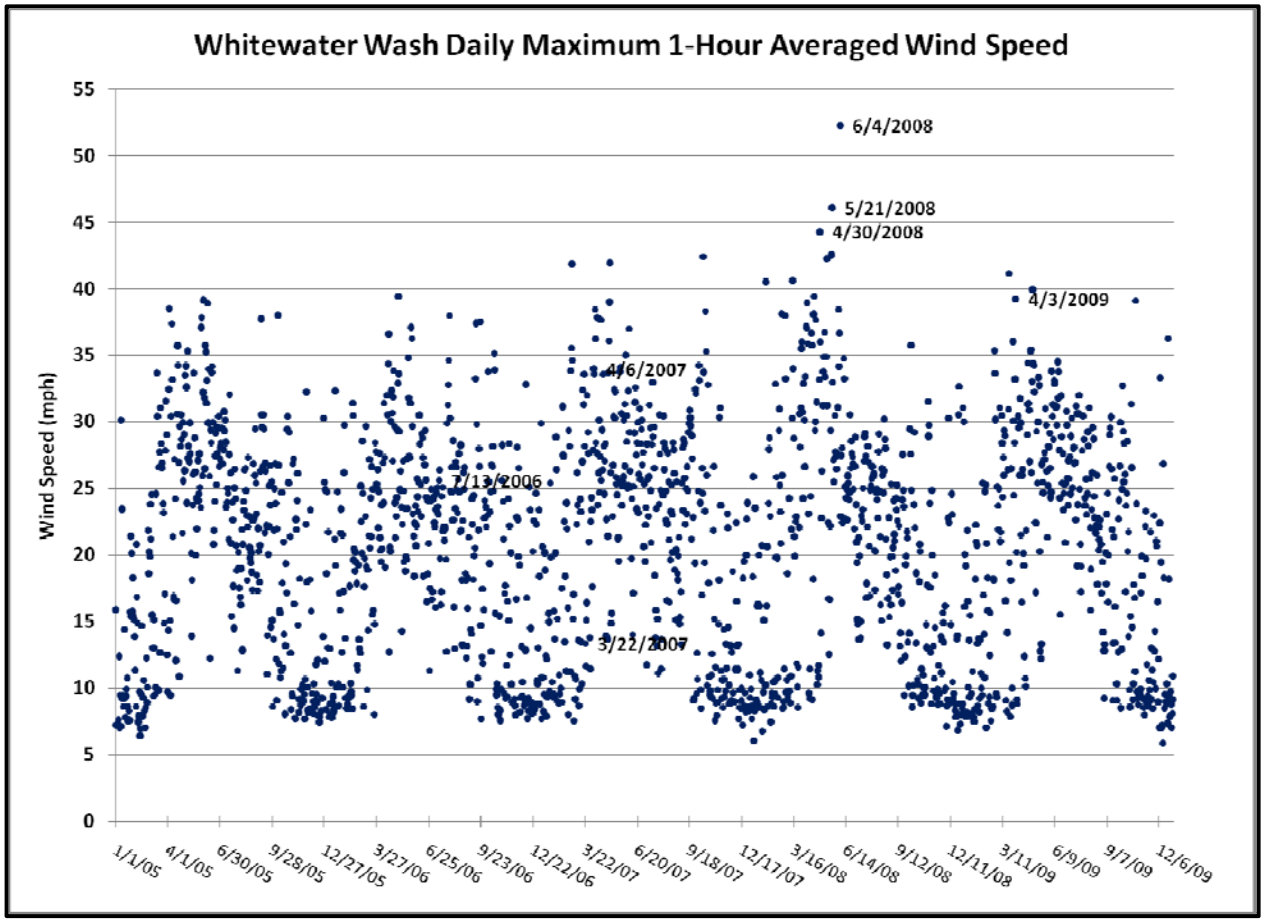

FIGURE 1-6
Time Series of Daily Maximum 1-Hour Average Sustained Wind Speed at AQMD Whitewater Wash Wind Station between 2005 and 2009
(Dates of 2008 High Wind Natural Events are shown)

The Coachella Valley is prone to very high winds that recur relatively frequently, especially in the windiest areas near the Valley centerline below San Gorgonio Pass, including the Whitewater Wash area. Whitewater wash measured an hourly averaged sustained wind speed in excess of 25 mph on approximately one third (33.4%) of the days during this period. Approximately 5% of the days in the 2005 through 2009 period even measured wind speeds in excess of 25 mph for daily 24-hour averages. PM10

exceedances at Indio and Palm Springs do not recur anywhere near this frequency, even with the daily PM10 FEM measurements since 2008. Other factors in addition to the entrainment threshold are important in the occurrence of windblown PM10 events and the effectiveness of the strong fugitive dust BACM control programs is particularly evident in the Coachella Valley. Soil characteristics (moisture, compactness, crust – the desert cement), the amount of gustiness, wind direction variability, the duration of the high wind speeds, and how widespread the strong winds are throughout the Coachella Valley are all factors in whether PM10 standard exceedances will occur or not. When these factors are right, the strongest wind events at the Whitewater Wash wind station can lead to PM10 violations in the Coachella Valley during situations with strong flows through the San Gorgonio Pass and down the Valley as the natural source areas and BACM-controlled anthropogenic sources are overwhelmed. These high wind events can and do recur, sometimes more frequently than once per year.

Table 1-2 ranks the NAAQS exceedances by percentile for each Coachella Valley station using all combined FRM and FEM 2005 to 2009 measured PM10 data during the 5-year period (using the maximum of the FRM and FEM 24-hour concentrations when both monitors collected data). All the exceedances are in the top 99.4th percentile, or higher, of the five years of data for that station. Any value that exceeded the PM10 NAAQS would be in the top 99.4th percentile of the data at Indio and in the top 99.5th percentile at Palm Springs.

TABLE 1-2

Percentile Ranking of Coachella Valley PM10 24-Hour High Concentrations (exceeding 150 μg/m^3) for the 5-Year Period 2005 through 2009 by Station

Event Date	Indio PM10 (μg/m^3)	Percentile Rank	Percentile	Palm Springs PM10 (μg/m^3)	Percentile Rank	Percentile
July 16, 2006	313	2	99.9	226	2	99.8
March 22, 2007	210	4	99.7	*		
April 6, 2007	157	7	99.4	64		
April 30, 2008	212	3	99.8	169	4	99.6
May 21, 2008	180	5	99.6	170	3	99.7
June 4, 2008	337	1	100.0	236	1	100.0
April 3, 2009	169	6	99.5			

Table 1-3 ranks the NAAQS exceedances for each Coachella Valley station during the same 5-year period by percentile for the three-month seasonal period of April through June. All the exceedances are in the top 99.2nd percentile, or higher, of the five years of data for that station. Any value that exceeded the federal PM10 standard in this 5-year

seasonal period would be in the top 99.2nd percentile of the data at Indio and in the top 99.4th percentile at Palm Springs. Thus, the PM10 concentrations on April 30, May 21 and June 4, 2008 are all in excess of normal historical fluctuations.

TABLE 1-3

Percentile Ranking of Coachella Valley PM10 24-Hour High Concentrations (exceeding 150 μg/m^3) for the 5-Year Period 2005 through 2009 by Station for the 3-Month Season (May-June)

Event Date	Indio PM10 (μg/m^3)	Percentile Rank	Seasonal Percentile	Palm Springs PM10 (μg/m^3)	Percentile Rank	Seasonal Percentile
July 16, 2006	313			226		
March 22, 2007	210			*		
April 6, 2007	157	5	99.2	64		
April 30, 2008	212	2	99.7	169	3	99.5
May 21, 2008	180	3	99.5	170	2	99.6
June 4, 2008	337	1	100.0	236	1	100.0
April 3, 2009	169	4	99.3			

1.7 Procedural Requirements

1.7.1 Flagging of Data

AQMD has submitted the PM10 data from the two Coachella Valley monitors (Palm Springs and Indio) that exceeded the federal standard on three days in 2008 (April 30, May 21 and June 4) 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 FEM BAM data was flagged individually. Windblown dust was the primary contributor to the measured PM10 NAAQS exceedances at Palm Springs and Indio on these days. Such flagging ensures that the air quality data is properly represented in the overall air quality planning process.

1.7.2 Public Notification

The South Coast Air Quality Management District (AQMD) has prepared this documentation to demonstrate that the NAAQS exceedances in the Coachella Valley on April 30, May 21 and June 4, 2008 were 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, requesting review and comment by the public for a minimum of 30 days. The website link is:

http://www.aqmd.gov/pubinfo/public_notices.htm

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 for 2008 Coachella Valley Events

Exceptional Event Technical Criteria:	**4/30/08**	**5/21/08**	**6/4/08**
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	✓*	✓*	✓*

* The 30 day public comment period will start as this document is posted on the AQMD website and forwarded to CARB and U.S. EPA.

1.8 Mitigation

1.8.1 Coachella Valley PM10 Natural Events Action Plan (NEAP)

In December 1996, AQMD adopted a Natural Events Action Plan (NEAP)[7] for the Coachella Valley, as was required under the former U.S. EPA Natural Events Policy, to address PM10 events by:

- establishing public notification and education programs;
- minimizing public exposure to high concentrations of PM10 due to natural events;
- abating or minimizing appropriate controllable sources of PM10;
- identifying, studying and implementing practical mitigating measures as necessary; and
- periodically reevaluating: (a) the conditions causing violations of the PM10 NAAQS in the area, (b) the status of implementation of the NEAP, and (c) the adequacy of the actions being implemented.

While not specifically required by the Exceptional Events Regulation, the Coachella Valley NEAP remains a blueprint for warning and educating the public about PM10 events and health-protective actions, as well as for minimizing the effects of high wind PM10 events through the use of appropriate mitigation measures. As such, the NEAP serves as a High Wind Action Plan. The NEAP was developed in conjunction with stakeholders affected by the plan, including the Coachella Valley Association of Governments, Coachella Valley local municipalities, business and community leaders, the building industry, farm associations, the news media and the public. Public education and outreach to information about the health impacts, AQMD PM10 regulatory activities, and ways to minimize exposure to PM10 are accomplished through public meetings, distribution of pamphlets and dust advisory information, press releases, web-based and telephone-based information and forecasts, and public outreach by AQMD Inspectors and other staff.

Through the efforts defined by the NEAP, local ordinances were developed for the mitigation of windblown dust and AQMD Rules 403 and 403.1 have been strengthened. Under the rule requirements, certain activities in the Coachella Valley are required to determine wind conditions and, in some cases, alter their activity plans during high wind conditions. In support of this, AQMD has a daily wind forecasting system that determines when wind conditions are expected to be greater than 25 mph in the Coachella Valley. During forecasted dust advisories, where PM10 is expected to exceed 150 $\mu g/m^3$ in the Coachella Valley, everyone is encouraged to limit outdoor exertion and

[7] Coachella Valley PM10 Attainment Redesignation Request and Maintenance Plan, Chapter 6, SCAQMD, December, 1996. http://www.aqmd.gov/aqmp/cvves/#download

people with respiratory ailments are encouraged to avoid outdoor exertion. The wind and windblown dust forecasts are based on current and predicted wind measurements, pressure gradients, weather conditions such as approaching storms, fronts or thunderstorms, and predictions, watches, warnings or advisories of high winds, blowing dust, or thunderstorm activity as obtained through the National Weather Service, AQMD monitors and other sources.

The NEAP provides for public notification of ambient PM10 levels and high wind forecasts. This is accomplished through the availability of current ambient PM measurements and Air Quality Index (AQI) by telephone (AQMD Interactive Voice Response System) and web-based services. Daily high wind and windblown dust forecasts and advisories specific to the Coachella Valley are available through the AQMD IVR telephone messages (1-800-CUT-SMOG or 909-396-2399) and from the daily air quality forecast text on the AQMD website:
http://www.aqmd.gov/telemweb/Forecast.aspx.
This system was in place and effective during each of the 2008 high wind natural events presented in this document.

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 (CARB) website (http://www.arb.ca.gov/aqd/aqmoninca.htm).