4 HIGH WIND EXCEPTIONAL EVENT ANALYSIS: June 4, 2008

4.1 Description of Exceedances

Violations of the PM10 NAAQS were recorded in the Coachella Valley at the AQMD air quality monitoring stations at Indio and Palm Springs on Wednesday, June 4, 2008. The 24-hour mass concentrations were 337 and 236 $\mu g/m^3$ at Indio and Palms Springs, respectively, as measured with FEM BAM PM10 samplers, based on hourly measurements averaged from midnight to midnight. This was not a routine 1-in-6-day FRM sampling day (or 1-in-3-day at Indio), so FRM PM10 mass, sulfate, nitrate and chloride mass loadings from the filters are not available on this day. FRM PM2.5 measurements were also not available for these two stations on this day. No continuous PM2.5 monitors are deployed in the Coachella Valley due to the consistently low concentrations measured with the FRM samplers. The AQMD FEM data has been submitted to the AQS database and flagged to request exclusion as a high wind natural event under the U.S. EPA Exceptional Event Rule. This analysis documents the high wind natural event on June 4 that caused the FEM PM10 exceedances.

The FRM 24-hour concentrations and the continuous, hourly BAM data from Indio and Palm Springs are shown in Table 4-1, starting at 1200 PST on June 3 before the concentrations started to increase and ending at 0600 PST on June 5 after the elevated concentrations ended. Concentrations exceeding 150 $\mu g/m^3$ are highlighted in bold type. The hourly concentrations at both Indio and, especially, Palm Springs were somewhat elevated in the afternoon of June 3 and the morning of June 4, with Palm Springs reaching 175.4 $\mu g/m^3$ at 1800 PST on June 3 and 207.3 $\mu g/m^3$ at 0100 PST on June 4. This was due to the locally gusty winds starting in the Coachella Valley. The hourly concentrations at both stations increased significantly in the late morning of June 4 and continued to be high into the evening, after which the concentrations dropped. The Indio monitor first exceeded 150 $\mu g/m^3$ at 1000 PST, with an hourly average of 243.6 $\mu g/m^3$. Palm Springs concentrations also climbed at this time to 240.8 $\mu g/m^3$. The maximum concentration of the day at Palm Springs, 696.5 $\mu g/m^3$, occurred during the hour starting at 1200 PST. Indio reached 936.3 $\mu g/m^3$ at 1300 PST, then 988.0 for the next three hours, then 962.0 at 1700 PST. Indio dropped below 150 $\mu g/m^3$ for the 2000 PST hour and Palms Springs dropped below at 2100 PST, after which both gradually decreased to lower concentrations.

The Palm Springs monitoring station is somewhat sheltered from the winds by the San Jacinto Mountains, causing less consistent flows from the blowsand source areas near Whitewater Wash and PM10 concentrations to be lower than those at Indio. The FEM PM10 difference between Indio and Palm Springs is very large in this case, more than what is typical during recent Coachella Valley high wind events. The three hours at Indio starting at 1400 PST that measured 988.0 $\mu g/m^3$ are suspicious; they represent a

full-range condition of the instrument, taking into account voltage offsets. They are treated here as valid measurements. The timing of those peaks in relation to the peak winds and the peak PM10 measurements at Palm Springs is consistent.

TABLE 4-1
Hourly FEM BAM and 24-hour FRM PM10 Measurements at the AQMD Indio and Palm Springs Air Monitoring Stations in the Coachella Valley Between 1200 PST June 3 and 0600 PST June 5, 2008

		Indio Monitoring Station			Palm Springs Monitoring Station		
DATE	HOUR (PST)	BAM Hourly PM10 (μg/m^3)	24-Hour Average PM10 (μg/m^3) (midnight to midnight)		BAM Hourly PM10 (μg/m^3)	24-Hour Average PM10 (μg/m^3) (midnight to midnight)	
			BAM	FRM		BAM	FRM
6/3/08	1200	25.8			30.2		
	1300	24.9			34.5		
	1400	21.8			41.3		
	1500	30.0			26.5		
	1600	38.7			46.2		
	1700	72.6			78.0		
	1800	68.9			123.3		
	1900	64.2			**175.4**		
	2000	74.7			100.1		
	2100	53.8			70.0		
	2200	55.2			55.3		
	2300	85.7	45.9		65.4	49.9	
6/4/08	0000	64.0			66.8		
	0100	120.2			**207.3**		
	0200	102.4			138.1		
	0300	124.1			139.9		
	0400	97.6			55.2		
	0500	118.4			34.1		
	0600	61.0			35.9		
	0700	92.4			7.8		
	0800	112.0			32.8		
	0900	139.1			56.7		
	1000	**243.6**			**240.8**		
	1100	**402.2**			**580.8**		
	1200	**637.0**			**696.5**		
	1300	**936.3**			**544.1**		
	1400	**988.0**			**571.7**		
	1500	**988.0**			**572.8**		
	1600	**988.0**			**594.2**		
	1700	**962.0**			**379.2**		
	1800	**301.4**			142.2		
	1900	**253.7**			**232.9**		
	2000	121.6			**152.1**		
	2100	72.6			80.9		
	2200	95.5			64.0		
	2300	62.3	**336.8**		45.2	**236.3**	
6/5/08	0000	39.1			49.0		
	0100	46.7			56.7		
	0200	33.6			46.2		
	0300	41.2			47.8		
	0400	39.6			49.3		
	0500	41.3			46.0		
	0600	50.9	41.3	46	24.5	35.7	34

4.2 Conceptual Model: How the Event Unfolded

Strong, gusty winds developed in the Coachella Valle on June 4, 2008, causing FEM PM10 NAAQS exceedances at the Palm Springs and Indio. The analysis of the meteorological setting, including weather charts, pressure gradients and satellite imagery, indicates significant potential for strong winds in the Coachella Valley on June 4. Previous natural event analyses defined four primary meteorological mechanisms that lead to high-wind PM10 events in the Coachella Valley, as discussed in Section 1.6.2: (Type 1) strong pressure and density gradients forcing high winds through the San Gorgonio Pass; (Type 2) storms and frontal passages; (Type 3) thunderstorm outflow winds; and (Type 4) Santa Ana wind events. The meteorological conditions on June 4 can be classified primarily as a Type 1 event with strong onshore pressure and density gradients between the coastal and desert air masses. This was enhanced by the synoptic weather pattern with low pressure at the surface over the Great Basin and a strong Pacific High in the eastern Pacific Ocean, as well as coupled along-valley flow aloft. As an upper level trough moved through, a deep marine layer west of the San Gorgonio Pass and the strong onshore pressure gradients caused flows through the Pass and high winds along the Coachella Valley.

Wind speeds in the Coachella Valley upwind of the Indio and Palm Springs air monitoring stations were high on this day, with sustained winds speeds well over 25 mph. The high PM10 measured at Indio and Palm Springs on June 4 occurred with consistent along-valley wind flows that prevailed throughout the day. This wind event was relatively widespread throughout the Valley, but the strongest winds were measured at the AQMD Whitewater Wash wind station, located near the centerline of the valley southeast of the San Gorgonio Pass in the primary natural desert blowsand source area in the northwestern Coachella Valley. Hourly averaged sustained wind speeds at Whitewater Wash exceeded 25 mph for every hour throughout the day on June. During the ten hour period from 1000 PST through 1900 PST, the 1-hour sustained wind speeds were 42 mph or higher and peaked at 52 mph, well in excess of the 23 mph threshold that is typical for windblown dust entrainment in this area. The Whitewater Wash instantaneous gusts reached 41 mph or higher during every hour of the day and 62 mph or higher through the peak period through the afternoon, to a maximum measured gust of 76 mph. The timing of the strongest winds correlate well with the timing of the highest hourly PM10 concentrations.

Further from the centerline of the Coachella Valley, sustained winds to 38 mph were recorded at the National Weather Service (NWS)/Federal Aviation Administration (FAA) station at Palm Springs Airport, along with peak wind gusts to 51 mph. *(The NWS/FAA airport stations measure sustained winds as the 2-minute average before the observation time and gusts as a running 3-second average.)* The highest sustained (1-minute averages) winds at the Palm Springs air monitoring station peaked at 18 mph on June 4. This indicates that windblown PM10 from localized sources close to the Palm

Springs monitoring station were not very significant and that most of the PM10 at Palm Springs would have been generated closer to the San Gorgonio Pass. Further to the southeast, the AQMD Palm Desert wind station measured sustained 1-hour averaged winds to 24 mph and gusts as high as 48 mph, although most hours of the day had hourly sustained wind speed below 25 mph. In this area, the Coachella Valley widens and the wind speeds are typically not as strong as those measured closer to the San Gorgonio Pass at the Valley centerline.

Further down the Coachella Valley at Indio where the highest PM10 concentrations were measured, the 1-minute sustained winds peaked at 33 mph for the day as the 1-hour averages reached 25 mph. While windblown dust entrained from localized sources near Indio was a potential factor as controls were overwhelmed by the strong winds, most of the particulates were generated further upwind in the natural blowsand source areas. At the NWS/FAA Thermal Airport weather station, located approximately 8.6 miles further downwind from the Indo monitor, sustained (2-minute average) winds peaked to 32 mph with peak wind gusts to 48 mph and reduced visibilities. The gusty northwesterly winds, reduced visibilities and haze reported from Thermal Airport support the presence of windblown dust at the Indio monitor throughout the afternoon. In addition, NWS forecast discussions, wind advisories and news reports also describe strong winds and blowing dust in the Coachella Valley, providing substantial weight-of-evidence for the sequence of events.

Figure 4-1 shows a snapshot of the Coachella Valley sustained winds and hourly PM10 concentrations measured during the hour starting at 1200 PST on June 4 to give a geographical perspective to this wind event. This is a time near the beginning of the strongest wind period when the PM10 at both Indio and Palm Springs first spiked above 600 $\mu g/m^3$ (637 $\mu g/m^3$ at Indio and 696.5 $\mu g/m^3$ at Palm Springs). During this time, winds in the Coachella Valley were representative of flows through the San Gorgonio Pass, with stronger along-valley (west-northwesterly to northwesterly) flows at the centerline of the valley and some turning and slowing of the winds near the edges of the as the topography of the foothills and mountains influenced the flow. The AQMD Whitewater Wash wind station measured the strongest winds at this time, with sustained 1-hour averaged wind speeds of 49 mph and instantaneous gusts to 72 mph. The winds at the AQMD Desert Hot Springs wind station remained more westerly, due to the strong westerly winds through the San Gorgonio Pass, with sustained 1-hour averages speeds of 33 mph and gusts to 57 mph. The Palm Springs winds were turned more northerly and slowed by the terrain of the San Jacinto Mountains, with 1-minute sustained speeds of 22 mph at the AQMD Palm Springs air monitoring station. Only a few miles away but closer to the centerline of the Valley, the 2-minute sustained wind observation at the Palm Springs Airport was northwesterly at 28 mph with gusts to 46 mph. The 1-hour averaged sustained speeds were only 16 mph at Palm Desert with gusts to 37 mph. The peak 1-minute averaged sustained wind speed was 30 mph at Indio. While 1-to-5-minute sustained winds were not recorded at the supplemental AQMD wind stations

(Whitewater Wash, Desert Hot Springs and Palm Desert), they would certainly be higher than the 1-hour averages. The extremely high 1-hour winds at Whitewater Wash indicate that the Whitewater River Wash and the open desert lands of this area are the primary source for the wind entrainment of dust and sand.

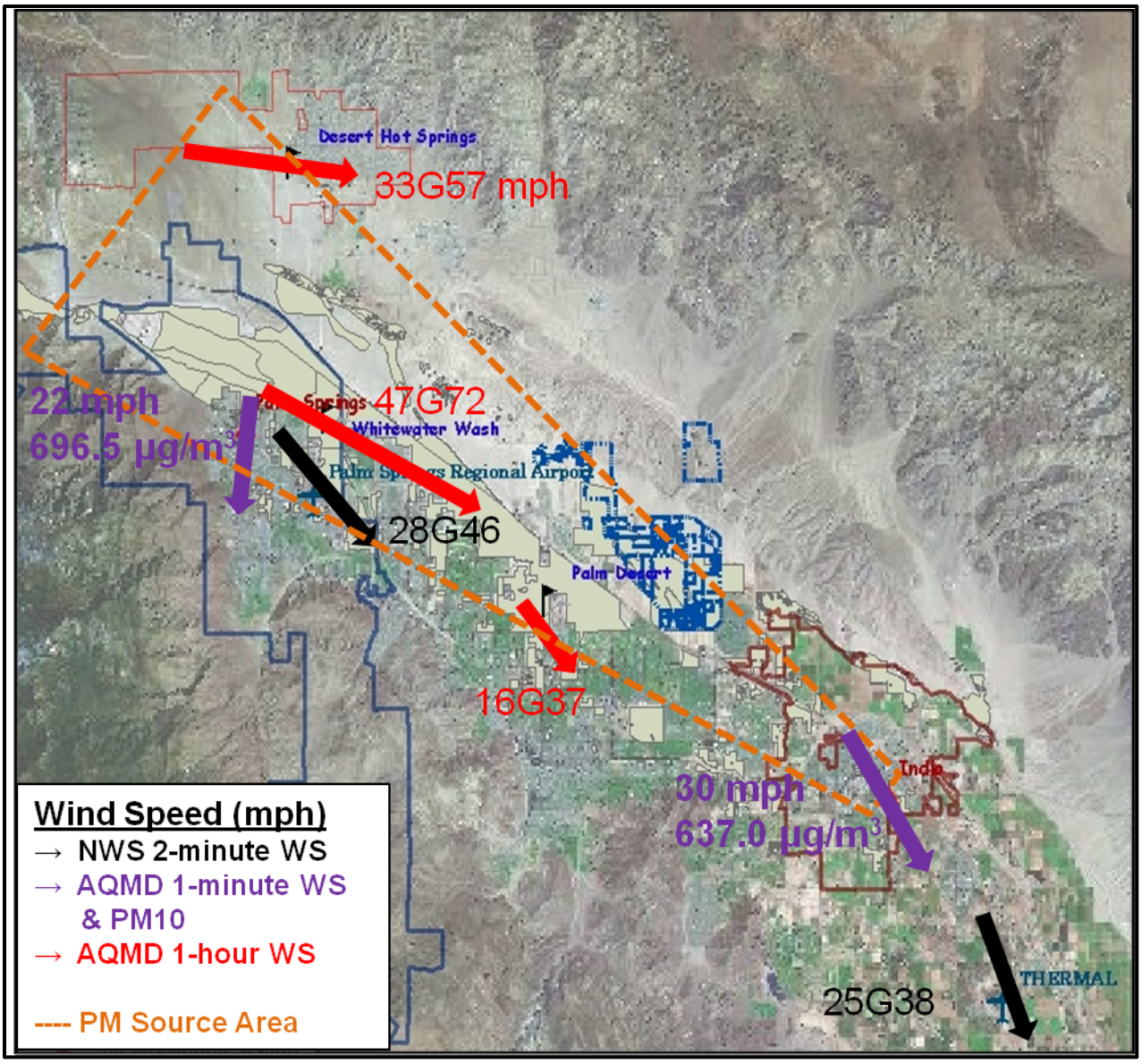

FIGURE 4-1
Map Showing Geography and Sustained Winds with Gusts (mph) Affecting the Coachella Valley PM10 Measurements (µg/m^3) during the Hour Starting at 1200 PST on June 4, 2008

[Sustained winds are 2-minute averages for NWS Airport METAR stations (black), 1-minute averages for AQMD Air Monitoring Stations (violet) and 1-hour averages for AQMD supplemental wind stations (red). Estimated PM10 source areas shown inside dashed orange border.]

Due to the widespread gusty winds in the Coachella Valley on June 4, sources of the windblown dust were both natural areas, primarily the Coachella Valley Preserve areas, and BACM-controlled anthropogenic sources. On this day, the wind entrained dust originated primarily from non-anthropogenic natural sources within the Coachella Valley, mainly the natural blowsand source areas of the Whitewater Wash and Coachella Valley Preserve System and other open desert areas. A portion of the wind-entrained dust may have also originated from anthropogenic sources, including some agricultural operations, construction activities and roadways, that are well controlled in the Coachella Valley as described in Section 1.6, Regulatory Measures. 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 BAM PM10 measurement data from the Coachella Valley. 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.

4.3 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 4-2. The following sections describe how the technical criteria are met for the June 4, 2008 natural event.

TABLE 4-2

Technical Criteria for High Wind PM10 Exceptional Event Demonstration

Technical Criteria	Document Section
Not reasonably controllable or preventable	4.3.1
Clear causal relationship between the measurement and the event	4.3.2
Evidence that the event is associated with a concentration in excess of normal historical fluctuations, including background	4.3.2.1
Affects air quality	4.3.3
Caused by human activity unlikely to recur at a particular location OR a natural event	4.3.4
No exceedance or violation but for the event	4.3.5

4.3.1 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.

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

Sources of windblown dust were both natural areas, particularly from the mountains and deserts, and BACM-controlled anthropogenic sources. This area is mapped in Figure 4-1, with the primary source areas outlined. The source area upwind of the Palm Springs monitor includes part of the Whitewater River Wash with large areas of natural blowsand below the canyons of the San Gabriel and San Jacinto Mountains and portions at the northern and western portion of the Coachella Valley. The Whitewater Wash and the Coachella Valley Preserve have been set aside as an undisturbed, natural ecological preserve under the Coachella Valley Multiple Species Habitat Conservation Plan, since the shifting sand is important to several wildlife species. 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 rock and gravel operations. The same potential PM10 sources are also upwind of the Indio monitor, with much larger portions of the Whitewater River Wash and the Coachella Valley Preserve system creating the blowsand zone along the centerline of the Coachella Valley upwind of Indio. The mix of potential BACM-controlled anthropogenic sources upwind of Indio is similar. Further down the Valley, beyond Indio and into Imperial County, agriculture becomes more prevalent. These and all sources in the Coachella Valley are subject to strict AQMD regulatory controls.

A statistical model relating wind speeds at the Whitewater Wash blowsand source area to the PM10 measured at the Indio air monitoring station has been presented for several previous Coachella Valley natural event evaluations, including those characterized in previous chapters of this document. The June 4, 2008 event was extreme, even for the Coachella Valley, with extremely high winds (24-hour average of 39.3 mph at Whitewater Wash) and very high PM10 measurements for part of the day. As such this day creates an extreme outlier for the statistical model, well beyond the Whitewater Wash wind speeds used to develop the regression relationship. The model uncertainty is large in this case. Using the 24-hour, 10-meter wind speed of 39.3 mph from the Whitewater Wash site, the predicted PM10 concentration is 217.5 $\mu g/m^3$ on the best-fit curve of Whitewater 24-hour averaged wind speed versus Indio 24-hour averaged PM10 (Figure 4-2). The 37 $\mu g/m^3$ local background that the model estimates at Indio regardless of wind is then subtracted to give 180.5 $\mu g/m^3$ that would be contributed by blowsand from the Whitewater Wash area. The remaining 156.3 $\mu g/m^3$ (336.8 $\mu g/m^3$

measured minus 180.5 μg/m^3 attributable to Whitewater blowsand from the model) shows the large uncertainty of the model with the extreme wind speeds measured, as well as the likelihood that numerous sources throughout the Coachella Valley contributed wind-entrained PM10 on this day. PM10 sources were both undisturbed, natural sources as well as anthropogenic sources where controls were overwhelmed by the extremely high winds.

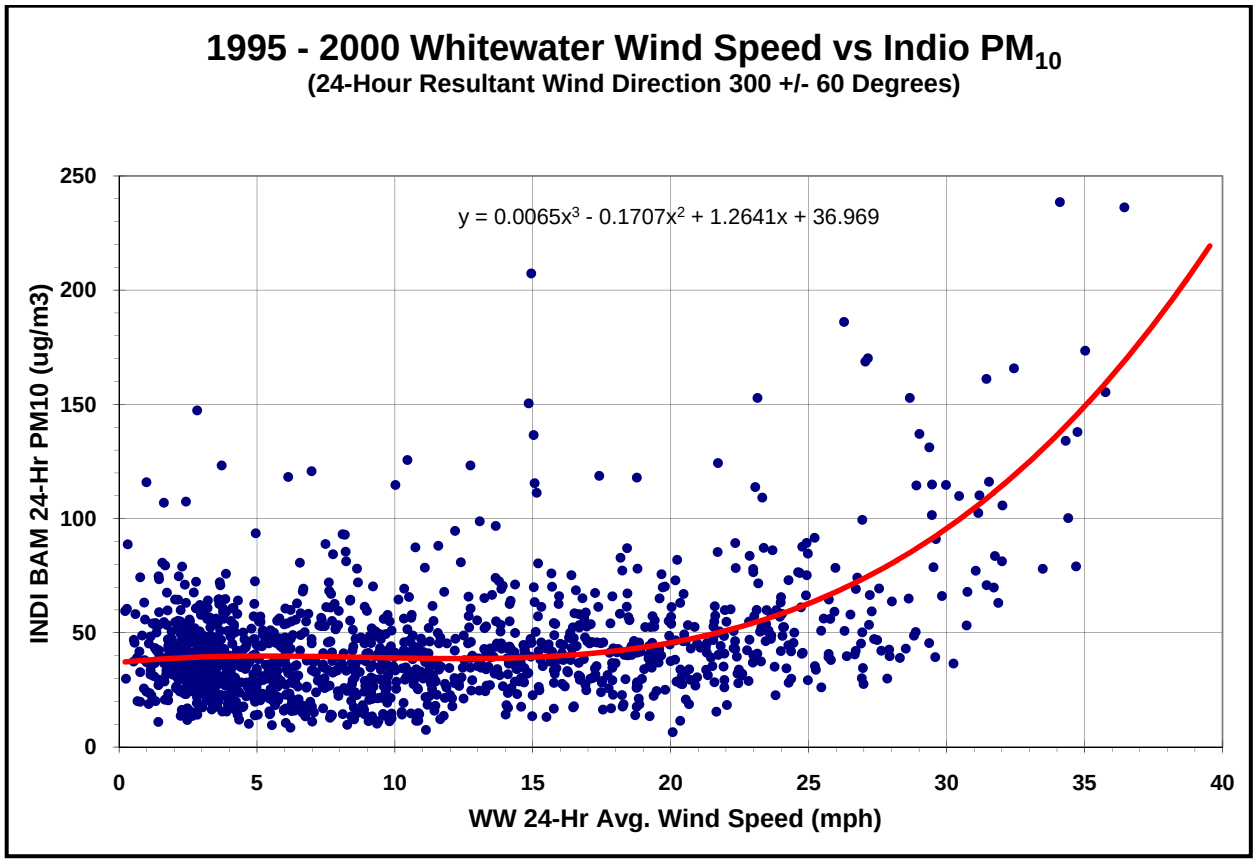

FIGURE 4-2
Plot of Paired 1995 - 2000 Whitewater Wash 24-Hour Averaged Wind Speeds (mph) versus Indio 24-Hour Averaged BAM PM10 Concentrations (μg/m^3) for winds through the Banning Pass
(Plotted curve is best-fit polynomial to data)

4.3.1.2 Analysis of wind speed

The high PM10 measured at Indio and Palm Springs on June 4 occurred with strong northwesterly, along-valley wind flows that peaked in the afternoon. Table 4-3 summarizes the peak wind speeds measured in the Coachella Valley on June 4, including

1-hour averaged sustained, 1-to-5-minute averaged sustained and 1-to-3-second gusts, as available. This wind event was relatively widespread throughout the Valley and all wind monitors, except the AQMD Palm Springs air monitoring station and the AQMD Palm Desert wind station, measured sustained winds in excess of 25 mph. Wind speeds near 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 are likely to be overwhelmed. This threshold is reasonable for the purpose of this analysis. The strongest winds were measured at the AQMD Whitewater Wash wind station, located near the centerline of the Valley southeast of the San Gorgonio Pass in the primary natural desert blowsand source area. Hourly averaged sustained wind speeds at Whitewater Wash, exceeded 25 mph for every hour throughout the day on June 4, with ten hours measuring hourly averages over 40 mph. The 24-hour wind speed at Whitewater Wash, averaged over the whole day, was 39 mph from the northwest on June 4, providing windblown dust from the northwestern Coachella Valley, downwind to the Palm Springs and Indio 24-hour PM10 monitors. The Whitewater Wash instantaneous gusts reached 41 mph or higher during every hour of the day. The peak sustained hourly wind speed was 52 mph and the peak gusts reached 76 mph. It is clear that winds in the general vicinity upwind of the PM10 monitors reached sustained speeds high enough to overwhelm controls on anthropogenic sources and entrain dust from natural sources and then transport it to the Palm Springs and Indio PM10 monitors.

TABLE 4-3
Sustained Wind Speeds and Peak Wind Gusts (mph) Measured in Coachella Valley on June 4, 2008 with Time of Occurrence (PST)

(AQMD air monitoring stations at Palm Springs and Indio measure hourly averaged and 1-minute maximum sustained wind speeds; no gusts are recorded. AQMD Coachella Valley Wind Network stations measure hourly averaged sustained winds and instantaneous gusts. Sustained winds at the NWS airport stations are 2-minute averages preceding the observation time. Peak wind gusts at the NWS stations are defined as the highest 3-second running average during the hour preceding the observation time.)

Station Location	Hourly Averaged Peak Sustained Wind Speed (mph)	Time of Peak Hourly Sustained Wind (PST)	1-5 Minute Averaged Peak Sustained Wind Speed (mph)	Time of Peak 1-5 Minute Sustained Wind (PST)	Peak Wind Gust (mph)	Time of Peak Gust (PST)
AQMD Whitewater Wash (blowsand source area near Coachella Valley centerline)	**52**	1500			**76**	1500
AQMD Desert Hot Springs (northern Coachella Valley)	**37**	1500			**70**	1500
NWS Palm Springs Airport (E of Palm Springs monitor)			**38**	1853 1953	**51**	1953
AQMD Indio Air Monitoring Station (southeastern Coachella Valley)	**25**	1500 1600	**33**	1500 1600		
NWS Thermal Airport (~8.6 miles SE of Indio monitor)			**32**	1652	**48**	1652
AQMD Palm Desert (between Indio & Palm Springs monitors)	24	1900			**48**	1900
AQMD Palm Springs Air Monitoring Station (northwestern Coachella Valley)	18	1300 1500	24	0100 1500		

4.3.1.3 Recurrence frequency

The sustained (hourly averaged) winds at the Whitewater Wash wind monitor in the blowsand source area exceed 25 mph quite often, on approximately one third of all days during the 2005 through 2009 period, as shown previously in Figure 1-6 in Section 1.6.3, Historical Perspective. In the 2005-2009 period, exceedances of the PM10 NAAQS occur approximately 1.4 times per year at Indio and 0.8 times per year at Palm Springs (Figures 1-4 and 1-5). That there are not more exceedances of the federal PM10 standard shows that other factors play a role and that the BACM controls on windblown dust sources in the Coachella Valley are effective on all but very windy days. All the PM10 24-hour NAAQS exceedances in the Coachella Valley since 1993 have been attributed to high-wind natural events, which may recur and still be considered for exclusion under the exceptional event rule.

4.3.1.4 Controls analysis

This requirement is met by demonstrating that despite having reasonable and appropriate measures in place, the June 4, 2008 wind event caused the NAAQS violation. During this event, there were no other unusual PM10-producing activities occurring in the Coachella Valley 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. The PM10 was primarily coarse particles from windblown sand and dust. Smoke from wildfires, agricultural or residential burning did not appear to have added any significant amount of PM10 to the concentrations recorded at Indio and Palm Springs. A relatively small fire burned three mobile homes and some brush in North Palm Springs in the evening of June 4, it started after 1700 PST and was controlled in about one hour according to news reports. A fire of this size would not have contributed significantly to PM10 measured in Palm Springs and Indio and the timing was not consistent with the high PM10 hourly measurements that began at 1000 PST that morning.

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 Palm Springs and Indio on June 4, from the upwind Whitewater River Wash and Coachella Valley Preserve areas, the undeveloped terrain of the northwestern Coachella Valley. Dust from these natural sources was not reasonably 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 anthropogenic sources (mainly construction related activities) as control measures were locally overwhelmed by the high winds. Due to the AQMD High Wind Day forecasts issued for June 4, earth-moving construction and agricultural operations were minimal in

the Coachella Valley on this day. The primary source of the windblown dust on June 4 was the natural blowsand preserve areas that were most impacted by the strong winds. These BACM-controlled sources are mainly in the developed areas of the Coachella Valley, mainly southwest of the Valley centerline from Palm Springs to Indio, as outlined in Figure 4-1.

A survey of the AQMD complaint records and inspection reports for the Coachella Valley indicated no evidence of unusual particulate emissions on June 4, 2008, other than related to the windblown dust event. The complaints are summarized in Table 4-4 from the AQMD CLASS database for complaints and compliance actions. Due to the extremely windy conditions, AQMD Compliance staff recorded twelve complaints related to windblown dust in the Coachella Valley on June 4. No Notices of Violation or Notices to Comply were issued for fugitive dust violations on this day. The complaints were directly related to the strong winds and windblown dust that overwhelmed the fugitive dust controls that are enforced in the Coachella Valley. Except for some large natural source areas such as the Whitewater Wash, individual sources of windblown dust could not be identified by AQMD inspectors on this day, since the strong winds and windblown particulates were so widespread that they could not distinguish material blowing from individual properties from that blowing across from further upwind. The control methods were generally effective throughout the Coachella Valley, but were apparently overwhelmed in several instances by the strong, gusty winds, causing windblown dust and sand to be entrained in the atmosphere.

TABLE 4-4
Summary of PM-Related Complaints in the Coachella Valley on June 4, 2008

Complaint Date/Time	Location	Complaint Description	Disposition
6/4/08 0849 PST	Cathedral City	Dust from construction site and wash; not watering enough; tarps on fence are down.	Inspector visit at 0929 PST on 6/4: Winds were 23-31 mph as measured by AQMD Inspector at various locations. Sand originating from an uncontrolled, natural wash (Whitewater River Wash) was affecting the construction site and neighborhood. Inspector noted that wash was not disturbed and in natural state. Sand from construction site did not appear to be affecting the residences, just from the wash with the high winds. Cathedral City Public Works Department had taken over control of the construction property, which was in bankruptcy, and later made fence repairs. Dust was not observed from the construction property. No further action taken.
6/4/08 1140 PST	Cathedral City	Fugitive sand from construction site; grading with no watering.	Likely to be related to previous finding. Dust mostly from natural wash area. No further action taken. Inspector measured winds to a maximum of 44 mph in this area on 6/4.
6/4/08 1148 PST	Bermuda Dunes	Fugitive dust on 2.5 acre lot that was previously graded. No watering being done.	On 6/4, Inspectors noted large areas of windblow dust in this area. Inspector follow-up on 6/5 did not find compliance issues. No further action taken.
6/4/08 1214 PST	Palm Desert	Fugitive dust from construction site; no watering being done and it's very windy.	On 6/4, Inspectors noted significant wind event and large areas of windblown dust from numerous sources. Inspector follow up on 6/13 did not find compliance issues. No further action taken.
6/4/08 1231 PST	Indio	Dust blowing from high school construction project. Wind blowing with piles of dirt uncovered; not watering.	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up on 6/13. No further action taken.
6/4/08 1257 PST	Indio	Dust from construction project; not watering	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up on 6/13. No further action taken.
6/4/08 1258 PST	Indio	Dust from country club, blowing everywhere with rock particles; very windy.	I On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up on 6/13. No further action taken.
6/4/08 1409 PST	Indio	Fugitive dust from vacant lot; not watering	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up on 6/13. No further action taken.
6/4/08 1421 PST	Indio	Piles of dirt on open land causing dust to blow everywhere especially with the winds; unable to see ¼ across the lot.	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up after event. No further action taken.
6/4/08 1620 PST	Thermal	Excess amount of dirt from nursery property; not watering.	On 6/4, Inspectors noted significant winds and windblown dust upwind of Thermal, throughout the Coachella Valley. Inspector follow up on 6/13. No further action taken.
6/4/08 1635 PST	Indio	Dust from pipeline installation.	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio, throughout the Coachella Valley. Inspector follow up after event. No further action taken.
6/4/08 1718 PST	Indio	Blowing sand from storm channel construction; no water control.	On 6/4, Inspectors noted significant winds and windblown dust upwind of Indio throughout the Coachella Valley. Inspector met with Coachella Valley Water District site supervisor on 6/12. 3 water trucks were onsite and soil was visibly moist and compact. Roads were being watered on both sides of the wash. Entrances were equipped with rumble plates and the site had a properly posted sign. Inspector did not observe any violations at the time of inspection. No further action taken.

4.3.2 Causal Connection

This demonstration shows a clear causal connection between the PM10 measured at the Palm Springs and Indio air monitoring stations 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 air monitoring stations, especially in the afternoon of June 4, and coinciding increases in the hourly PM10 concentrations at Palm Springs and Indio.

4.3.2.1 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 an event affected air quality with a causal connection. The historical perspective is presented in detail in Section 1.6.3 and is summarized here in relation to June 4, 2008. Five-year time series of the 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. Daily maximum sustained (1-hour averaged) wind speeds from the AQMD Whitewater Wash wind station are shown in Figure 1-6 for the same period. These show that PM10 exceedances occur an average of 1.4 times per year at Indio and less than once per year at Palm Springs. As was shown previously in Tables 1-2 and 1-3, on June 4 the 337 $\mu g/m^3$ 24-hour PM10 concentration was the 100^{th} percentile value (the highest of the period) for the full 5-year period and the 236 $\mu g/m^3$ concentration at Palm Springs was the 100^{th} percentile value (the highest of the period). If considering the 3-month seasonal period of April through June, the Indio and Palm Springs concentrations were each still 100^{th} percentile value. This event on June 4 was associated with the highest sustained (1-hour averaged) wind speed at the AQMD Whitewater Wash wind monitor, 52 mph, measured during the 2005-2009 period.

4.3.2.2 Event occurrence and geographic extent

This section contains details of the high-wind natural event occurrence on June 4, 2008, including a description of meteorological conditions with details of the sequence of events that led to the PM10 NAAQS exceedances. 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. Figure 4-1 shows the geographic extent of the wind near the time of the peak hourly PM10 measurement at Indio and a high concentration at Palms Springs.

Meteorological Setting

The meteorological conditions on Wednesday, June 4, 2008 can be classified primarily as a Type 1 event, as defined previously, with strong pressure and density gradients between the desert and coastal air masses. This was enhanced by the synoptic weather pattern with low pressure at the surface over the Great Basin and a strong Pacific High in the eastern Pacific Ocean, as well as coupled along-valley flow aloft. On Tuesday, June 3, a broad upper level trough of low pressure had developed over the west coast, including Southern California Figure 4-3 shows the height analysis chart of the 500 millibar (MB) pressure level at 1600 PST, June 3. The winds at this level were northwesterly and northerly at this time over southern California, becoming westerly over Arizona. The passage of the upper level low brought a weak surface cold front through the deserts of southern California, increasing onshore pressure gradients and bringing gusty wind through the Coachella Valley. By 0400 PST in the morning of June 4 (Figure 4-4), the trough deepened over southern California, causing stronger west-northwesterly winds aloft at the coast to 46 mph (40 knots). By 1600 PST in the afternoon of June 4, (Figure 4-5), the trough deepened further over southern California and its axis shifted slightly to the east, bringing northwesterly winds aloft with speeds measured to 86 mph (75 knots). The upper level trough provided support for the strong westerly and northwesterly winds at the surface during this period.

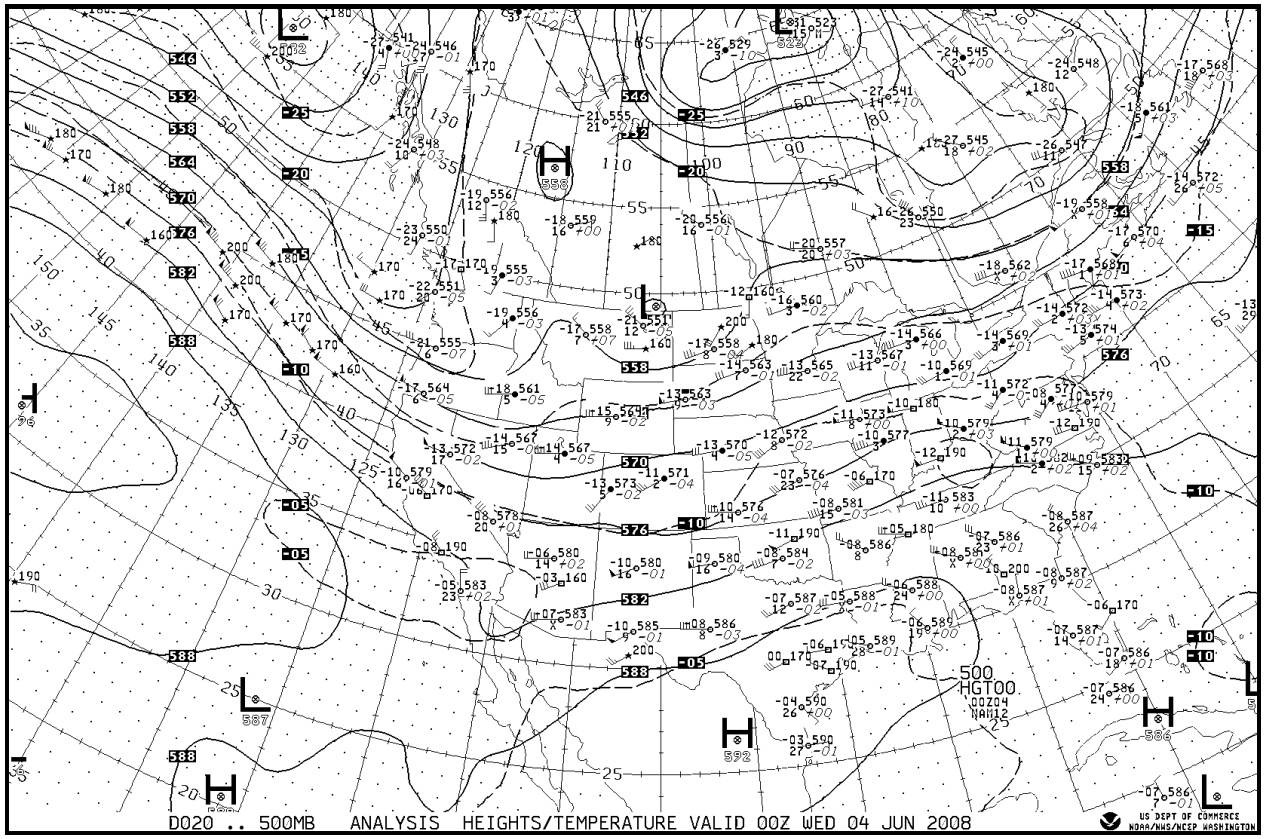

FIGURE 4-3
National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 1600 PST Tuesday, June 3, 2008

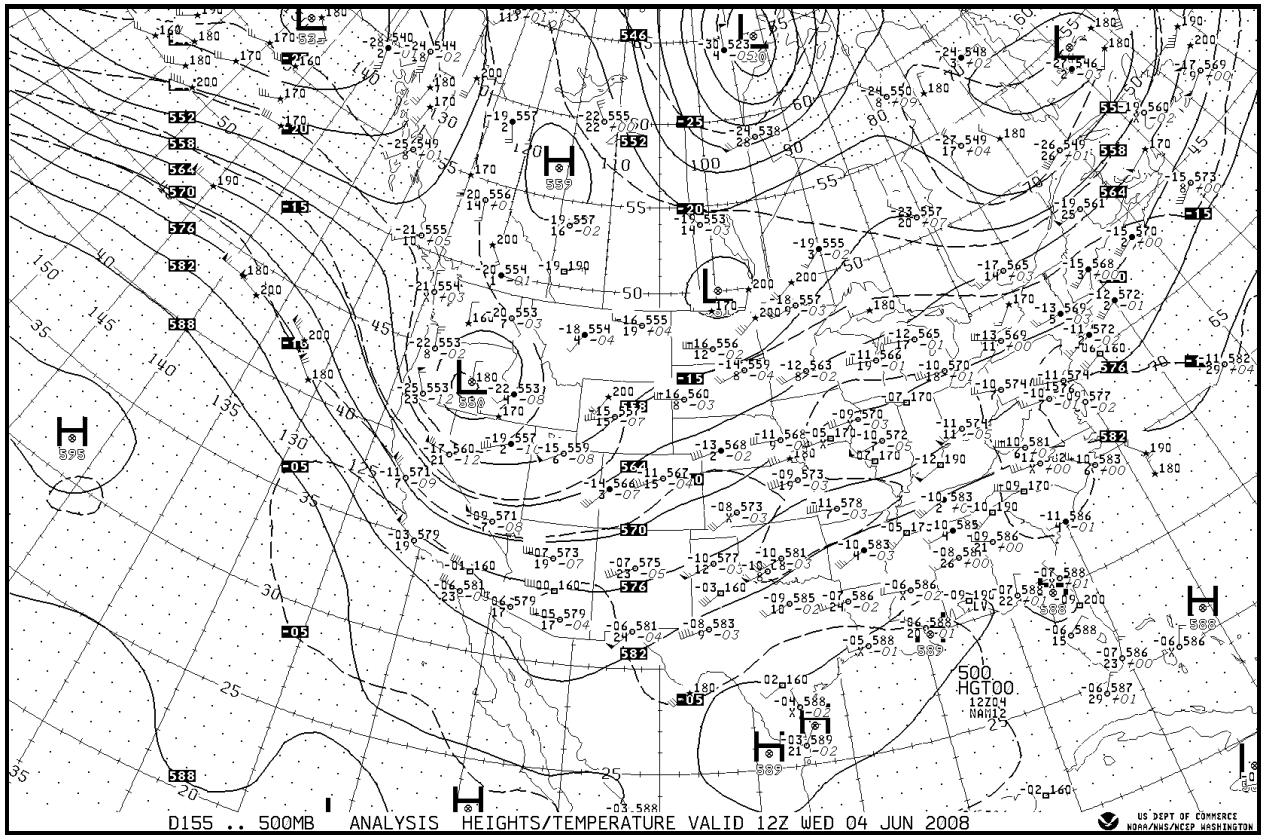

FIGURE 4-4
National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 0400 PST Wednesday, June 4, 2008

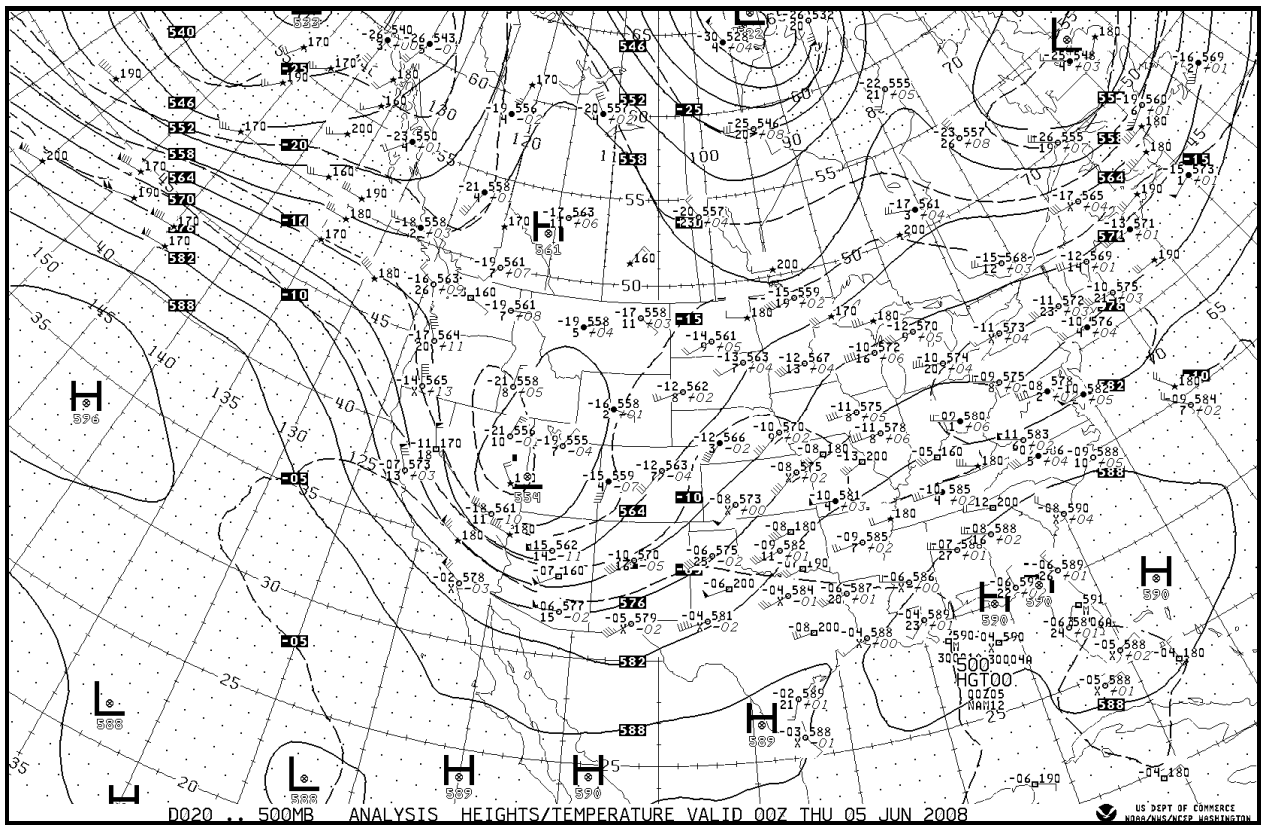

FIGURE 4-5
National Weather Service Height Analysis (solid contours in tens of meters) of the 500 Millibar Pressure Surface for 1600 PST Wednesday, June 4, 2008

Figures 4-6A and 4-6B show the NWS mean sea level pressure analysis every three hours throughout the day on June 4, 2008, starting at 0100 PST. An area of low pressure was over southern Nevada, near the border with California and Arizona, that was part of a larger system that extended to the east. As the day progressed, a surface front impacted the deserts of southern California, including the Coachella Valley. The surface pressured gradients increased through the day, especially after 1000 PST (1800 Z); the tight spacing of the isobars indicate stronger pressure gradients and stronger winds throughout the area. This surface weather pattern brought increased westerly onshore flow across the South Coast Air Basin and through the San Gorgonio Pass with strong, gusty winds in the Coachella Valley for much of the day.

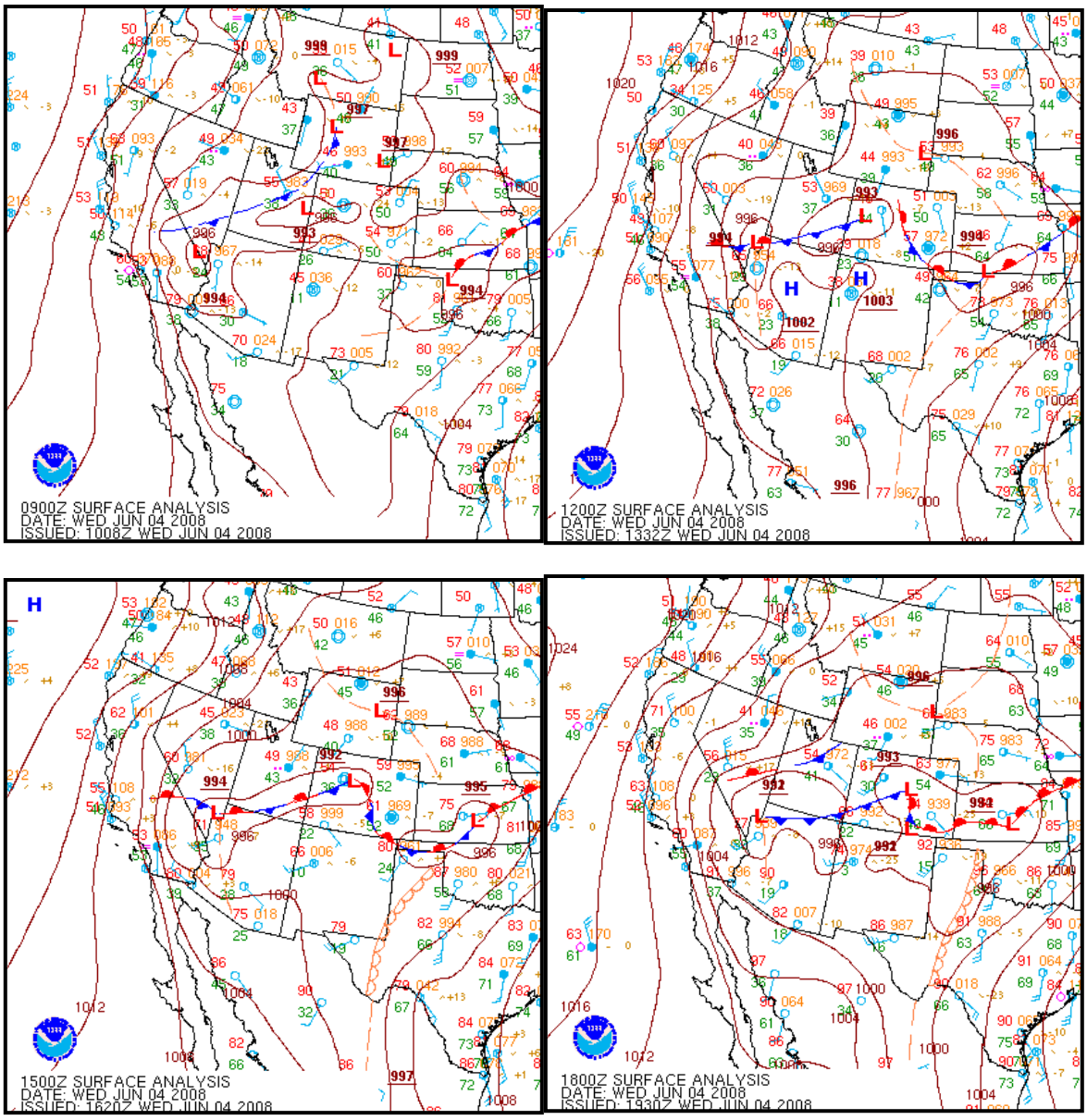

FIGURE 4-6A
National Weather Service Sea-Level Pressure Analysis (contours every 4 millibars) for every three hours between 0100 and 1000 PST Wednesday, June 4, 2008

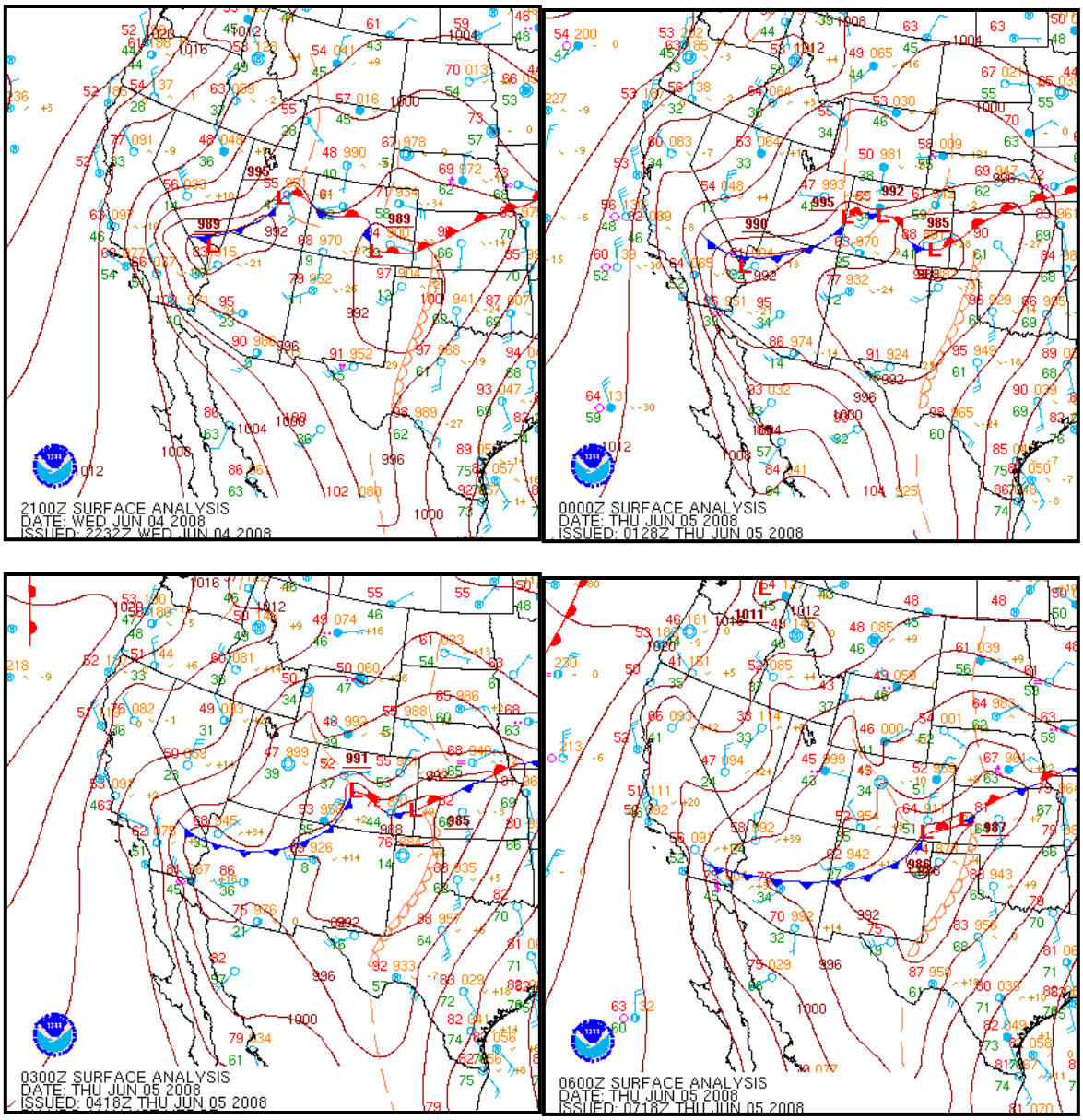

FIGURE 4-6B
National Weather Service Sea-Level Pressure Analysis (contours every 4 millibars) for every three hours between 1300 and 2200 PST Wednesday, June 4, 2008

The coastal inversion base at 0400 PST in the morning of June 4 was 3,275 feet. The trough had created a coastal eddy offshore, deepening the marine layer and bringing patchy fog and some drizzle to the South Coast Air Basin west of the mountains overnight and in the morning. This is illustrated in the visible satellite image from 1003 PST on June 4 (Figure 4-7), that a weak coastal eddy with low clouds west of the mountains. The deep marine layer and onshore flow supported the onshore pressure and density gradient through the San Gorgonio Pass and the gusty winds observed in the Coachella Valley.

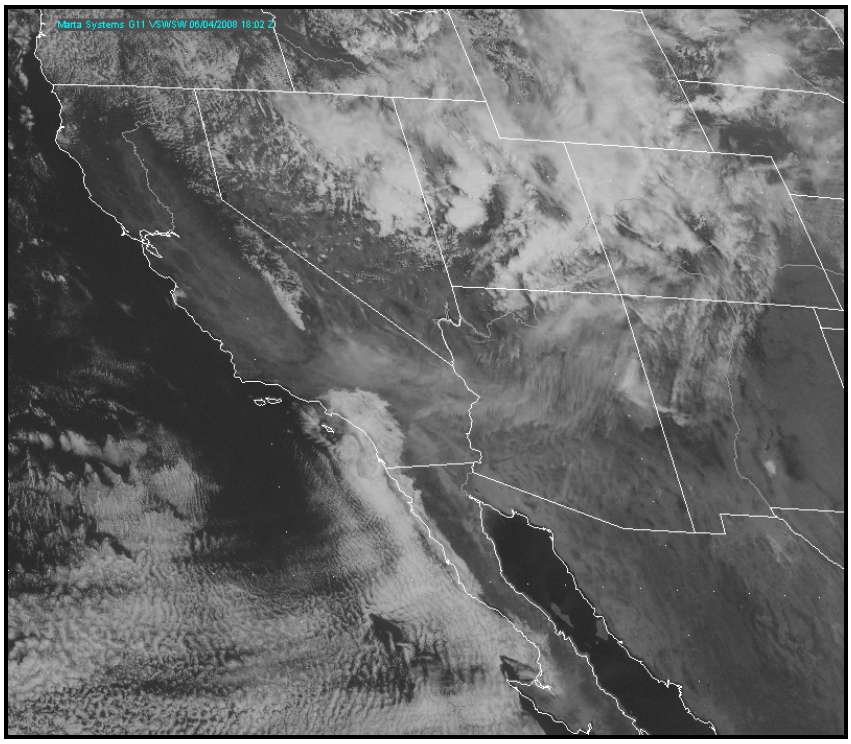

FIGURE 4-7
Visible Satellite Image for 1002 PST in the Morning of Wednesday June 4, 2008

In their forecasts for the Coachella Valley, the NWS San Diego Forecast Office predicted strong, gusty northwesterly winds in the mountains and deserts of southern California to start in the evening of Tuesday, June 3 and to continue through Wednesday night, June 4. Wind advisories were issued for this period and were later extended through the early morning of June 5, covering the Coachella Valley, the Riverside, San Bernardino and San Diego County mountains, the San Diego County deserts and Apple and Lucerne Valleys in the San Bernardino County deserts. The winds were predicted to

peak in the afternoon and evening of June 4 with sustained winds from 20 to 30 mph and gusts in excess of 50 mph at times, along with reduced visibilities from blowing dust and sand. With their forecast issued at 0839 PST on June 4, NWS San Diego issued a high wind warning for the Coachella Valley and the San Diego County deserts, for the period from 1300 PST on June 4 through 0200 PST the following morning. The high wind warning predicted that strong northwest winds, with gusts to 60 mph, could create driving hazards and areas of blowing dust and sand with reduced visibilities below a quarter of a mile. The following summarizes the NWS wind advisories and warnings issued for the Coachella Valley during the period.

WWUS76 KSGX 040432
NPWSGX

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE SAN DIEGO CA
932 PM PDT TUE JUN 3 2008 (2032 PST, Tuesday, June 3, 2008)

...STRONG NORTHWEST WINDS IN THE MOUNTAINS AND DESERTS THROUGH WEDNESDAY NIGHT...

.STRONG NORTHWEST WINDS WILL IMPACT THE MOUNTAINS AND DESERTS OF SOUTHERN CALIFORNIA THROUGH WEDNESDAY NIGHT. THE WINDS WILL PEAK WEDNESDAY AFTERNOON AND EVENING. SUSTAINED WINDS FROM 20 TO 30 MPH ARE LIKELY WITH GUSTS IN EXCESS OF 50 MPH AT TIMES... ESPECIALLY LATE WEDNESDAY. MOTORISTS TRAVELLING THROUGH THE MOUNTAIN PASSES AND INTO THE DESERTS MAY ENCOUNTER REDUCED VISIBILITIES IN BLOWING DUST AND SAND.

CAZ055-056-058-060>062-041300-
/O.CON.KSGX.WI.Y.0074.000000T0000Z-080605T1000Z/
SAN BERNARDINO COUNTY MOUNTAINS-RIVERSIDE COUNTY MOUNTAINS-
SAN DIEGO COUNTY MOUNTAINS-APPLE AND LUCERNE VALLEYS-
COACHELLA VALLEY-SAN DIEGO COUNTY DESERTS-
932 PM PDT TUE JUN 3 2008

...WIND ADVISORY REMAINS IN EFFECT UNTIL 3 AM PDT THURSDAY...

A WIND ADVISORY REMAINS IN EFFECT UNTIL 3 AM PDT THURSDAY.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH WEDNESDAY NIGHT. THE STRONGEST WINDS ARE EXPECTED WEDNESDAY AFTERNOON AND EVENING WHEN NORTHWEST WINDS FROM 20 TO 30 MPH WILL GUST IN EXCESS OF 50 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND COULD REDUCE VISIBILITY TO LESS THAN A QUARTER MILE...ESPECIALLY IN THE DESERTS.
MM/MAXWELL

WWUS76 KSGX 041242
NPWSGX

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE SAN DIEGO CA
542 AM PDT WED JUN 4 2008 (0442 PST, Wednesday, June 4, 2008)

CAZ055-056-058-060>062-042045-
/O.CON.KSGX.WI.Y.0074.000000T0000Z-080605T1000Z/
SAN BERNARDINO COUNTY MOUNTAINS-RIVERSIDE COUNTY MOUNTAINS-
SAN DIEGO COUNTY MOUNTAINS-APPLE AND LUCERNE VALLEYS-
COACHELLA VALLEY-SAN DIEGO COUNTY DESERTS-
542 AM PDT WED JUN 4 2008

...WIND ADVISORY REMAINS IN EFFECT UNTIL 3 AM PDT THURSDAY...

A WIND ADVISORY REMAINS IN EFFECT UNTIL 3 AM PDT THURSDAY.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH WEDNESDAY NIGHT. THE STRONGEST WINDS ARE EXPECTED WEDNESDAY AFTERNOON AND EVENING WHEN NORTHWEST WINDS FROM 20 TO 30 MPH WILL GUST IN EXCESS OF 50 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING DIFFICULT...ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND COULD REDUCE VISIBILITY TO LESS THAN A QUARTER MILE...ESPECIALLY IN THE DESERTS.

WWUS76 KSGX 041639
NPWSGX

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE SAN DIEGO CA
939 AM PDT WED JUN 4 2008 (0839 PST, Wednesday, June 4, 2008)

CAZ061-062-050100-
/O.NEW.KSGX.HW.W.0015.080604T2100Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T2100Z/
COACHELLA VALLEY-SAN DIEGO COUNTY DESERTS-
939 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON...
...HIGH WIND WARNING IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH TONIGHT. THE STRONGEST WINDS ARE EXPECTED THIS AFTERNOON AND EVENING WHEN NORTHWEST WINDS WILL GUST IN EXCESS OF 60 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND WILL REDUCE VISIBILITY TO LESS THAN A QUARTER MILE... ESPECIALLY BELOW CANYONS AND PASSES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN LEAD TO PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.

CAZ055-056-058-050100-
/O.NEW.KSGX.HW.W.0015.080604T2100Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T2100Z/
SAN BERNARDINO COUNTY MOUNTAINS-RIVERSIDE COUNTY MOUNTAINS-
SAN DIEGO COUNTY MOUNTAINS-
939 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON...
...HIGH WIND WARNING IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON.

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WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN CAUSE PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.

CAZ060-050100-
/O.NEW.KSGX.HW.W.0015.080604T1800Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T1800Z/
APPLE AND LUCERNE VALLEYS-
939 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 11 AM PDT THIS MORNING...
...HIGH WIND WARNING IN EFFECT UNTIL 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT UNTIL 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 11 AM PDT THIS MORNING.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH TONIGHT. THE STRONGEST WINDS ARE EXPECTED THIS AFTERNOON AND EVENING WHEN NORTHWEST WINDS WILL GUST IN EXCESS OF 60 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND WILL REDUCE VISIBILITY TO LESS THAN A QUARTER MILE... ESPECIALLY BELOW CANYONS AND PASSES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN CAUSE PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.
BALFOUR

WWUS76 KSGX 041649 CCA
NPWSGX

URGENT - WEATHER MESSAGE
NATIONAL WEATHER SERVICE SAN DIEGO CA
939 AM PDT WED JUN 4 2008 (0839 PST, Wednesday, June 4, 2008)

CORRECTION TO START TIME IN HEADLINE FOR APPLE LUCERNE VALLEYS

CAZ061-062-050100-
/O.NEW.KSGX.HW.W.0015.080604T2100Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T2100Z/
COACHELLA VALLEY-SAN DIEGO COUNTY DESERTS-
939 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON...
...HIGH WIND WARNING IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH TONIGHT. THE STRONGEST WINDS ARE EXPECTED THIS AFTERNOON AND EVENING WHEN NORTHWEST WINDS WILL GUST IN EXCESS OF 60 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND WILL REDUCE VISIBILITY TO LESS THAN A QUARTER MILE... ESPECIALLY BELOW CANYONS AND PASSES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN LEAD TO PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.

CAZ055-056-058-050100-
/O.NEW.KSGX.HW.W.0015.080604T2100Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T2100Z/
SAN BERNARDINO COUNTY MOUNTAINS-RIVERSIDE COUNTY MOUNTAINS-
SAN DIEGO COUNTY MOUNTAINS-

939 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON...
...HIGH WIND WARNING IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT FROM 2 PM THIS AFTERNOON TO 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 2 PM PDT THIS AFTERNOON.

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WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN CAUSE PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.

CAZ060-050100-
/O.NEW.KSGX.HW.W.0015.080604T1800Z-080605T1000Z/
/O.EXT.KSGX.WI.Y.0074.000000T0000Z-080604T1800Z/
APPLE AND LUCERNE VALLEYS-
948 AM PDT WED JUN 4 2008

...WIND ADVISORY NOW IN EFFECT UNTIL 11 AM PDT THIS MORNING...
...HIGH WIND WARNING IN EFFECT FROM 11 AM PDT UNTIL 3 AM PDT THURSDAY...

THE NATIONAL WEATHER SERVICE IN SAN DIEGO HAS ISSUED A HIGH WIND WARNING...WHICH IS IN EFFECT UNTIL 3 AM PDT THURSDAY. THE WIND ADVISORY IS NOW IN EFFECT UNTIL 11 AM PDT THIS MORNING.

STRONG NORTHWEST WINDS WILL CREATE HAZARDOUS DRIVING CONDITIONS THROUGH TONIGHT. THE STRONGEST WINDS ARE EXPECTED THIS AFTERNOON AND EVENING WHEN NORTHWEST WINDS WILL GUST IN EXCESS OF 60 MPH AT TIMES.

WINDS THIS STRONG CAN MAKE DRIVING HAZARDOUS... ESPECIALLY FOR HIGH PROFILE VEHICLES. AREAS OF BLOWING DUST AND SAND WILL REDUCE VISIBILITY TO LESS THAN A QUARTER MILE... ESPECIALLY BELOW CANYONS AND PASSES.

A HIGH WIND WARNING ALSO MEANS SUSTAINED WIND SPEEDS AND OR GUSTS CAN CAUSE PROPERTY DAMAGE. BE ALERT FOR FLYING DEBRIS. DOWNED POWER LINES AND TREES ARE ALSO POSSIBLE.

BALFOUR

The criteria used by the AQMD Meteorology Section to forecast high winds and windblown dust events in the Coachella Valley in accordance with AQMD Rule 403.1, Wind Entrainment of Fugitive Dust, require:

(1) 0700 PST Pressure Gradient Index (PGI) > 17 MB,

where PGI = the 0700 PST Summation Pressure Gradient [SPG = (SAN-LAS)[20] + (LGB-DAG)[21] + (RIV-DAG)[22]] + the 24-hour change in the SPG from the previous day;

and

(2) 0400 PST Coastal Temperature Inversion Base > 1,500 feet;

or

0700 PST (SFO-TRM)[23] Pressure Gradient ≥ 8 MB.

On the morning of June 4, the 0700 PST Summation Pressure Gradient (SPG) was 30.8 MB. The 24-hour change in the SPG was 11.2 MB, giving a Pressure Gradient Index (PGI) of 42.0 MB. The San Francisco to Thermal pressure gradient was 13.2 MB. The coastal inversion base at 0400 PST in the morning of June 4 was 3,275 feet. Thus, the conditions favored strong winds through the Pass and the Coachella Valley on this day. The AQMD Meteorology Section predicted this on the previous day and issued a Rule 403.1 high wind forecast valid for June 4. The AQMD high-wind forecast is available to the public and facilities subject to AQMD Rule 403.1 as part of the AQMD daily air quality forecast, available on the web at:

http://www.aqmd.gov/telemweb/Forecast.aspx.

The forecast discussion section of the AQMD air quality forecast text valid for June 4 included a statement that gusty winds were likely in the mountains and deserts. The Rule 403.1 forecast text was as follows:

```
-------------------------------------------------------------------------

 Coachella Valley Rule 403.1 Wind Forecast:  High Wind Day

-------------------------------------------------------------------------
```

A daily recorded message for the AQMD Coachella Valley wind forecast is also available through 1-800-CUT-SMOG or directly at 909-396-2399. The wording for the Rule 403.1 high-wind advisory forecast message on June 4 was as follows:

[20] Sea Level Pressure difference between San Diego and Las Vegas
[21] Sea Level Pressure difference between Long Beach and Daggett
[22] Sea Level Pressure difference between Riverside and Daggett
[23] Sea Level Pressure difference between San Francisco and Thermal

> The following forecast is valid for Wednesday, June 4, 2008.
>
> The South Coast Air Quality Management District has designated Wednesday, June 4 as a Rule 403.1 High Wind Day in the Coachella Valley. This means that localized wind gusts are expected to exceed 25 miles per hour throughout the valley.

According to National Climatic Data Center (NCDC) Event Record Reports,[24] the gusty winds in the southern California deserts on June 4 reached high wind criteria and caused power outages, downed power poles, broken tree limbs and blowing dust in the Coachella Valley. A 59 mph wind gust was recorded at Thousand Palms in the Coachella Valley between 1146 and 1155 PST on this day. In the San Diego County deserts, sustained winds of 49 mph and gust to 64 mph were recorded at the Borrego Springs mesonet between 1245 and 1445 PST. In Imperial County, visibilities were reported as low as ¼ mile due to blowing dust and sand and associated strong winds between 1800 and 2300 PST. The NCDC Event Record Reports are reproduced below.

[24] *NOAA/NESDIS/NCDC: http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms*

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC Search Field: Search NCDC

Event Record Details

Event: **High Wind**
Begin Date: **04 Jun 2008, 11:46:00 AM PST**
Begin Location: **Not Known**
End Date: **04 Jun 2008, 11:55:00 AM PST**
End Location: **Not Known**
Magnitude: **51**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 25.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Coachella Valley**

Description:
EVENT NARRATIVE: A 59 mph wind gust was measured in Thousand Palms. EPISODE NARRATIVE: Strong onshore pressure gradients approaching 20 mb caused a period of gusty winds in the mountains and deserts. Gusts reached high wind criteria in all three desert zones during the peak of the event. The high wind gusts resulted in power outages, downed power poles, broken tree limbs, and blowing dust in the Coachella Valley.

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This page dynamically generated 22 Feb 2011 from:
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms
Please send questions or comments about this system to Stuart.Hinson@noaa.gov
Please see the NCDC Contact Page if you have questions or comments.

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC

Search Field: Search NCDC

Event Record Details

Event: **High Wind**
Begin Date: **04 Jun 2008, 12:45:00 PM PST**
Begin Location: **Not Known**
End Date: **04 Jun 2008, 14:45:00 PM PST**
End Location: **Not Known**
Magnitude: **56**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **San Diego County Deserts**

Description:
EVENT NARRATIVE: A 64 mph wind gust was measured at the Borrego Springs mesonet. Sustained winds of 49 mph were also measured. EPISODE NARRATIVE: Strong onshore pressure gradients approaching 20 mb caused a period of gusty winds in the mountains and deserts. Gusts reached high wind criteria in all three desert zones during the peak of the event. The high wind gusts resulted in power outages, downed power poles, broken tree limbs, and blowing dust in the Coachella Valley.

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This page dynamically generated 22 Feb 2011 from:
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms
Please send questions or comments about this system to Stuart.Hinson@noaa.gov
Please see the NCDC Contact Page if you have questions or comments.

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC Search Field: Search NCDC

Event Record Details

Event: **Dust Storm**
Begin Date: **04 Jun 2008, 18:00:00 PM PST**
Begin Location: **Not Known**
End Date: **04 Jun 2008, 23:00:00 PM PST**
End Location: **Not Known**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 0.0K**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties

Zones affected: **Imperial County Except The Low**

Description:
EVENT NARRATIVE: The visibility was reported as low as 1/4 mile at Imperial Airport. Spotters and other sources across Imperial County reported low visibilities due to blowing dust and sand associated with strong winds. EPISODE NARRATIVE: A strong low pressure system moving through the Great Basin and the associated gusty winds resulted in widespread areas of blowing dust.

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News articles from the Desert Sun Newspaper are reproduced below, relating to the strong winds in the Coachella Valley on June 4 and a residential fire that damaged three mobile homes in North Palm Springs in the evening near 1715 PST. Winds, reported at 30 mph winds with 45 mph gusts, damaged utility lines and caused power outages.

Strong winds to die down today

Colin Atagi • The Desert Sun • June 5, 2008

Weather experts expect today's winds to be weaker than the ones that wreaked havoc around the Coachella Valley on Wednesday, causing road closures, power outages, and downing trees throughout the desert.

Winds should blow about 20 mph with 35 mph gusts - down from the 30 mph winds and 45 mph gusts local residents endured Wednesday, National Weather Service meteorologist Stefanie Sullivan said.

"They should definitely die down (this) morning pretty early," she said.

Cathedral City resident John Jensen walked into a Palm Springs Walgreens for about two minutes to buy a birthday card and was greeted by strong winds on his way out just after 5 p.m.

"I just came out of the store and my card took off across the parking lot," said Jensen, 53.

Excessive wind was also cited as a factor in a quickly spreading fire in North Palm Springs on Wednesday evening. Two people suffered smoke inhalation and a firefighter hurt his arm, while two mobile homes were destroyed and a third sustained significant damage, officials said.

More than 2,000 Imperial Irrigation District customers lost electricity after winds damaged utility lines.

About 750 customers in the area of Avenue 52 and Jefferson Street in La Quinta lost power for about 30 minutes at 4:10 p.m., company spokesman Tony DeZego said.

Another 750 customers near Van Buren and Polk streets in Coachella also lost power.

An outage also occurred in Indio at Fred Waring Drive and Monroe Street in Indio and northeast of Interstate 10 in Coachella.

Another 1,100 customers in Mecca and Thermal also lost power.

Three injured in mobile home fire fueled by winds

Colin Atagi • The Desert Sun • June 5, 2008

A two-alarm fire destroyed two mobile homes and damaged a third while vegetation as far away as three blocks was set ablaze by blowing embers in North Palm Springs Wednesday night.

Two people were treated for smoke inhalation and a firefighter suffered an arm injury, officials said, adding that a family pet was killed.

The fire was reported about 6:15 p.m. Wednesday at Carefree Mobile Home Park on Indian Avenue at Thumb Drive.

Upon arrival, firefighters found a mobile home fully engulfed in flames and an adjacent home on fire.

Twenty-nine mph winds blew embers across the street to where about a dozen palm trees stood, and ignited them, officials said.

High winds carried additional embers several blocks east along Thumb Drive, igniting numerous smaller fires.

“If the wind wasn’t blowing, we wouldn’t have those spot fires and the fire would’ve been confined to the homes,” Cal Fire Capt. Fernando Herrera said.

The blaze displaced two families, park manager DeAnn Levey said.

No one was injured, but a pet Corgi Mix, named Milo died.

“The family is heartsick over their dog,” Levey said.

She added that one of the families is staying in a vacant mobile home and the other opted to move in with family members.

It took about an hour for 35 Cal Fire and Bureau of Land Management firefighters to contain the blaze.

Afterwards, they remained at the scene putting out hot spots and removing the palm trees.

Indian was shut down between 18th Avenue and Dillon Road while they cleared the area.

The road opened just before 9 p.m.

The cause of the fire remains under investigation.

No damage estimates were available.

An AQMD Air Quality Inspector took numerous pictures and videos throughout the Coachella Valley (Palm Desert, Cathedral City, La Quinta, Indio and Bermuda Dunes) during the high wind event on June 4. Several of the pictures are reproduced below to show the widespread nature of this event.

Vista Chino and Date Palm in Cathedral City, near the Whitewater River Wash.


06.04.2008 13:57


06.04.2008 15:08


06.04.2008 15:15


06.04.2008 15:25


06.04.2008 16:26

Windblown Dust Analysis

Table 4-5 shows the winds from the AQMD air monitoring stations at Indio and Palm Springs in the Coachella Valley and at Banning Airport at the western portion of the San Gorgonio Pass in the South Coast Air Basin. Just upwind of the San Gorgonio Pass, the winds at the AQMD Banning Airport air monitoring station increased in the morning of June 4 and remained somewhat elevated throughout the afternoon. The wind directions were from the west and west-southwest, indicating consistent flows through the pass. While this site did not measure particularly strong winds to locally create significant windblown dust, sustained hourly averages to 22 mph and three hourly maximum 1-minute averaged sustained winds of 25 mph or higher were measured, peaking at 28 mph 1600 PST in the afternoon. This demonstrates that the onshore surface pressure gradient was forcing the flow through the San Gorgonio Pass and into the Coachella Valley.

The AQMD Palm Springs air monitoring station is typically sheltered from winds in the Coachella Valley by the San Jacinto Mountains, but that station also measured some elevated winds in the early morning and again in the afternoon, with 1-minute averaged sustained speeds to 24 mph (Table 4-5). The wind directions at Palm Springs were more northerly as the winds came through the San Gorgonio Pass and were deflected by the San Jacinto Mountains into Palm Springs. With the sustained winds below 25 mph, the contributions of windblown dust from the immediate vicinity of the Palm Springs air monitoring station was minimal. Most of the PM10 at Palm Springs was generated further north, toward the centerline of the Coachella Valley, in the blowsand source area below the San Gorgonio Pass.

The winds at the AQMD Indio air monitoring station (Table 4-5) were high, starting at 1000 PST in the morning of June 4, when the 1-minute sustained wind speeds first reached 25 mph, and continuing until 2000 PST in the evening. During this period nine hours had 1-minute sustained wind speeds over 25 mph. The strongest winds at this station occurred between during the hours of 1500 and 1600 PST in the afternoon when the sustained 1-hour averaged wind speeds reached 25 mph for both hours and the highest hourly 1-minute averaged sustained speeds reached 33 mph. The wind directions were consistently from the northwest, indicating flow along the Coachella Valley from the San Gorgonio Pass. Instantaneous gusts would be higher at the AQMD air monitoring stations, if they were available. Some local contribution to the PM10 concentration was possible, especially at Indio, where the local winds were strong enough at times to overwhelm local dust controls, but the wind speeds at the air monitoring sites are mostly not consistently strong enough to generate enough local windblown dust near the stations to cause the high concentrations of PM10 measured. The PM10 was primarily entrained upwind of the air monitoring stations, further up the Coachella Valley below the San Gorgonio Pass, in the blowsand source areas near the Whitewater Wash. The entrained sand and dust was then transported and deposited

where the winds were weaker due to the deflection and weakening of the flow due to the mountains near Palm Springs and the widening of the Valley before Indio.

TABLE 4-5

Hourly Wind Directions (degrees), Wind Speeds (mph) and Maximum 1-Minute Average Speed for each Hour (mph) for AQMD Air Quality Monitoring Stations in the Coachella Valley and San Gorgonio Pass on June 4, 2008

		Banning Airport Monitoring Station (BNAP)			Palm Springs Monitoring Station (PLSP)			Indio Monitoring Station (INDI)		
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**	**WD (deg)**	**WS (mph)**	**Maximum 1-Minute Avg. (mph)**
6/3/08	1000	286	14	17	354	7	12	311	6	10
	1100	284	13	21	007	9	13	303	4	8
	1200	253	11	16	358	10	13	259	5	10
	1300	267	13	20	005	10	14	286	7	12
	1400	263	12	16	002	11	16	313	7	11
	1500	254	13	18	357	10	14	315	12	16
	1600	246	12	19	353	11	16	318	14	21
	1700	240	13	20	005	11	17	334	15	21
	1800	245	11	16	356	13	20	322	14	18
	1900	247	11	18	354	13	18	324	15	20
	2000	261	10	14	355	13	18	326	14	19
	2100	259	12	17	002	13	17	323	15	20
	2200	258	10	14	360	13	17	330	15	21
	2300	252	10	13	355	13	17	320	16	22
6/4/08	0000	266	11	15	354	14	20	323	15	23
	0100	264	12	16	356	15	24	321	19	24
	0200	268	14	18	360	13	20	323	16	21
	0300	264	16	21	347	12	18	316	17	23
	0400	265	18	23	347	8	17	313	15	22
	0500	278	22	**29**	027	6	13	314	14	21
	0600	268	16	22	349	7	13	316	14	24
	0700	237	16	23	347	7	13	319	14	18
	0800	236	14	22	018	7	15	325	14	19
	0900	250	16	23	004	10	18	330	17	24
	1000	231	15	**25**	358	13	20	325	18	**25**
	1100	243	13	18	004	16	22	327	20	**25**
	1200	249	13	18	006	17	22	330	21	**30**
	1300	252	13	17	004	18	22	343	23	**30**
	1400	256	14	23	007	17	23	335	22	**29**
	1500	236	19	**28**	002	18	24	325	**25**	**33**
	1600	256	16	24	005	15	19	332	**25**	**33**
	1700	260	15	21	360	16	21	329	23	**31**
	1800	229	12	21	005	16	22	337	23	**32**
	1900	235	9	15	003	17	21	326	20	**26**
	2000	276	10	18	001	15	22	325	17	**28**
	2100	256	9	13	007	14	18	321	16	20
	2200	276	8	11	357	12	18	313	13	21
	2300	246	6	9	356	8	13	297	10	16
6/5/08	0000	258	6	9	001	8	12	315	12	18
	0100	248	7	10	357	6	9	296	10	13
	0200	261	8	11	010	5	8	303	9	12
	0300	274	8	10	005	5	7	313	9	12
	0400	272	10	12	003	4	7	297	8	10
	0500	284	9	12	013	5	7	314	8	12
	0600	274	8	10	358	3	7	302	7	9
	0700	263	7	9	347	2	6	306	7	11
	0800	254	5	8	200	3	8	297	6	10
	0900	120	8	16	360	4	8	206	5	11
	1000	104	14	21	014	2	7	246	5	9
	1100	095	10	18	254	4	7	228	6	11
	1200	071	7	12	196	3	6	237	5	10

Further to the east of the Palm Springs Air monitoring station, the winds at the NWS Palm Springs Airport weather station (Table 4-6) were mostly northwesterly and gusty, starting in the afternoon of June 3. Some gusty winds also occurred just after midnight on June 4 to 31 mph and sustained (2-minute averaged) wind speeds of 20 mph as the PM10 initially spiked at the Palm Springs monitor to an hourly average of 207 $\mu g/m^3$. The Palm Springs Airport winds decreased through the rest of the morning until the observation at 1153 PST when the sustained speeds increased to 22 mph and the gusts reached 36 mph. After noon, the winds remained high with sustained (2-minute averaged) wind speeds between 28 and 38 mph until the 2053 PST observation, along with gusts between 41 and 51 mph for 8 hours. This windy period coincides well with the timing of the highest PM10 concentrations measured at both Indio and Palm Springs on this day, as shown in Table 4-1. The automated visibility at Palm Springs Airport decreased slightly from 10 miles to 7 miles for the observations between 1553 and 1953 PST, but no remarks of blowing dust were noted with the automated process at that station.

TABLE 4-6

Hourly Wind Directions (degrees), Wind Speeds (mph), Wind Gusts (mph) when reported, Visibilities (statute miles), Weather Conditions and Observer Remarks for the National Weather Service Palm Springs Airport Station on Wednesday, June 4, 2008

HZ = Haze, BLDU = Blowing Dust, BLSA = Blowing Sand, WSHFT = Wind Shift followed by time in UTC, PK WND = Peak Wind since last hour (direction &speed in knots/time in UTC), SQ = Squall, LTG = Lightning, TS = Thunderstorm, RA = Rain, + = Heavy, - = Light, SH = Shower, CB = Cumulonimbus Clouds, B = Begin time, E = End time, P = Precipitation amount since last observation in hundredths of inches (P0000 = Trace)

Palm Springs Airport (PSP)									
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**VIS (miles)**	**Peak WD (deg)**	**Peak WS (mph)**	**PK Wind Time (PST)**	**Remarks**
6/3/08	1153	320	13	20	10				clear
	1253	310	13	17	10				clear
	1353	310	18	**30**	10				clear
	1453	320	24	**29**	10				clear
	1553	320	23	**27**	10				mostly clear
	1653	320	**27**	**33**	10				clear
	1753	320	15	**31**	10				partly cloudy
	1853	320	20	**33**	10				partly cloudy
	1953	320	23	**32**	10				clear
	2053	310	22	**31**	10				clear
	2153	320	21		10				clear
	2253	310	14	23	10				clear
	2353	310	10	21	10				clear
6/4/08	0053	320	20	**31**	10				clear
	0153	320	8	**25**	10				clear
	0253	310	17	**25**	10				clear
	0353	310	15	22	10				clear
	0453	150	6		10				mostly cloudy
	0553	190	4		10				mostly cloudy
	0653	CALM	0		10				mostly cloudy
	0753	VRB	6		10				mostly cloudy
	0853	330	7		10				overcast
	0953	VRB	6	16	10				clear
	1053	VRB	4	21	10				overcast
	1153	330	22	**36**	10				mostly cloudy
	1253	320	**28**	**46**	10				mostly cloudy
	1353	320	**33**	**41**	10				mostly cloudy
	1453	310	**30**	**45**	10				mostly cloudy
	1553	300	**30**	**44**	**7**				mostly cloudy
	1653	320	**29**	**43**	**7**				mostly cloudy
	1753	320	**35**	**44**	**7**				clear
	1853	320	**38**	**44**	**7**				clear
	1953	320	**38**	**51**	**7**				clear
	2053	320	24	**36**	10				clear
	2153	300	16	**30**	10				clear
	2253	300	10	21	10				clear
	2353	300	8		10				clear
6/5/08	0053	280	7		10				clear
	0153	VRB	5		10				clear
	0253	360	6		10				clear
	0353	050	7		10				clear
	0453	330	10		10				clear
	0553	CALM	0		10				clear
	0653	350	7		10				clear
	0753	210	6		10				clear

The strongest winds typically occur through the centerline of the Coachella Valley, just below the San Gorgonio Pass, weakening with distance toward the southeast as the Valley widens before Indio. These strong winds are often observed along the I-10 corridor, especially near the Whitewater Wash and the Coachella Valley Preserve, where much of the blowsand that affects the Valley is generated. This case was as expected in that strong winds were measured at the AQMD Whitewater Wash wind station, part of the supplemental AQMD Coachella Valley Wind Network. This data is shown in Table 4-7. The Whitewater Wash winds were consistently from the west-northwest throughout the day on June 4. The 24-hour averaged wind at Whitewater Wash was 39.3 mph. The 1-hour averaged winds at Whitewater Wash exceeded 25 mph for every hour starting at 1200 PST on June 3 and throughout the day on June 4, peaking at 52 mph for the 1500 PST hour. Starting 1000 PST, the 1-hour sustained winds exceeded 42 mph with gusts above 65 mph for eight hours, before starting to decrease through the evening. Hourly instantaneous wind gusts exceeded 40 mph through the entire day of June 4, peaking at 76 mph during the 1500 PST hour.

TABLE 4-7

Hourly Wind Directions (degrees) and Speeds with Peak Gusts (mph) for the AQMD Coachella Valley Meteorological Network Stations on Wednesday, June 4, 2008

		Whitewater Wash Blowsand Site (WWW)			Desert Hot Springs Wind Station (DHS)			Palm Desert Wind Station (PDT)		
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**
6/3/08	1000	301	18	**32**	259	17	**31**	279	4	10
	1100	302	23	**36**	258	19	**32**	305	4	13
	1200	302	**26**	**38**	262	19	**36**	329	6	18
	1300	302	**29**	**45**	265	22	**36**	322	7	20
	1400	301	**31**	**51**	266	23	**41**	317	10	**27**
	1500	305	**32**	**49**	268	24	**45**	318	13	**27**
	1600	307	**31**	**49**	261	21	**37**	321	14	**27**
	1700	309	**34**	**52**	266	20	**41**	321	15	**30**
	1800	303	**33**	**53**	270	20	**41**	322	18	**39**
	1900	300	**36**	**58**	283	19	**34**	323	18	**34**
	2000	302	**36**	**58**	282	19	**35**	319	15	**30**
	2100	305	**37**	**55**	276	21	**38**	315	15	**29**
	2200	302	**35**	**55**	278	18	**34**	317	14	**29**
	2300	303	**33**	**52**	276	22	**45**	314	11	**26**
6/4/08	0000	300	**37**	**56**	278	21	**41**	315	10	**25**
	0100	301	**35**	**58**	277	21	**39**	317	11	**26**
	0200	304	**37**	**59**	284	16	**39**	312	12	**30**
	0300	305	**38**	**63**	300	13	**28**	312	12	**28**
	0400	308	**34**	**55**	314	11	23	313	15	**33**
	0500	307	**31**	**48**	303	9	**27**	313	15	**34**
	0600	308	**30**	**51**	301	11	**25**	313	13	**29**
	0700	307	**30**	**49**	294	12	**27**	318	15	**35**
	0800	303	**33**	**59**	297	16	**40**	324	17	**35**
	0900	295	**36**	**58**	285	24	**48**	324	18	**37**
	1000	295	**43**	**65**	293	**31**	**59**	327	14	**34**
	1100	298	**48**	**70**	277	**31**	**60**	328	17	**37**
	1200	299	**47**	**72**	278	**33**	**57**	323	16	**37**
	1300	298	**48**	**69**	276	**31**	**59**	325	18	**37**
	1400	300	**49**	**73**	270	**34**	**63**	328	18	**39**
	1500	298	**52**	**76**	272	**37**	**70**	329	16	**34**
	1600	298	**49**	**72**	273	**35**	**68**	320	17	**35**
	1700	305	**45**	**66**	276	**28**	**57**	321	12	**33**
	1800	308	**42**	**62**	297	**25**	**46**	327	19	**46**
	1900	307	**44**	**67**	290	20	**38**	328	24	**48**
	2000	307	**40**	**61**	280	19	**35**	312	19	**43**
	2100	310	**36**	**57**	286	17	**31**	317	16	**37**
	2200	311	**31**	**46**	287	13	**30**	321	13	**27**
	2300	306	**26**	**41**	309	9	20	321	13	**25**
6/5/08	0000	301	20	**32**	302	6	16	321	12	22
	0100	304	18	**29**	272	5	17	321	10	23
	0200	307	17	24	281	5	12	307	8	17
	0300	304	17	**25**	302	4	12	317	6	14
	0400	311	13	20	278	4	14	290	7	14
	0500	307	14	22	322	4	8	286	8	20
	0600	328	9	18	189	3	8	286	6	16
	0700	300	5	14	027	13	**29**	277	8	**28**
	0800	006	11	**27**	018	15	**37**	261	6	14
	0900	136	7	16	100	11	24	185	5	14
	1000	167	6	13	047	10	**28**	206	5	14
	1100	159	7	14	069	6	17	223	6	13
	1200	153	6	13	121	7	21	205	5	12

The timing of the winds at Whitewater Wash correlates well with the timing of the high hourly PM10 concentrations. Given the gusty winds throughout much of the day at Whitewater Wash, windblown dust was entrained from the Coachella Valley blowsand source areas throughout the day, although the strongest winds and most consistent transport to the Indio PM10 BAM monitor occurred starting at 1000 PST and through the afternoon. The initial hourly PM10 spikes of 241 and 244 $\mu g/m^3$ during the hour beginning at 1000 PST at Palm Springs and Indio, respectively, associated with the jump in the wind speeds at Whitewater Wash. The highest PM10 concentration at Indio (988 $\mu g/m^3$) was measured in the afternoon during the period with the strongest sustained wind speeds and highest gusts. The highest hourly PM10 concentrations at Palm Springs occurred at 1200 PST (697 $\mu g/m^3$) after the initial wind increase occurred at Whitewater Wash and gusts reach 70 mph with sustained 1-hour winds of exceeded 47 mph.

The AQMD Desert Hot Springs meteorological station is further east from the centerline of the Valley and the Whitewater Wash station. As a result, Desert Hot Springs winds (Table 4-7) were generally more westerly and weaker than those at Whitewater Wash as they flowed around the Morongo Mountains, north of the Coachella Valley. The 1-hour sustained wind speeds at Desert Hot Springs exceeded 25 mph starting at 1000 PST and continuing until the 1800 PST hour with a peak of 37 mph at 1500 PST. Instantaneous wind gusts during this period exceeded 56 mph to a peak of 70 mph at 1500 PST. The gusty winds at Desert Hot Springs indicate that windblown dust was also entrained from the northern portion of the Coachella Valley, in addition to the centerline of the valley.

Further southeast, down the Valley from the Palm Springs and Whitewater Wash stations, the winds at the AQMD Palm Desert wind station (Table 4-7) were significantly weaker that those measured at either Whitewater Wash or Desert Hot Springs. This is due to the widening of the Coachella Valley before this site and its distance from the San Gorgonio Pass. No 1-hour averaged sustained winds Palm Desert exceeded 25 mph, with the peak of 24 mph measured at 1900 PST. However, instantaneous wind gusts reached or exceeded 25 mph for every hour on June 4, peaking at 48 mph at 1900 PST. That the winds were strongest in the Whitewater Wash area than the other locations throughout the Coachella Valley indicates that this was the primary source area for PM10 that was measured at Indio. This is the most significant natural blowsand source area in the Coachella Valley, as noted in several similar high wind natural events.

A few miles southeast of Indio, the NWS weather station at Thermal Airport reported gusty northwesterly winds through the day and sustained (2-minute averaged) speeds below 25 mph through the morning, then eleven hours with winds of 25 mph or higher through the afternoon and evening, starting with the 1152 PST observation (Table 4-8). The 2-minute sustained winds peaked at 32 mph at 1652 PST, along with the peak gust of the day, 48 mph. Visibilities dropped, starting with the 1052 PST observation, to a low of 2.5 miles with haze reported, during this period of the strongest winds. These

observations of reduced visibilities correlate well with the timing of the high PM10 concentrations at the Indio monitor.

TABLE 4-8

Hourly Wind Directions (degrees), Wind Speeds (mph), Wind Gusts (mph) when reported, Visibilities (statute miles), Weather Conditions and Observer Remarks for the National Weather Service Thermal Airport Station on Wednesday, June 4, 2008

Thermal Airport (TRM)									
DATE	**HOUR (PST)**	**WD (deg)**	**WS (mph)**	**Gust (mph)**	**VIS (miles)**	**Peak WD (deg)**	**Peak WS (mph)**	**PK Wind Time (PST)**	**Remarks**
6/3/08	1152	VRB	6		10				clear
	1252	CALM	0		10				clear
	1352	VRB	5		10				clear
	1452	VRB	4		10				clear
	1552	350	16		10				clear
	1652	340	16		10				clear
	1752	330	18	**30**	10				clear
	1852	340	22	**28**	10				clear
	1952	340	23	**30**	10				clear
	2052	340	20	**28**	10				clear
	2152	330	18	**27**	10				clear
	2252	320	20	**27**	10				clear
	2352	310	16	**27**	10				clear
6/4/08	0052	320	17	**30**	10				clear
	0152	310	21	**29**	9				clear
	0252	320	13	**25**	10				clear
	0352	310	16	23	10				clear
	0452	310	14		10				clear
	0552	310	15	21	8				clear
	0652	330	16	21	10				clear
	0752	330	14	**27**	10				clear
	0852	330	22	**30**	9				clear
	0952	340	20	**27**	10				clear
	1052	330	21	**29**	**6**				**haze**
	1152	340	**29**	**38**	**4**				**haze**
	1252	340	**25**	**38**	**4**				**haze**
	1352	340	**28**	**39**	**5**				**haze**
	1452	330	**28**	**40**	**3**				**haze**
	1552	330	**28**	**45**	**3**				**haze**
	1652	330	**32**	**48**	**2.5**				**haze**
	1752	340	**30**	**44**	**4**				**haze**
	1814	340	**28**	**43**	7				clear
	1852	330	**27**	**37**	8				clear
	1952	330	**25**	**41**	9				clear
	2052	310	**27**	**38**	9				clear
	2152	320	24	**33**	10				clear
	2252	310	15	**27**	10				clear
	2352	330	17		10				clear
6/5/08	0052	320	17		10				clear
	0152	330	16		10				clear
	0252	310	13		10				clear
	0352	320	14		10				clear
	0452	340	7		10				clear
	0552	CALM	0		10				clear
	0652	320	10	16	10				clear
	0752	320	12		10				clear

4.3.2.3 Transport of emissions related to the event

The mapped winds in Figure 4-1 in Section 4.3.1 and the wind data presented in the tables in Section 4.3.2.2 provide wind direction data showing that emissions from sources identified as part of the "not reasonably controllable or preventable" demonstration were upwind of the Indio and Palm Springs monitors in question. The transport of emissions related to the event was in the direction of the monitors where the PM10 federal standard exceedances were recorded.

4.3.2.4 Temporal relationship between the high wind and elevated PM concentrations

The timing of the this event is verified with the high wind observations and reports of reduced visibility and blowing sand and dust, in conjunction with the hourly FEM PM10 measurement data. Figure 4-8 shows the hourly BAM PM10 data from the Palm Springs and Indio air monitoring stations, along with the wind speeds from the AQMD Whitewater Wash wind station. This shows that winds in the northwestern Coachella Valley (Whitewater Wash) increased in the last morning of June 4, causing increasing hourly PM10. The high winds and high PM10 concentrations continued throughout the afternoon and started decreasing in the evening and continued to diminish into the following day. The highest PM10 spikes occurred at the Palm Springs and Indio monitoring stations, when the 1-hour wind speeds at Whitewater Wash exceeded 40 mph and gusts exceeded 65 mph. Note that while the Indio and Palm Springs air monitoring station wind speeds were elevated at this time, all the sustained wind speeds at Palm Springs were below 25 mph and the Indio sustained wind speeds to 32 mph were much lower than those at Whitewater Wash. This indicates that the PM10 was mainly transported from the windier areas upwind of these stations. Minor contributions from windblown sand and dust locally entrained in the immediate vicinity of the Palm Springs station is possible, but unlikely, while a somewhat larger local contribution of wind-entrained PM10 close to Indio stations is possible.

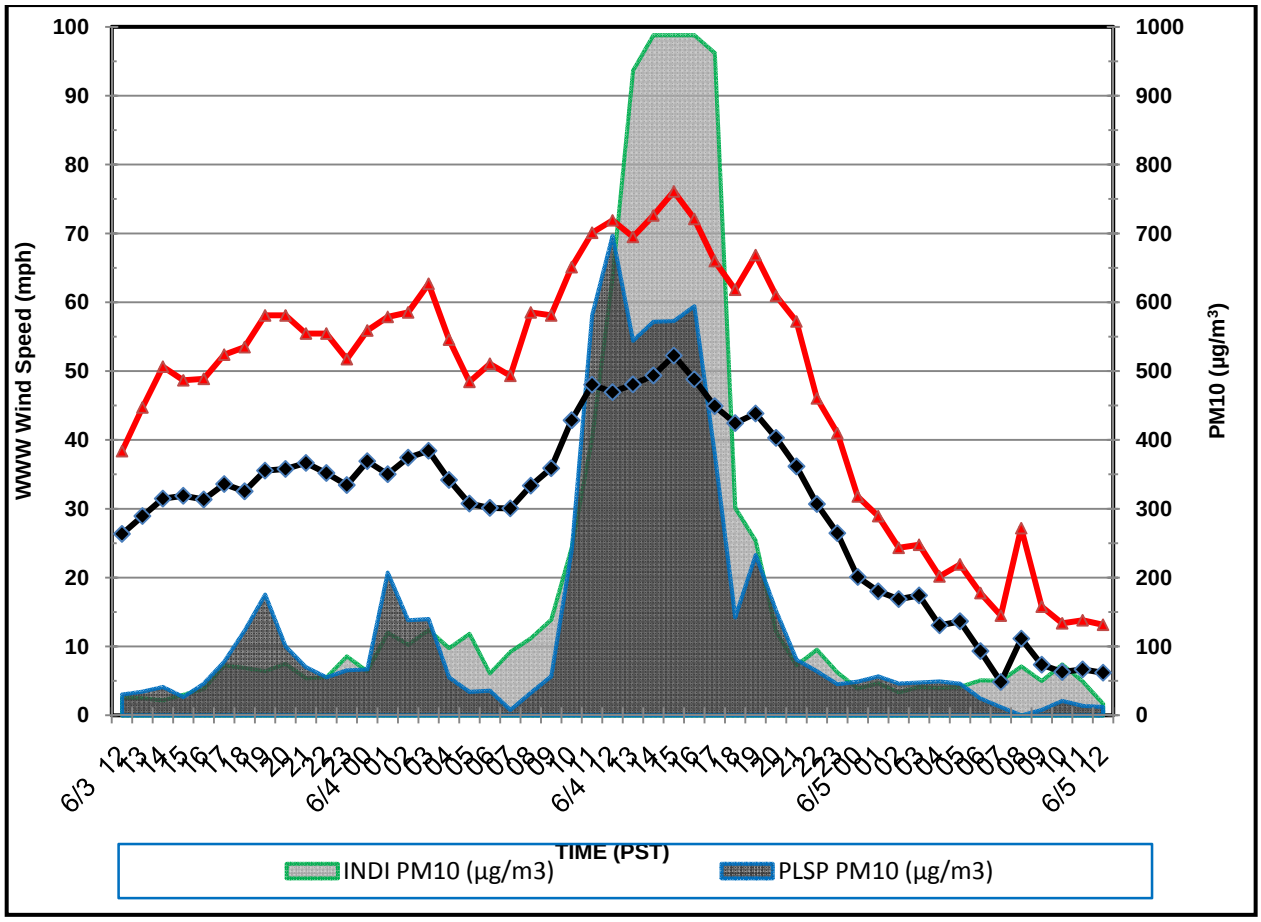

FIGURE 4-8

Time Series of Whitewater Wash (WWW) Wind Speeds (Hourly Average and Gust, mph) with Indio and Palm Springs Hourly BAM PM10 (µg/m^3) from 1200 PST June 3 through 1200 PST June 5, 2008

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

Since this was not an FRM PM10 sampling day, the sulfate, nitrate and chloride mass loadings from the PM10 filters were not available for the Coachella Valley on June 4. No continuous PM2.5 monitors are deployed in the Coachella Valley due to the consistently low concentrations measured with the FRM samplers. No FRM PM2.5 measurements were collected on June 4 in the Coachella Valley. The concentrations of the PM10 species and PM2.5 have been historically very low in the Coachella Valley and high measured PM10 mass is primarily crustal material due to windblown sand and dust. The 24-hour PM10 and PM2.5 concentrations and the PM-Coarse percentage [(PM10-PM2.5)/PM10] on the days surrounding June 4 for the Coachella Valley stations, as well as the two nearest South Coast Air Basin stations in Riverside County (Banning and Riverside-Rubidoux), are summarized in Table 4-9. These show relatively low PM2.5 concentrations, below the Federal 24-hour standard on the days before and after the event and on June 4 at the Riverside-Rubidoux station. The South Coast Air Basin stations at Riverside-Rubidoux and Banning Airport typically show a greater influence from the PM2.5 from combustion sources in the PM-Coarse percentage. This provides further evidence that the PM10 in the Coachella Valley was primarily due to the wind event and not related to fires, transportation or other combustion processes.

TABLE 4-9

24-Hour FRM and FEM PM10 and PM2.5 Measurements (μg/m^3) and PM-Coarse (PM10-2.5) fraction of PM10 (%) from the Coachella Valley (Indio and Palm Springs) and the nearest South Coast Air Basin (Banning Airport and Rubidoux) Air Monitoring Stations between May 30 and June 8, 2008

Station	Type	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8
PM10											
Indio	PM10 FRM	29			49			46			38
Indio	PM10 BAM	24.0	26.0	26.5	37.5	45.9	**336.8**	41.3	48.1	40.9	32.2
Palm Springs	PM10 FRM	21						34			
Palm Springs	PM10 BAM	26.5	30.2	40.5	34.8	49.9	**236.3**	35.7	68.0	42.6	33.0
Banning Airport	PM10 FRM	28						43			
Rubidoux	PM10 FRM	36			46			56			54
Rubidoux	PM10 TEOM	40.9	41.3	43.0	46.8	50.5	30.6	57.8	62.2	65.5	62.4
PM2.5											
Indio	PM2.5 FRM	7.6			9.6			8.4			10.4
Palm Springs	PM2.5 FRM	7.3			8.8			8.8			8.8
Banning Airport	PM2.5 BAM	17.8	17.3	20.8	19.1	23.3	20.4	20.1	15.4	15.4	19.5
Rubidoux	PM2.5 FRM	9.4	13.2	16.1	16.7	22.8	18.3	15.9	15.1	17.8	19.0
Rubidoux	PM2.5 BAM	14.8	17.7	23.0	22.6	27.6	21.0	22.3	20.6	23.9	27.8
PM-Coarse (%)											
Indio	FRM – FRM	73.8			80.4			81.7			72.6
Indio	BAM – FRM	68.3			74.4			79.7			67.7
Palm Springs	FRM – FRM	65.2						74.1			
Palm Springs	BAM – FRM	72.5			74.7			75.4			73.3
Banning Airport	FRM – BAM	36.4						53.3			
Rubidoux	FRM – FRM	73.9			63.7			71.6			64.8
Rubidoux	TEOM – BAM	63.8	57.1	46.5	51.7	45.3	31.37	61.4	66.9	63.5	55.4

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

The 24-hour PM10 and PM2.5 concentrations and the PM-Coarse percentage [(PM10-PM2.5)/PM10] on the days surrounding June 4 for the Coachella Valley stations (Indio and Palm Springs), as well as the two nearest South Coast Air Basin stations in Riverside County (Banning and Riverside-Rubidoux), are summarized above in Table 4-9. 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. These show that the PM10 concentrations were relatively low on the days before and after the high wind event at all locations. The elevated PM10 was only found in the Coachella Valley on June 4, showing that the windblown dust event did not significantly affect the South Coast Air Basin and that PM10 transport from the urban South Coast Air Basin was not a significant factor. The PM10 was higher at both Indio and Palm Springs on June 4 than on the surrounding days due to the strong winds in the Coachella Valley that afternoon. The lower measurement at Palm Springs on June 4 also shows that most of the PM10 measured at Indio was generated in the Coachella Valley. The low PM10 concentrations before and after June 4 demonstrate that the NAAQS violation would not have occurred if not for the high wind natural event. While the PM2.5 is generally higher at the South Coast Air Basin sites, the concentration measured at Riverside on June 4 would not have contributed significantly to the PM0 mass measured in the Coachella Valley. This indicates that urban transport from the South Coast and combustion sources, including wildfires, were not likely to be very significant to this PM10 event on June 4. The PM10 concentrations in the Coachella Valley were over three times the next highest 24-hour average measured on the sampling days before and after that day. This indicates the impact of the natural event on the June 4 PM10 air quality, resulting in the higher than typical PM10 concentrations above the federal standard level at Indio and Palm Springs.

4.3.3 Affects Air Quality

This criterion 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.

4.3.4 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.

4.3.5 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 Coachella Valley immediately preceding, during and after the event. Activity levels in the Valley 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. Furthermore, due to the forecasts for high winds on June 4, agricultural and construction earth moving activities were restricted and mitigation methods like watering and soil stabilization were increased.

Vehicular traffic, cooking and residential fires do not directly cause PM10 24-hour NAAQS violations in the Coachella Valley. Activity levels 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 June 4, such emissions would not contribute significantly to the PM10 measured. There were reasonable and appropriate measures in place to control PM10 in the Coachella Valley on June 4, 2008, including AQMD Rules 403, 403.1, 444, 1157 and 1186. Moreover, U.S. EPA has approved AQMD's BACM demonstration for all significant sources of PM10 in the Coachella Valley.

Based on the data provided in this report, AQMD concludes that there would not have been exceedances of the PM10 NAAQS in the Coachella Valley on June 4, 2008 if high winds were not present. The causal connection of the measured PM10 and the strong winds through the Coachella Valley, 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.

4.3.6 Conclusion

The PM10 NAAQS violation on June 4, 2008 is a typical example of a Type 1 high wind event in the Coachella Valley, where strong pressure and density gradients force high

winds through the San Gorgonio Pass creating strong, gusty winds along the centerline of the Coachella Valley near the AQMD Whitewater Wash site and in the Coachella Valley Preserve areas. This flow pattern was enhanced by the synoptic weather pattern with low pressure at the surface over the Great Basin and a strong Pacific High in the eastern Pacific Ocean, as well as coupled along-valley flow aloft. There is a strong causal connection between the high PM10 measured in the Coachella Valley on June 4 and the strong wind event, supported by the meteorological conditions. Sustained hourly averaged wind speeds were measured to 52 mph at Whitewater Wash, with instantaneous gusts to 76 mph. Gusty winds were recorded at stations throughout the Coachella Valley. NWS observations of reduced airport visibilities, haze and blowing dust and news accounts 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 BAM PM10 measurements from available monitors. These show a strong correlation between the high winds and high hourly PM10 concentrations.

If not for the high wind event and the associated wind-entrained dust, the PM10 NAAQS violations measured at Palm Springs and Indio on June 4 would not have occurred. Therefore, with the weight of evidence provided, AQMD staff recommends the flagging of the PM10 NAAQS violations on June 4, 2008 as exceptional event due to high winds in the U.S. EPA Air Quality System (AQS) database.