IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

IMAGE COURTESY OF THE DESERT SUN MARCH 26, 2014 – CAPTION READ: Weather systems are visible to the West looking from California Express Highway 86 near 66th Avenue in Mecca after several traffic collisions caused both directions of the highway to be closed from 66th avenue to 81st Avenue on March 26, 2014. Omar Ornelas/The Desert Sun Omar Ornelas/The Desert Sun

March 26, 2014
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

February 3, 2017

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ACRONYM	DESCRIPTIONS
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HF	Historical Fluctuations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
LST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time

QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan

I Introduction

On March 26, 2014, two State and Local Ambient Air Monitoring Station (SLAMS) (AQS Sites Code 06-025-0007 and 06-025-4004), located in Brawley and Niland, California recorded exceedances of the National Ambient Air Quality Standard (NAAQS) when the Federal Equivalent Method (FEM), Beta Attenuation Monitors Model 1020 (BAM 1020) located in Brawley and Niland, California, measured (midnight to midnight) 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 375.3 µg/m^3 and 279.7 µg/m^3, respectively. PM_{10} 24-hr measurements recorded above the 150 µg/m^3 are exceedances of the NAAQS. March 26, 2014 was not a scheduled run day for the FRM Size-Selective Inlet (SSI) high volume samplers in Imperial County. The SLAMS in Brawley and Niland were the only stations, in Imperial County to record an exceedance of the PM_{10} NAAQS on March 26, 2014.

TABLE 1-1
BRAWLEY AND NILAND CONCENTRATIONS OF PM_{10} ON MARCH 26, 2014

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION ug/m^3	PM_{10} NAAQS ug/m^3
03/26/14	Brawley	06-025-0007	3	24	375.3	150
03/26/14	Niland	06-025-4004	3	24	279.7	150

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from FRM SSI instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Most recently, since 2013 ICAPCD has been submitting continuous PM_{10} data from BAM 1020's. On March 26, 2014 the Brawley and Niland monitors were impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds generated by a deep, upper-level trough that moved through southern California, including Imperial County.

This report demonstrates that the exceedances observed on March 26, 2014 were caused by a naturally occurring event which elevated particulate matter affecting air quality, was not reasonably controllable or preventable (nRCP), was in excess of normal historical fluctuations (HF) and would not have occurred "but for" the entrainment of fugitive windblown dust from outlaying deserts and mountains from the Sonoran Desert. The document further substantiates the request by the ICAPCD to flag PM_{10} 24-hour NAAQS exceedances of 375.3 µg/m^3 and 279.7 µg/m^3 as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[1].

[1] "Treatment of Data Influenced by Exceptional Events; Final Rule", 72 FR 13560, March 22, 2007

I.1 Demonstration Contents

Section II - Describes the March 26, 2014 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the event affected air quality. Overall, this section provides the evidence that the event was a natural event.

Section III - Describes the normal historical fluctuations using data charts, summaries, and time-series graphs which demonstrate that the elevated concentrations of PM_{10} on March 26, 2014 were in excess of normal historical fluctuations.

Section IV - Provides evidence that the event of March 26, 2014 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Discusses and establishes the clear causal relationship between the exceedances at the Brawley and Niland stations and the natural event which occurred on March 26, 2014. This section provides evidence that the event affected air quality as a result of a natural event

Section VI - Brings together the evidence presented within this report and shows a clear causal relationship between the natural event, the exceedance and how BACM was overwhelmed making it nRCP concluding that the exceedance which occurred March 26, 2014 would not have occurred "but for" the natural event.

I.2 Requirements of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, there are additional non-technical requirements that must be met in order for the USEPA to concur with flagged air quality monitoring data.

I.2.a Public Notification that a potential event was occurring

The ICAPCD and the National Weather Service (NWS) provided notification via the ICAPCD's webpage that winds 20 to 30 mph and gust to 40 miles per hour (mph) could impact this region potentially elevating particulate matter. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day in Imperial County. **Appendix A** contains copies of notices as they were issued during the early morning of March 26, 2014.

I.2.b Notification to USEPA of the intent to exclude a measured violation (40 CFR §50.14(c)(2)(I))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) air

ambient data used for regulatory purposes. Ambient data that is potentially influenced by an exceptional event must be appropriately flagged and initially described and submitted to USEPA according to 40 CFR § 50.14(c)(2)(iii) no later than July 1st of the calendar year following the year in which the flagged measurement occurred.

The ICAPCD made a written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured concentrations in Brawley. The request, dated May 28, 2015 requested initial flags for the measurements from the BAM 1020 in Brawley of 375.3 µg/m^3 and Niland of 279.7 µg/m^3. A brief description was included with the initial flag of the meteorological data which indicated a potential natural event had occurred on March 26, 2014.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 4, 2017. The notice advised the public that comments were being solicited regarding this demonstration, which supports the request, by the ICAPCD to exclude the measured concentration of 190.9 µg/m^3, which occurred on March 26, 2014 in Brawley and Niland. The final closing date for comments was February 3, 2017. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(i)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(a)(1-2))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA no later than 3 years following the end of the calendar quarter in which the flagged concentration was measured or 12 months prior to the date that a regulatory decision must be made by USEPA.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The deadline for the submittal of this demonstration is March 31, 2017; however, it currently has regulatory implications for the PM_{10} SIP due in 2016.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on March 26, 2014, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

a The event “affects air quality”
b The event “is not reasonably controllable or preventable.”

c The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."

d The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that air quality was affected by the exceptional event in Imperial County. There is a clear causal relationship between the event and the measured concentrations in Brawley and Niland supporting that the event affected the air quality in Imperial County.

C This demonstration provides evidence that the measured concentration, caused by the event, is in excess of normal historical fluctuations.

D This demonstration provides evidence that "but-for" the event there would have been no exceedance (violation).

II March 26, 2014 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the April 24, 2015 event unfolded in Imperial County. The subsection elements include

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

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast

direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, along with the unincorporated city of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-3)**. Together, these communities and agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

FIGURE 2-3
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

Fig 2-3: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

Furthermore, portions of the Sonoran Desert located to the east and west of Imperial County expand to the southeast and southwest into Mexico (**Figure 2-4)**. Combined, these deserts are sources of dust emissions which impact the Imperial County during high wind events.

FIGURE 2-4
DESERTS IN CALIFORNIA, YUMA AND MEXICO

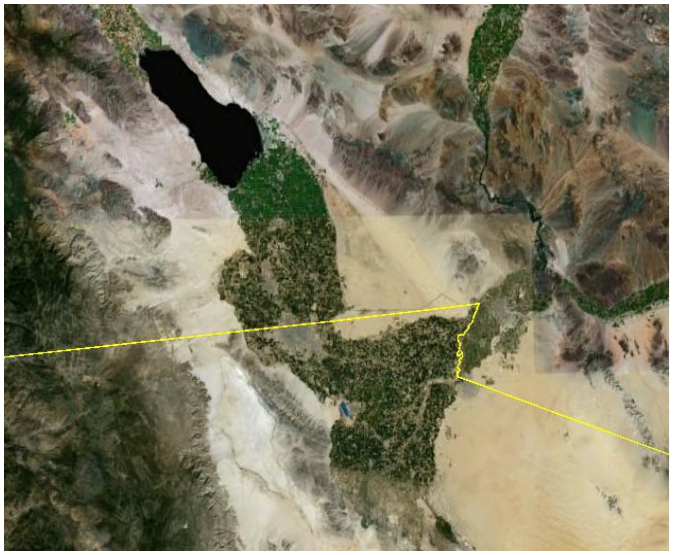

Fig 2-4: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-5**. SLAMS in Imperial County are located in Calexico, El Centro, Westmorland, Brawley, and Niland. Each station measures air quality and meteorological data; the station located in Brawley only measures air quality and no meteorological data. Other air monitoring stations with air quality and meteorological data used for this demonstration include stations in Riverside County and Arizona (**Figure 2-5 and Table 2-1)**.

As mentioned above, the PM_{10} exceedance on March 26, 2014, occurred at the Brawley and Niland stations. The Brawley and Niland stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions of meteorological conditions occurring on March 26, 2014, other meteorological sites used in this demonstration include airports in eastern Riverside County, southern San Diego County, southwestern Yuma (Arizona) County, northern Mexico, and Imperial County, along with other sites relevant to the wind event (**Figures 2-5 and B-1)**.

FIGURE 2-5
MONITORING SITES IN IMPERIAL COUNTY

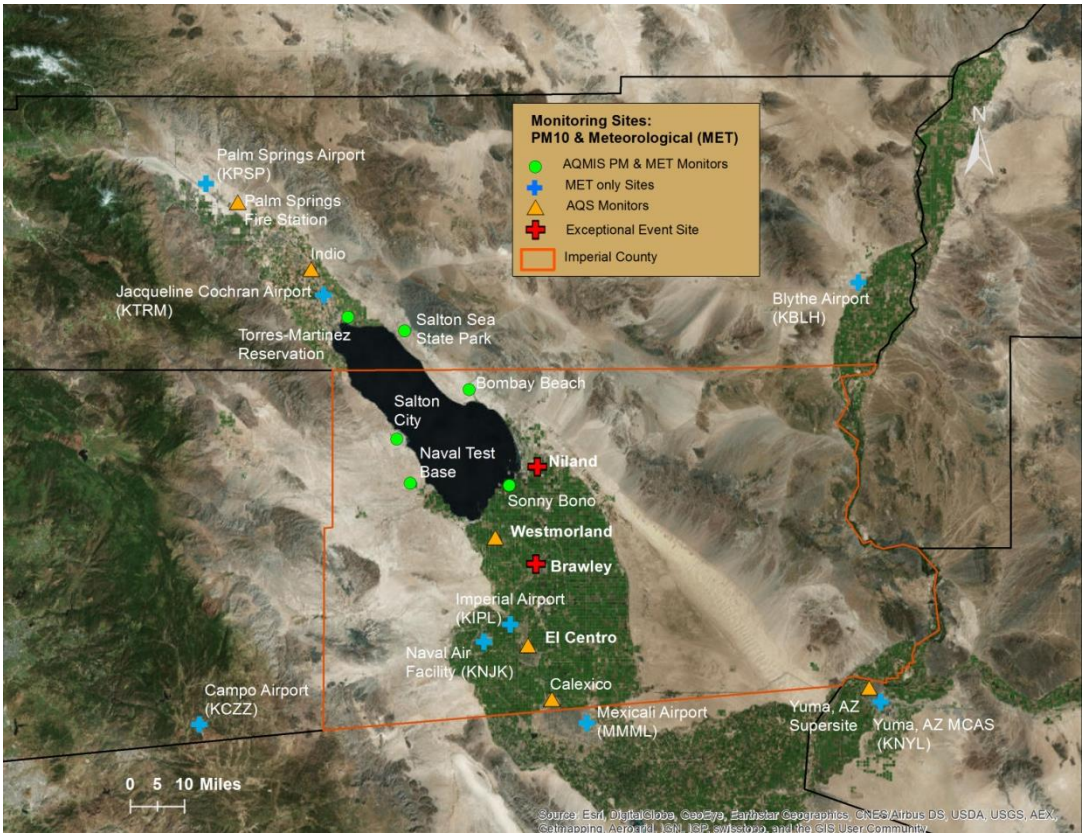

Fig 2-5 Depicts a select group of meteorological and PM10 monitoring sites in Imperial County, eastern Riverside County, southern San Diego County, southwestern Yuma (Arizona) County, and northern Mexico. The image exemplifies the regional area impacted by the exceptional event, which occurred on March 26, 2014

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MARCH 26, 2014

Monitor Site Name	Operator*	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} (ug/m³) Avg	1-hr PM_{10} (ug/m³) Max	Time of Max Reading	Max Wind Gust (mph)	Time of Max Wind Gust
IMPERIAL COUNTY											
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	-	-	-	20.1	15:00
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	-	-	-	14.5	15:00
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	N/A	-	-	-	-	-
		BAM 2010					375.3	980.6	9:00	-	-
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	-	-	-	-	-
		BAM 2010					-	-	-	-	-
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-54	-	-	-	-	-
		BAM 2010					279.7	939	12:00	30.4	13:00
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	113.3	272	15:00	25.3	14:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	168.3	516	11:00	13	14:00
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	N/A	191.6	476	9:00	27.6	12:00

CARB = California Air Resources Board
IID = Imperial Irrigation District
ICAPCD = Air Pollution Control District, Imperial County
SCAQMD = South Coast Air Management Quality District
ADEQ =Arizona Department of Environmental Quality

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-6**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-6
SONORAN DESERT REGION

The Sonoran Desert Region consists of the Sonoran Desert itself plus the surrounding biological communities, including the Sea of Cortez (Gulf of California) and its islands

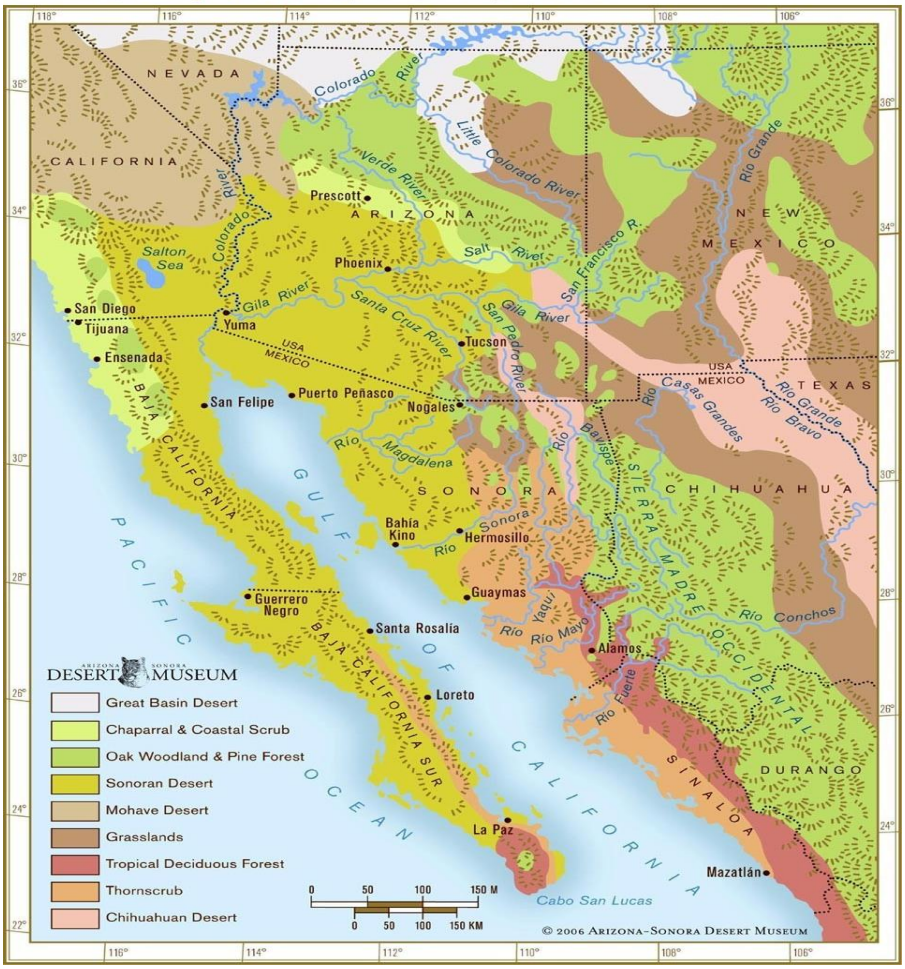

Fig 2-6: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region; the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty winds. The arid nature of the region is demonstrated when historical annual average precipitation levels in Imperial County average 3.11" (**Figure 2-7)**. During the 12-month period prior to March 26, 2014, Imperial County recorded total annual precipitation of 2.14 inches.

FIGURE 2-7
IMPERIAL COUNTY HISTORICAL WEATHER

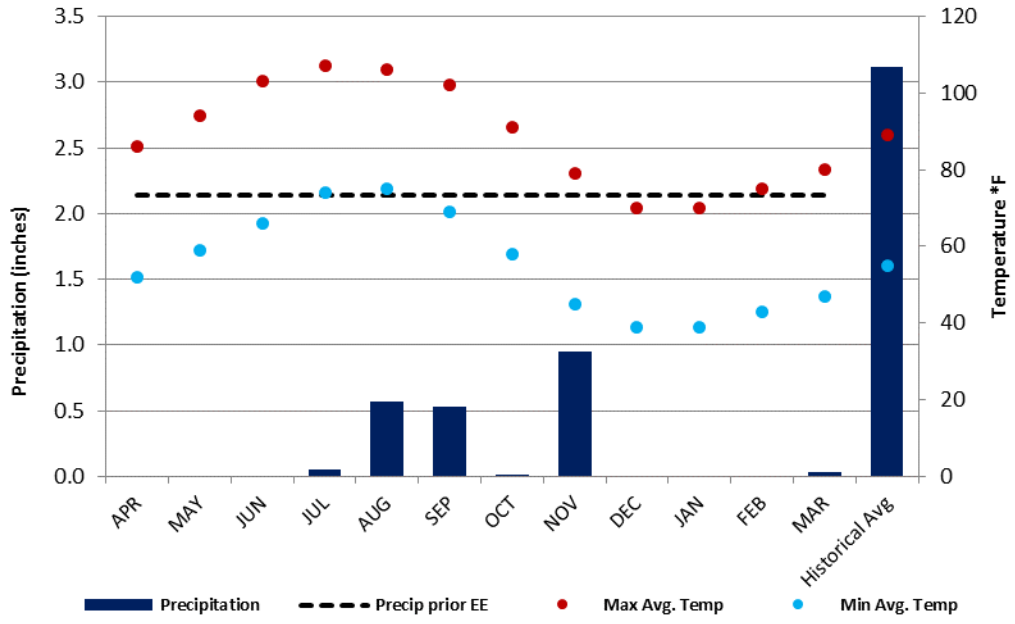

Fig 2-7: Prior to March 26, 2014, the region had suffered abnormally low precipitation of 2.14 inches. Average annual precipitation is 3.11 inches. MET data courtesy of Weather Underground, California Observed Climate Normals, and Western Regional Climate Center (WRCC)

While windblown dust events in Imperial County during the summer monsoon season are often

due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly. The strong winds can loft dust into the air and transport it over long distances, especially if soils in the region are dry.

II.3 Event Day Summary

The exceptional event for March 26, 2014, was caused by an upper-level low pressure that moved across southern California and the desert southwest. The weather system brought strong and gusty westerly winds across the mountains and deserts of southeastern California and parts of western Arizona. The regional strength of the system prompted the NWS (National Weather Service) Phoenix office to issue a Hazardous Weather Outlook (see **Appendix A**) that included a wind advisory eastward from Riverside County, the whole of Imperial County, and the lower Colorado River valley from Blythe south to Yuma, Arizona. Winds of 25 to 35 mph were forecasted, accompanied by gusts up to 45 mph. Patches of blowing dust with impacts to motorists on Interstate 8 and Interstate 10 were also expected. **Figure 2-8** and **Figure 2-9** show the extent of the low pressure across southern California and the desert southwest.

FIGURE 2-8
SATELLITE SURFACE MAP - MARCH 26, 2014

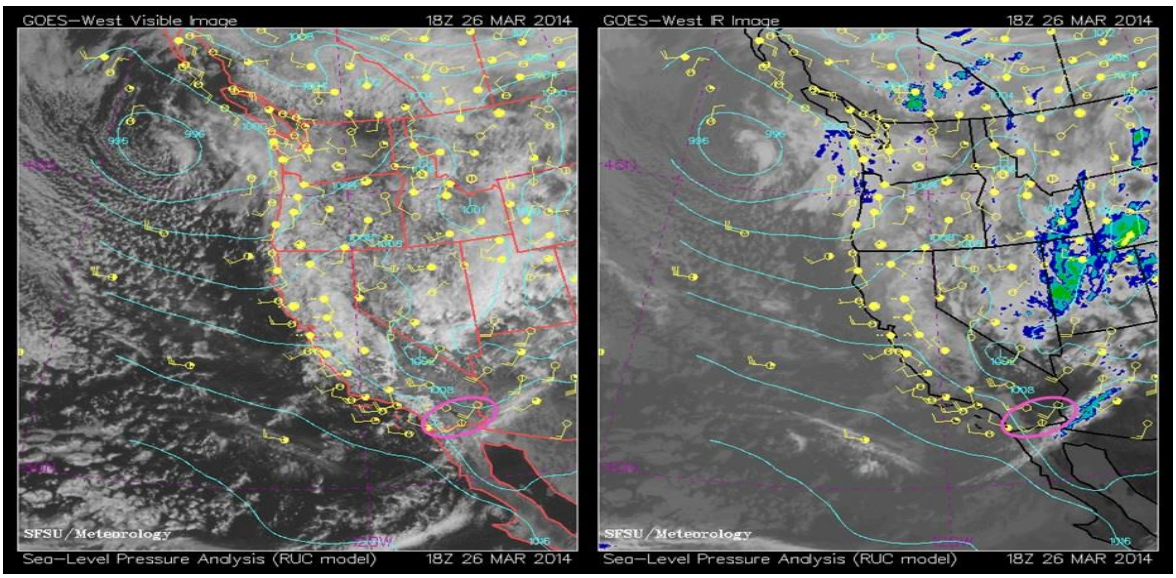

Fig 2-8: A GOES-W seal-level composite analysis satellite image (visible, left; infrared, right) shows the low pressure system at 10:00 on March 26, 2014. The weather system brought winds to wide area of southern and southeastern California. Note the moderately strong (~23 mph) southwesterly wind barbs as indicated by the maroon graphics. Image courtesy of SFSU Department of Earth & Climate Sciences and the California Regional Weather Server, http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

FIGURE 2-9
DAILY WEATHER MAP - MARCH 26, 2014

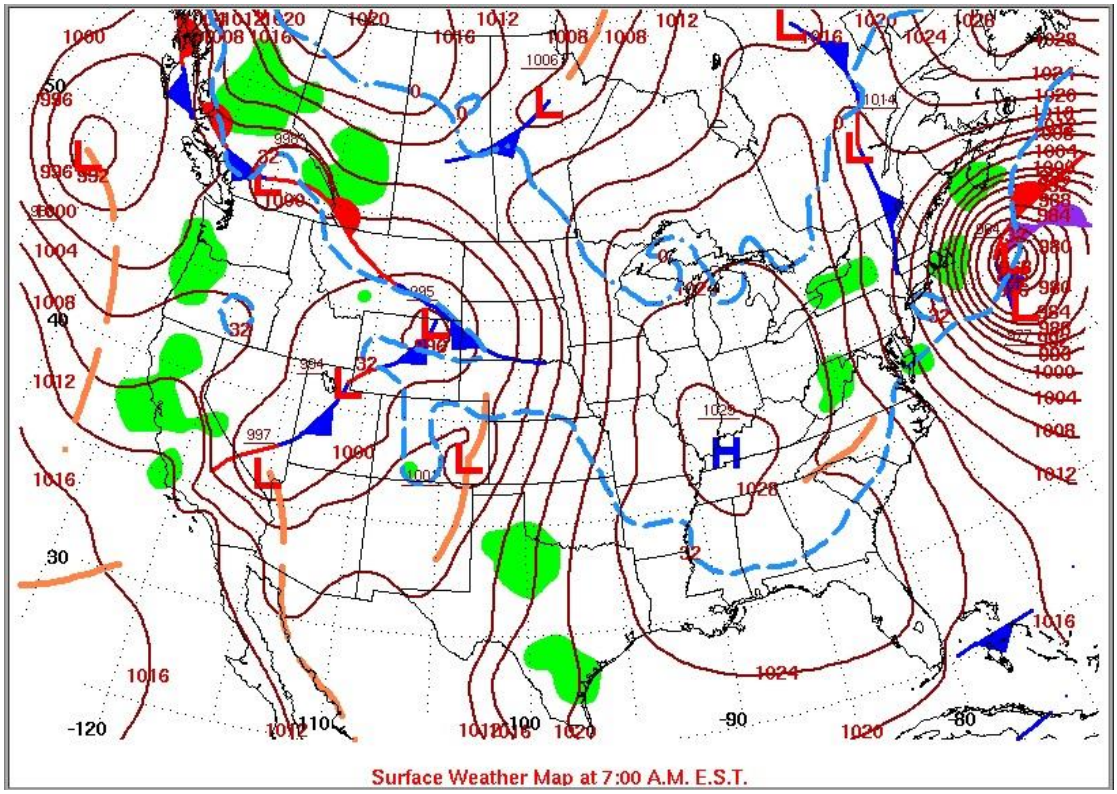

Fig 2-9: A daily weather map shows the low pressure system extending into southern California, southern Nevada, and northwestern Arizona. Source: NCEI Weather Prediction Center, www.wpc.ncep.noaa.gov/dailywxmap

The exceptional event actually began on March 25. The chain of events is visually demonstrated in **Figure 2-10**. In the morning hours of March 25, 2014, both Imperial County Airport (KIPL) and El Centro NAF (KNJK) reported light and generally variable winds. During the 15:00 hour, wind speed and direction at both sites experienced a robust change. Wind direction shifted to WSW. Wind speed jumped to 24 mph at KNJK, with gusts of 31 mph. By 16:53, KIPL had winds of 21 mph with gusts of 29 mph.

Wind speed increased and gusts intensified during March 26. The Imperial County Airport monitor measured WSW winds up to 26 mph and gusts up to 38 mph on March 26, 2014. The El Centro Naval Air Facility site measured winds up to 36 mph and gusts up to 43 mph. Regional sites also experienced high winds. Blythe Airport (KBLH), Jacqueline Cochran Regional Airport (KTRM), and Palm Springs International Airport in Riverside County, all recorded wind gusts over 35 mph, as did Campo Airfield (KCZZ) in southeastern San Diego, and Yuma MCAS (KNYL) in Yuma, Arizona. Winds started to diminish during late evening on March 26, 2014. A summary of winds, wind gusts, and wind direction at monitors in Imperial County, Riverside County, Yuma, Arizona, and Mexicali, Mexico is shown in **Table 2-2**. For detailed meteorological station graphs see **Appendix B**.

FIGURE 2-10
RAMP-UP TO MARCH 26, 2014 EVENT

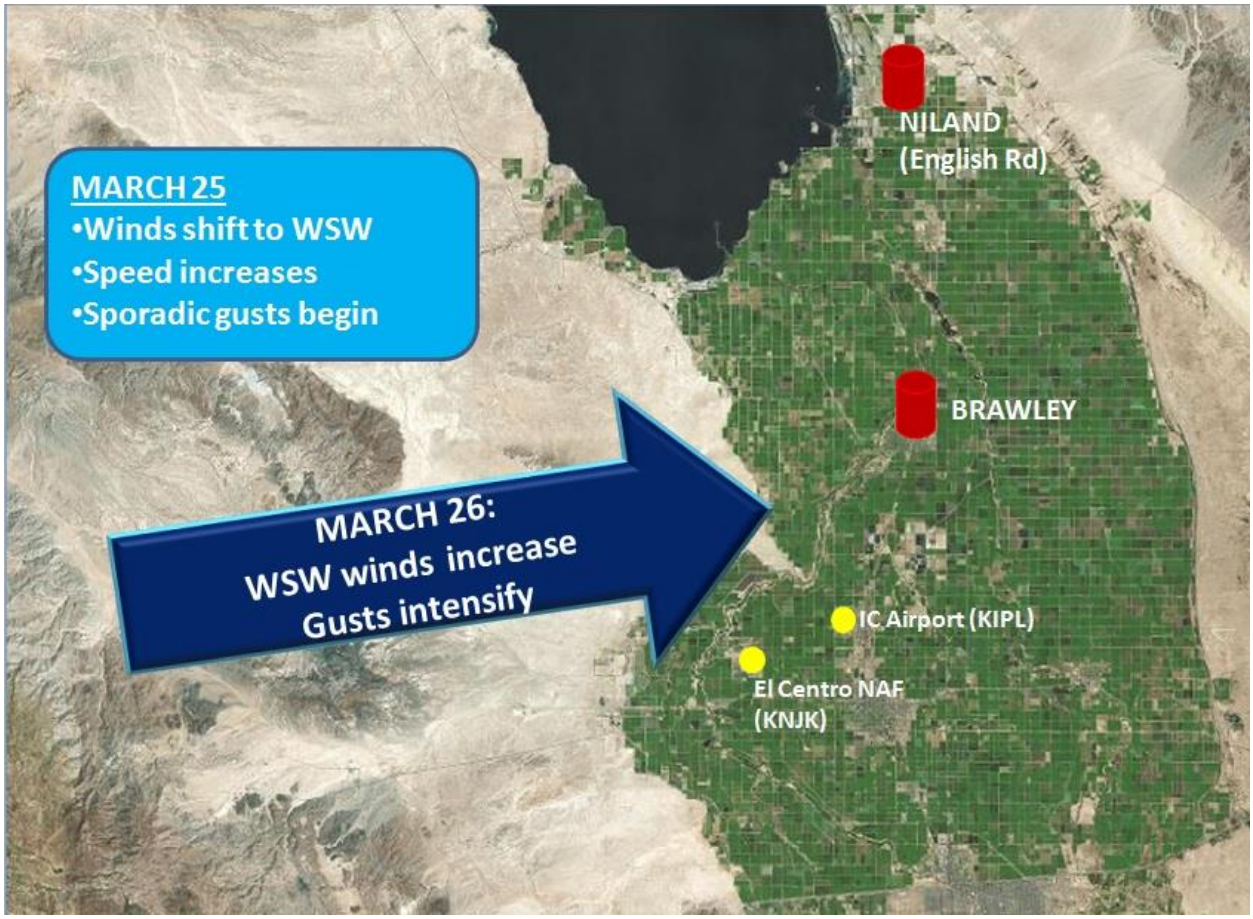

Fig 2-10: The graphic above visualizes the ramp-up to the event at Niland and Brawley on March 26, 2014. Wind data for Imperial Valley Airport and El Centro NAF from the NCEI's QCLCD data bank

Hourly PM_{10} measurements measured at both the Brawley and Niland air monitoring stations began to increase late on March 25, 2014. By 17:00, hourly PM_{10} concentrations at Brawley stood at 252.5 µg/m^3. By 20:00, hourly PM_{10} concentrations at Niland were 287.7 µg/m^3. PM_{10} concentrations remained at elevated levels at both stations during most hours throughout the remainder of March 25 and into March 26. Brawley recorded its maximum hourly PM_{10} concentration of 980.6 µg/m^3 at 09:00, while Niland reported its peak hourly PM_{10} concentration of 938.9 µg/m^3 at 12:00 on March 26. PM_{10} concentrations did not begin to normalize until 01:00 of March 27, 2014. For additional correlated wind speed and PM_{10} concentration graphs see **Appendix C**.

TABLE 2-2
WIND SPEEDS ON MARCH 26, 2014

Station Monitor Airport Met Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Hour of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Hour of Max WG	PM_{10} correlated to time of Max Wind Speed	Hourly Maximum Observed PM_{10} (ug/m3)
Imperial Airport (KIPL)	26	250	11:00	38	16:00	-	-
Naval Air Facility (KNJK)	36	250	0:00	43	15:00	-	-
Calexico (Ethel St)	20.1	269	15:00	-	-	-	-
El Centro -9th Street	14.5	255	15:00	-	-	-	-
Westmorland	-	-	-	-	-	-	-
Niland	30.4	256	13:00	-	-	-	939
RIVERSIDE COUNTY							
Blythe Airport (KBLH)	29.9	220	16:00	39.1	16:00	-	-
Palm Springs Airport (KPSP)	25.3	30	14:00	38	14:00	150	272
Jacqueline Cochran Regional Airport (KTRM) - Thermal	25.3	280	17:00	36.8	12:00	-	-
ARIZONA – YUMA							
Yuma MCAS (KNYL)	27.6	290	8:00	39.1	8:00	370	476
MEXICALI - MEXICO							
Mexicali Int. Airport (MXL)	23	270	9:00	-	-	-	-

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back-trajectory models[2], **Figure 2-11**, shows the path of air flow in the 12 hours preceding the exceedances at Brawley and Niland. The trajectory shows that air moved across the source area of arid and largely barren desert soils to the west before impacting the Brawley and Niland monitors. The Brawley 12-hour back trajectory ends at 09:00, while the 12-hour back trajectory for Niland ends at 12:00. This is during the hour of maximum PM_{10} concentration at both sites on March 26. It should be noted that modeled winds can differ substantially from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

[2] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

FIGURE 2-11
BRAWLEY & NILAND HYSPLIT MODELS

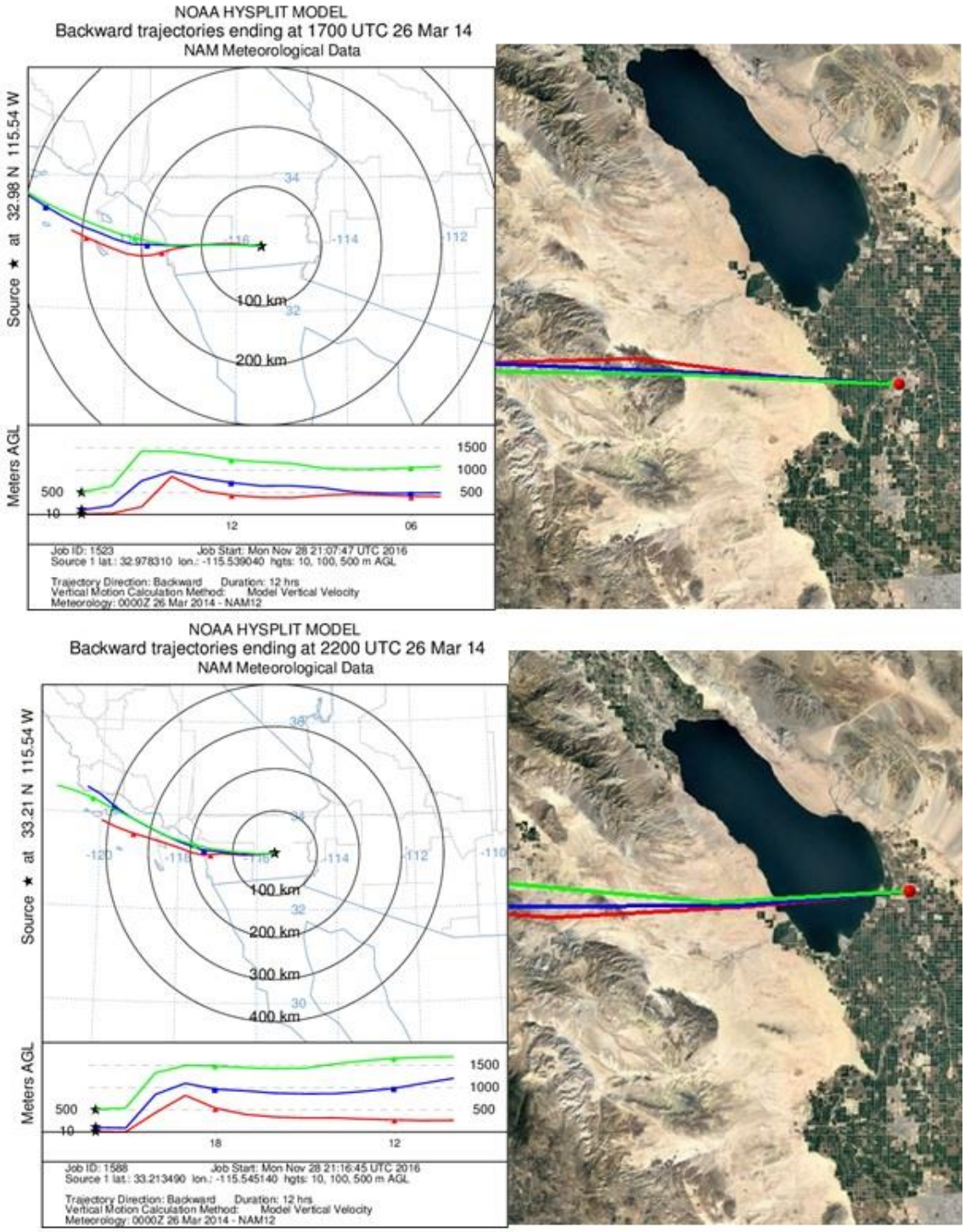

Fig 2-11: A pair of 12-hour back trajectories for Brawley (top) ending at 09:00, and Niland (right), ending at 12:00 on March 26, 2014. Red line indicates 10 meters AGL (above ground level); blue=100m; green=500m. Generated through the NOAA Air Resources Laboratory HYSPLIT

Figure 2-12 illustrates regional elevated levels of PM_{10} concentrations measured in Riverside, Imperial, and Yuma counties. The elevated levels of PM_{10} concentrations measured in the three counties illustrates the regional nature of the event (**Table 2-1**). The concentrations were significantly higher in the Imperial and Riverside counties which supports the transportation of dust from the west. The entrained dust particles resulted in a (midnight to midnight) 24-hr average concentration of 375.3 µg/m^3 and 279.7 µg/m^3 at the Brawley and Niland monitors, respectively. Best Available Control Measures (BACM) was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-12
72 HOUR PM_{10} CONCENTRATIONS AT REGIONAL STATIONS

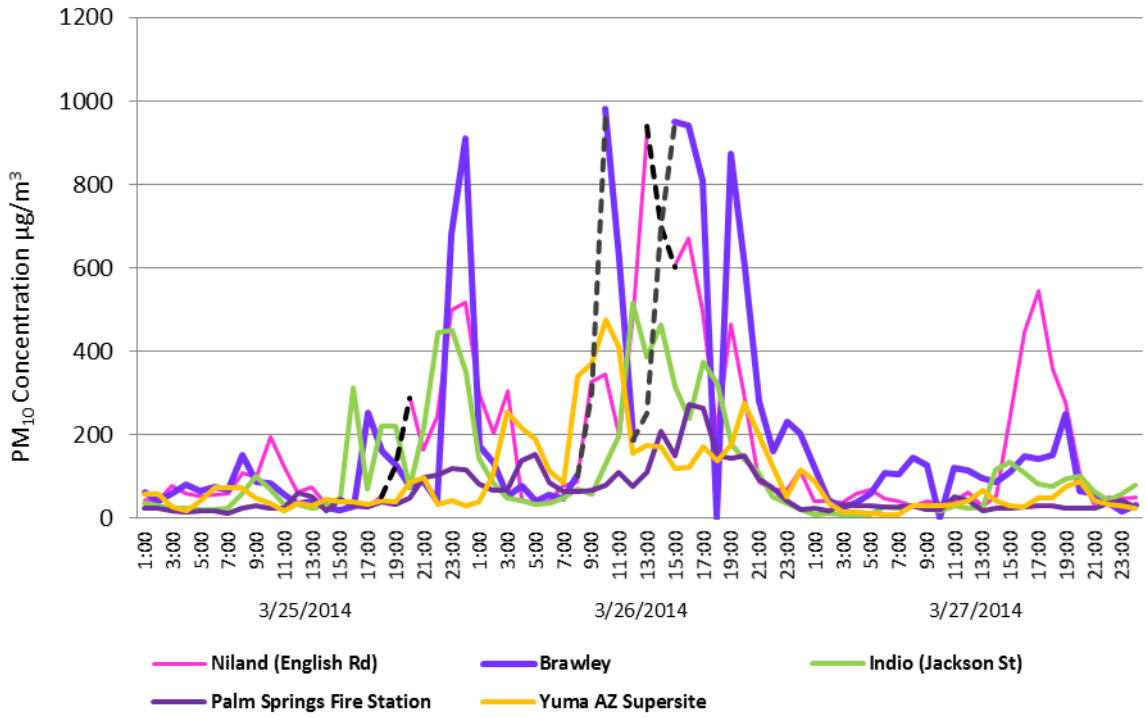

Fig 2-12: 72-hour relative PM_{10} concentrations at various monitoring locations throughout Riverside, Imperial and Yuma counties. The graph clearly demonstrates the elevation of PM_{10} concentration on March 26, 2014 at all sites that were impacted by the weather system and accompanying winds

III Historical Norm

III.1 Analysis

While naturally occurring high wind events may occur seasonally and at times frequently and qualify for exclusion under the EER, historical fluctuations of the particulate concentrations provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley and Niland monitors on March 26, 2014, were unusual and in excess of normal historical fluctuations. The analysis also provides convincing evidence that the event affected air quality.

Figures 3-1 through 3-3 show the time series of available FRM and FEM BAM 24-hr PM_{10} concentrations at the Brawley and Niland monitors for the five-year period of January 1, 2010 to March 26, 2014, for a total of 1,546 sample run days. Note that prior to 2013, the BAM data was not considered FEM and was not submitted to AQS. In order to properly establish the intensity of the event, as it occurred on March 26, 2014, 24-hour averaged PM_{10} concentrations were compiled and plotted as a time series, January 01, 2010 to March 26, 2014, to provide a historical perspective of PM_{10} concentrations.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 26, 2014

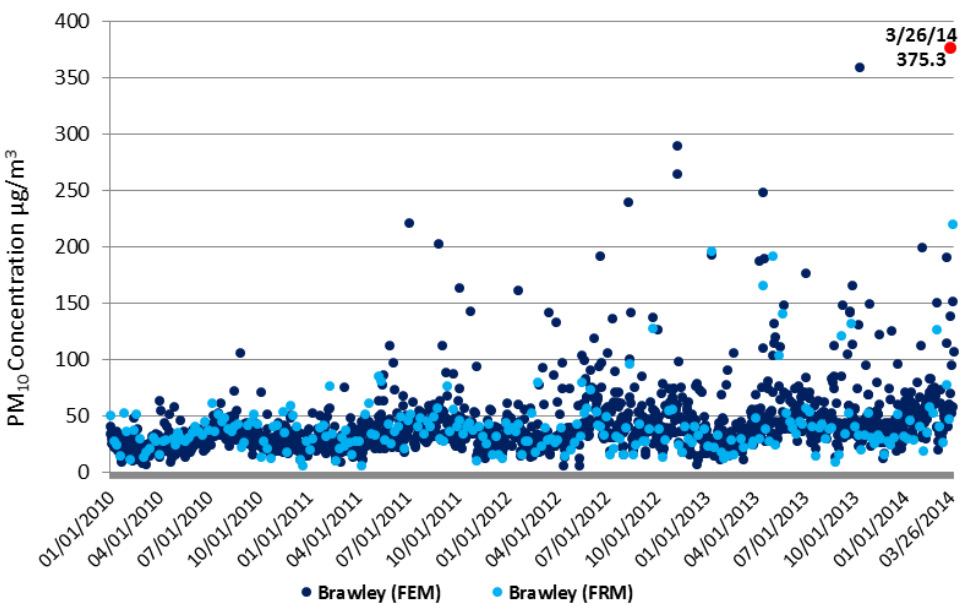

Fig 3-1: A historical comparison of PM_{10} concentrations demonstrates that the March 26, 2014 measured concentration of 375.3 µg/m^3 by the Brawley BAM 1020 PM_{10} monitor was outside the normal historical measurements. Air quality data from the EPA's AQS data bank

FIGURE 3-2
NILAND HISTORICAL
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 26, 2014

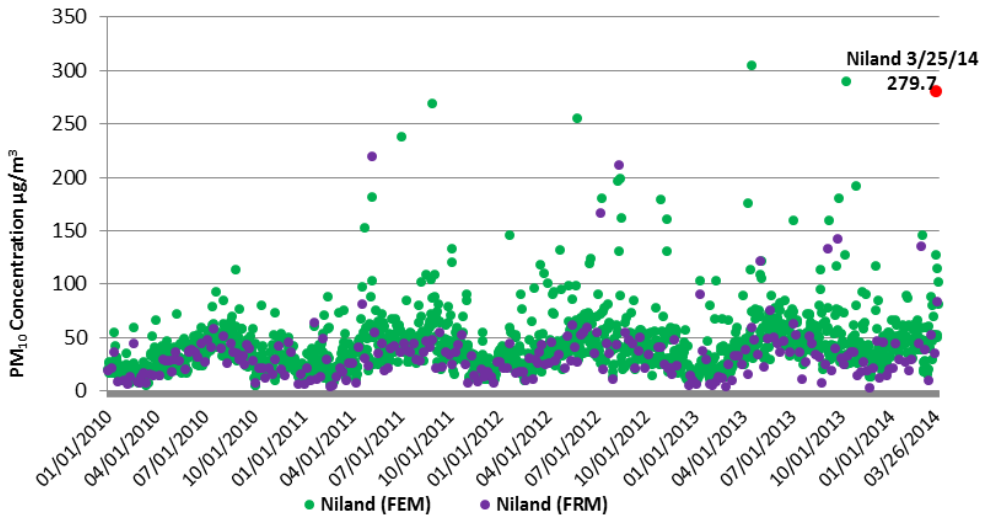

Fig 3-2: A historical comparison of PM_{10} concentrations demonstrates the March 26, 2014 279.7 µg/m^3 measured concentration from the Niland BAM 1020 PM_{10} monitor was outside the historical norm. Air quality data from the EPA's AQS data bank

FIGURE 3-3
BRAWLEY AND NILAND
HISTORICAL FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 26, 2014

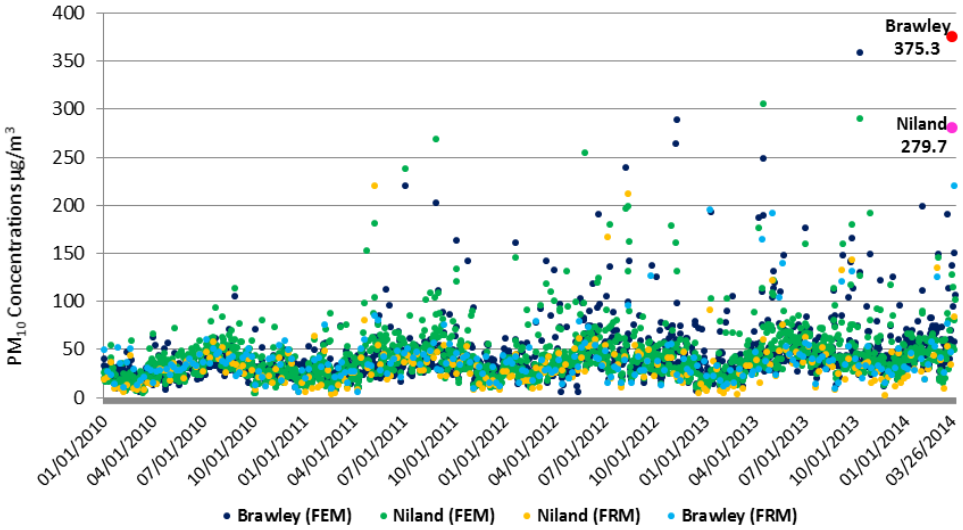

Fig 3-3: A combined comparison of PM_{10} concentrations for both Brawley and Niland demonstrates that the measured concentrations of 375.3 µg/m^3 and 279.7 µg/m^3, respectively, on March 26, 2014 were outside normal historical measurements

Figure 3-3 for Brawley and Niland includes a total of 3,585 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and March 26, 2014. Overall, the time series illustrates that of the 1,546 sampling days between January 1, 2010 through March 26, 2014, there were a total of 29 exceedances that occurred. Of the total 29 exceedances only three days experienced lone FRM exceedances with no corresponding FEM exceedances. None of the single FRM exceedances occurred during the first quarter. For FEM BAM and/or a combination of FRM/FEM measurements during the first quarter, there were five measured exceedances out of 3,585 credible samples. That works out to just 0.14 percent of all credible samples. The other 24 exceedances occurred during the second, third and fourth quarters between January 2010 and March 26, 2014. No exceedances of the standard occurred during 2010. As mentioned above FEM BAM data was not considered regulatory from 2010 to 2012.

Figures 3-4 through 3-6 for Brawley and Niland illustrate the seasonal pattern between January and March for the years 2010 through 2014. **Figure 3-6** shows the combined seasonal time series for both Brawley and Niland. Of the 1,035 credible samples over 446 sampling days, only five exceedances occurred. That works out to just 0.48 percent of all credible samples.

FIGURE 3-4
BRAWLEY SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
MONTHS JANUARY-MARCH, 2010-2014

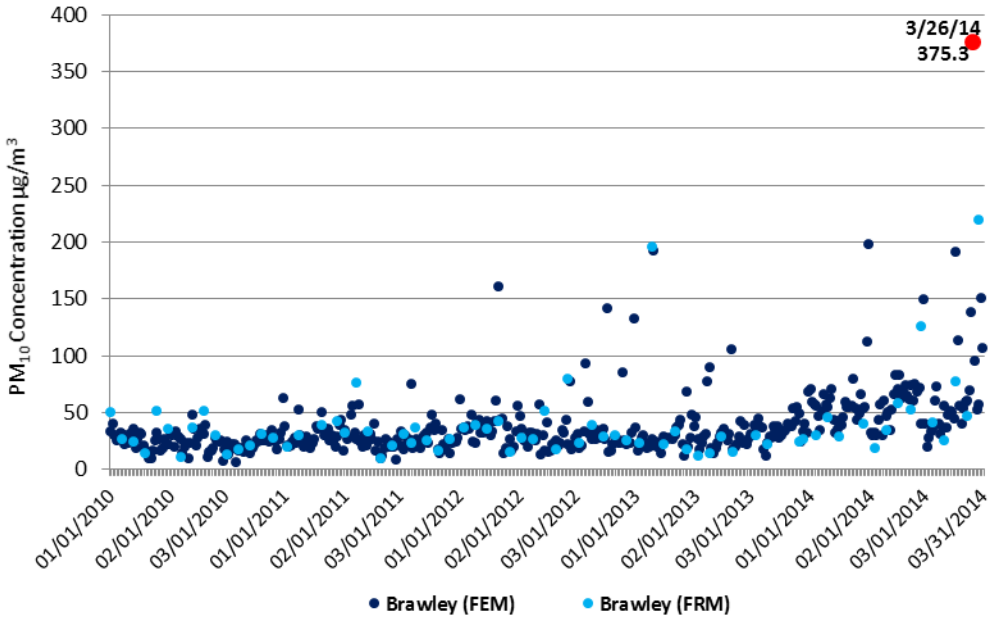

Fig 3-4: The seasonal historical comparison using the months of January through March for the years 2010 through 2014 supports that the measured exceedance at the Brawley monitor on March 26, 2014 was outside the historical norm. Air quality data from the EPA's AQS data bank

FIGURE 3-5
NILAND SEASONAL COMPARISON
PM_{10} 24-HR AVG CONCENTRATIONS
MONTHS JANUARY-MARCH, 2010-2014

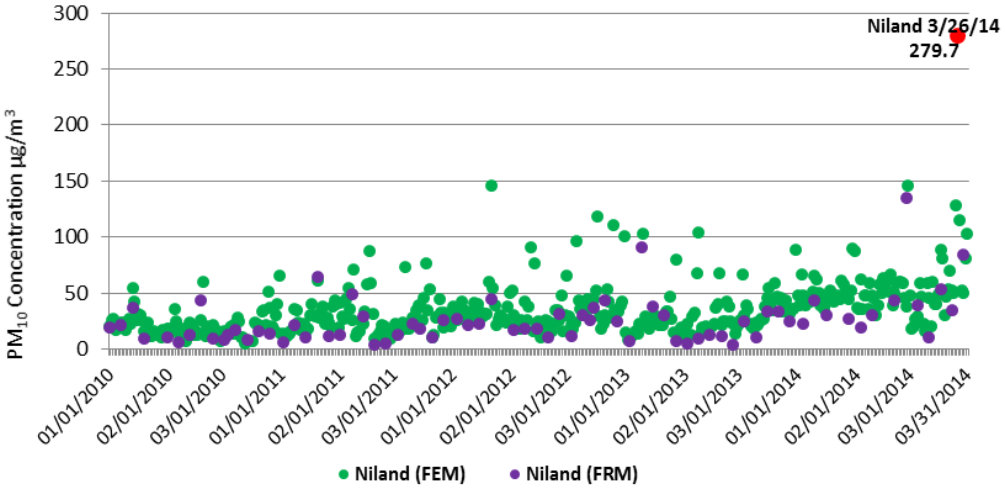

Fig 3-5: The seasonal historical comparison using the months of January through March for the years 2010 through 2014 supports that the measured exceedance at the Niland monitor on March 26, 2014 was outside the historical norm

FIGURE 3-6
BRAWLEY AND NILAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MARCH 31, 2014

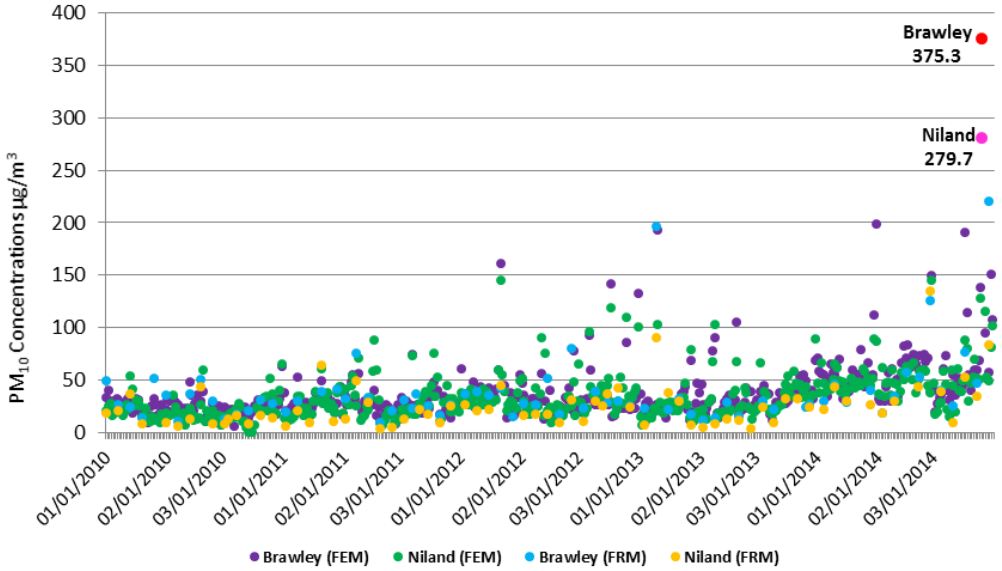

Fig 3-6: A seasonal comparison supports that the measured exceedances of 375.3 µg/m^3 and 279.7 µg/m^3 at the Brawley and Niland monitors, respectively, on March 26, 2014 were outside the historical norm. Air quality data from the EPA's AQS data bank

For the combined historical FRM and FEM annual 2010 through March 2014 Brawley and Niland dataset, the FEM concentrations of 375.3 µg/m^3 for Brawley and 279.7 µg/m^3 for Niland are above the 99th percentile ranking. For the combined FRM and FEM seasonal January through March, years 2010 to 2014 dataset for Brawley and Niland, the FEM concentrations of 375.3 µg/m^3 for Brawley and 279.7 µg/m^3 for Niland, respectively, are above the 98th percentile ranking. Note that prior to 2013, the BAM data was not considered FEM and was not submitted to AQS. However, this does not affect the percentile rankings. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings, the March 26, 2014 measured exceedances of 375.3 µg/m^3 and 279.7 µg/m^3 are clearly in excess of normal historical fluctuations with seasonal exceedances of the NAAQS not occurring frequently.

FIGURE 3-7
BRAWLEY AND NILAND HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 2010 TO MARCH 2014

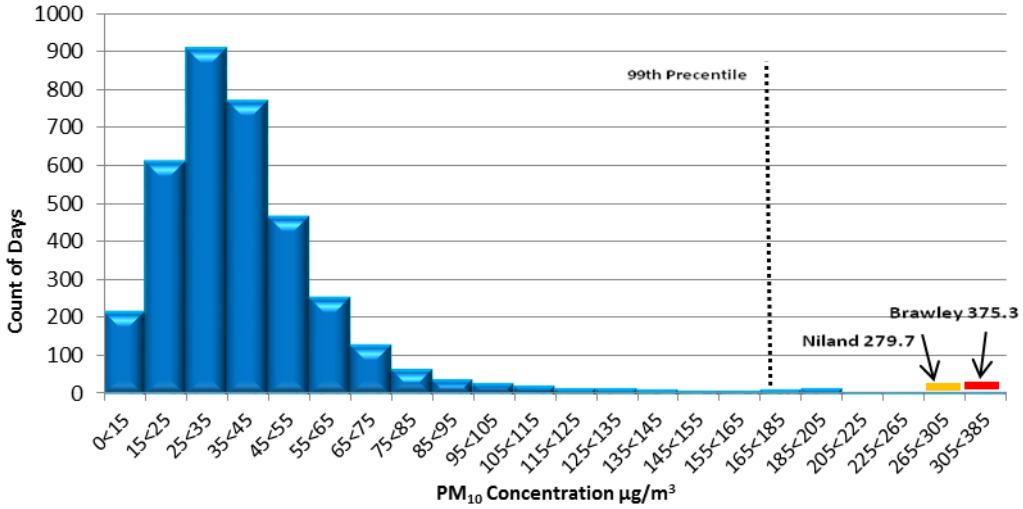

Fig 3-7: The 24-hr average PM_{10} concentrations measured at the Brawley and Niland monitoring sites demonstrates that the March 26, 2014 event was in excess of the 99th percentile

FIGURE 3-8
BRAWLEY AND NILAND SEASONAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY TO MARCH, 2010-2014

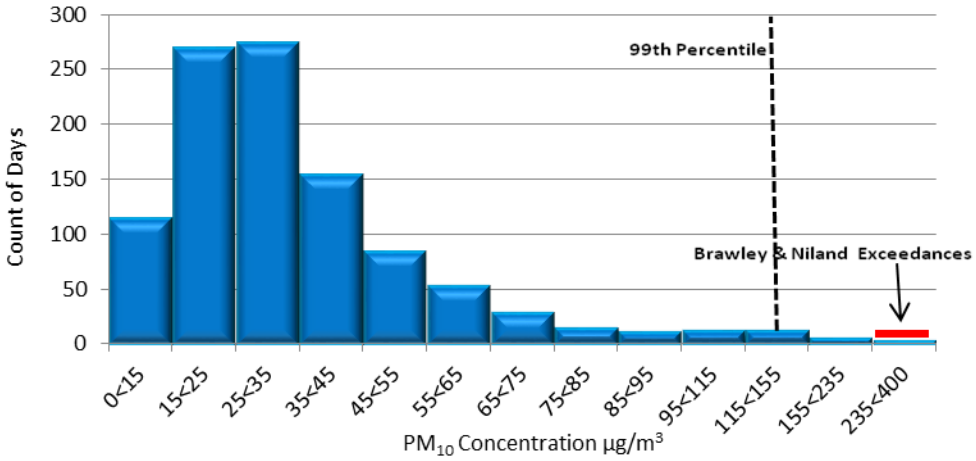

Fig 3-8: The seasonal 24-hr average PM_{10} concentrations at the Brawley and Niland monitoring sites demonstrate that the March 26, 2014 event was in excess of the 98th percentile

III.2 Summary

The information provided, above, by the historical and seasonal time series plots and the percentile rankings illustrate that the PM_{10} concentration observed on March 26, 2014 occur infrequently. When comparing the measured PM_{10} levels on March 26, 2014 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances at the Brawley and Niland sites were outside the normal historical fluctuations. This historical concentration data and the demonstration found under the clear causal relationship supports that the measured exceedances on March 26, 2014 were an exceptional event and that it affected air quality.

IV Not Reasonably Controllable or Preventable

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

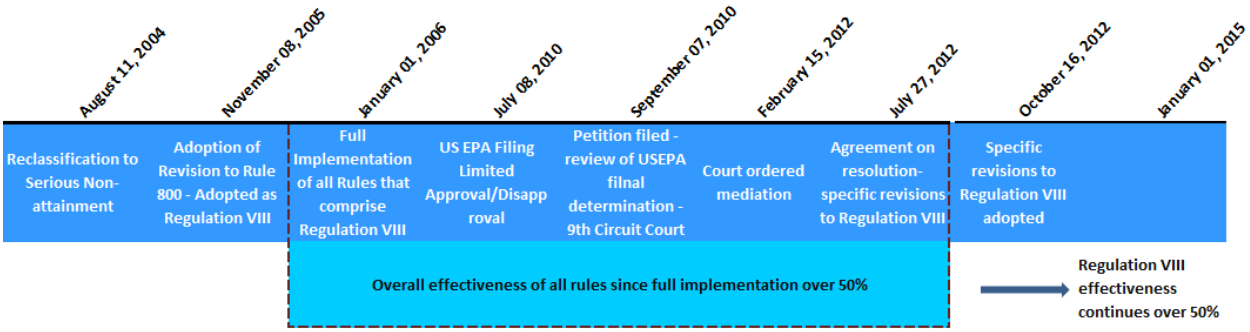

Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. The complete set of rules can be found in **Appendix D**.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B of Appendix D describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generate dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically

requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews hourly surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On March 26, 2014, the ICAPCD declared a No Burn Day **(Appendix A).** No complaints were filed for agricultural burning on March 26, 2014.

IV.1.c Review of Source-Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Brawley and Niland during the time of the March 26, 2014 PM_{10} exceedance. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. March 26, 2014 was officially designated as a **"**No Burn Day." No complaints were filed on March 26, 2014 related to agricultural or waste burning. However, three dust complaints were filed. The first complaint asserted that dust was impacting a residence across from a construction site in Calexico. The follow up investigation by certified personnel concluded the dust emissions were due to strong winds at the area. The source was required to use more water to control dust. No violation was issued. The second complaint asserted that dust was been generated by activity at a renewable energy source in Ocotillo. The follow up investigation by certified personnel concluded the dust emissions as emanating from the surrounding open desert areas. No violation was issued. The third complaint asserted that dust was impacting a residence located across from a cemetery in Brawley. The follow up investigation by certified personnel concluded the dust emissions were generated from a pile of dirt at the site and due to strong winds at the area. The responsible party was required to use more water to control dust at the source. No violation was issued. Appendix A contains copies of the "No Burn Day" and Complaint notices issued on March 26, 2014.

IV.2 Forecasts and Warnings

Wind advisories were issued by the NWS and web-based AQI alerts for Brawley and Niland were issued by the ICAPCD. At 11:00 on March 26, the ICAPCD placed air quality at Niland in the "Orange" category with PM_{10} concentrations of 101 to 150 $\mu g/m^3$. Air quality was identified as "Unhealthy for Sensitive Groups." The alert stated that "people with respiratory or heart disease, the elderly, and children are the groups most at risk, especially when they are physically active. There is an increased likelihood of respiratory symptoms in sensitive individuals, and aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly." The alert also carried an advisory from the U.S. EPA that "people with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion." The ICAPCD

issued a web-based AQI alert for Brawley on March 26, 2014. By 15:00, air quality at Brawley had reached the "Red" or "Unhealthy" stage of 151 to 200 µg/m^3.

The alert stated that "people with respiratory or heart disease, the elderly, and children are the groups most at risk, especially when they are physically active. Persons with cardiopulmonary disease and the elderly may experience increased aggravation of heart or lung disease and premature mortality. The general population may experience increased respiratory effects." The alert also carried an advisory from the U.S. EPA that "people with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion." See **Appendix A** for AQI alerts notices.

On March 25, the NWS Phoenix office issued a Wind Advisory for the possibility of blowing dust over a wide region of southeastern California from Riverside County, all of Imperial County, and the lower Colorado River valley from Blythe south to Yuma, Arizona. The advisory was in effect from 8:00 a.m. March 25 until 8:00 p.m. on March 26. It warned of the potential for strong winds with wind speeds of between 20 and 30 mph, wind gusts of up to 40 mph, and reduced visibilities due to windblown dust in Imperial County. **Appendix A** contains copies of the issued NWS notices on March 26, 2014.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and all of Imperial County. Imperial County Airport recorded winds of 25 mph or greater for two consecutive hours, and gusts greater than 30 mph for nine consecutive hours. El Centro NAF recorded two consecutive hours of winds over 25 mph during the first two hours of the morning. Starting in the 11:00 hour, it recorded seven consecutive hours of winds over than 25 mph. The airfield also experienced eight consecutive hours of gusts at or above 30 mph, and reported a peak gust of 43 mph. Wind speeds of over 25 mph are normally sufficient to overcome most PM_{10} control measures. During the March 26, 2014 event wind speeds were above the 25 mph threshold for consecutive hours, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that strong winds associated with an intense upper-level low pressure system that moved through southern California caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements upstream of Brawley and Niland during the event were high enough (at or above 25 mph, with wind gusts over 35 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions 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 that occurred on March 26, 2014 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedance and the high wind event timeline and geographic location. The March 26, 2014 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations identified an upper-level low pressure system that moved across southern California and into southern Nevada as responsible for bringing high winds over a large portion of the desert southwest. The system brought strong and gusty westerly winds exceeding 35 mph across the mountains and deserts of southeastern California. High winds and strong gusts started during the afternoon of March 25 and intensified on March 26. The NWS issued a wind advisory[3] for Imperial County along with a blowing dust advisory (see **Appendix A, Figure A-7**). Dust was lofted and transported downstream to monitors at Brawley and Niland, both of which recorded exceedances. **Figure 5-1** shows dust being carried aloft into the Imperial Valley on March 26, 2014. **Figure 5-2** is two GOES (satellite) Aerosol Smoke Product (GASP) image supporting the presence of dust in the atmosphere over southeastern California and Imperial County. High winds over source areas upstream of Niland and Brawley passed over a wide fetch of arid, mostly barren soils on the western edge of the Sonoran Desert near the Imperial-San Diego County line (see **Figure 5-4**).

FIGURE 5-1
AQUA MODIS SATELLITE IMAGE - MARCH 26, 2014

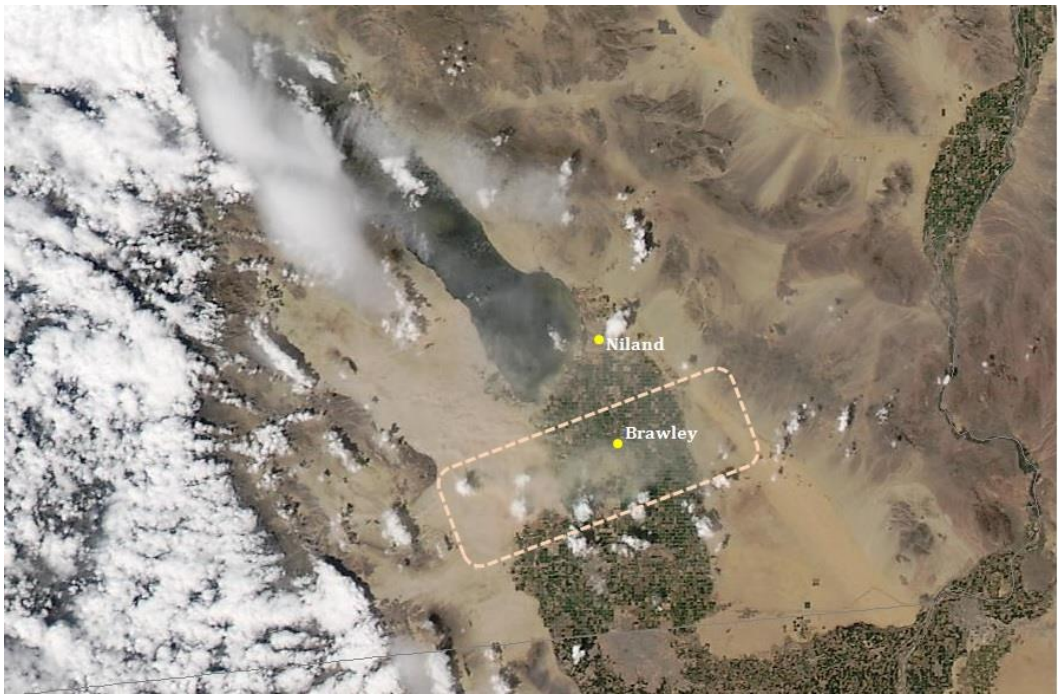

Fig 5-1: Dust can be seen near Brawley as it is transported west to east across the Imperial Valley. Image source: MODIS Today, http://ge.ssec.wisc.edu/modis-today/

[3] A wind advisory is issued when the following conditions are met for one (1) hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016; http://www.weather.gov/lwx/WarningsDefined#WindAdvisory

FIGURE 5-2
GASP AOD IMAGE - MARCH 26, 2014

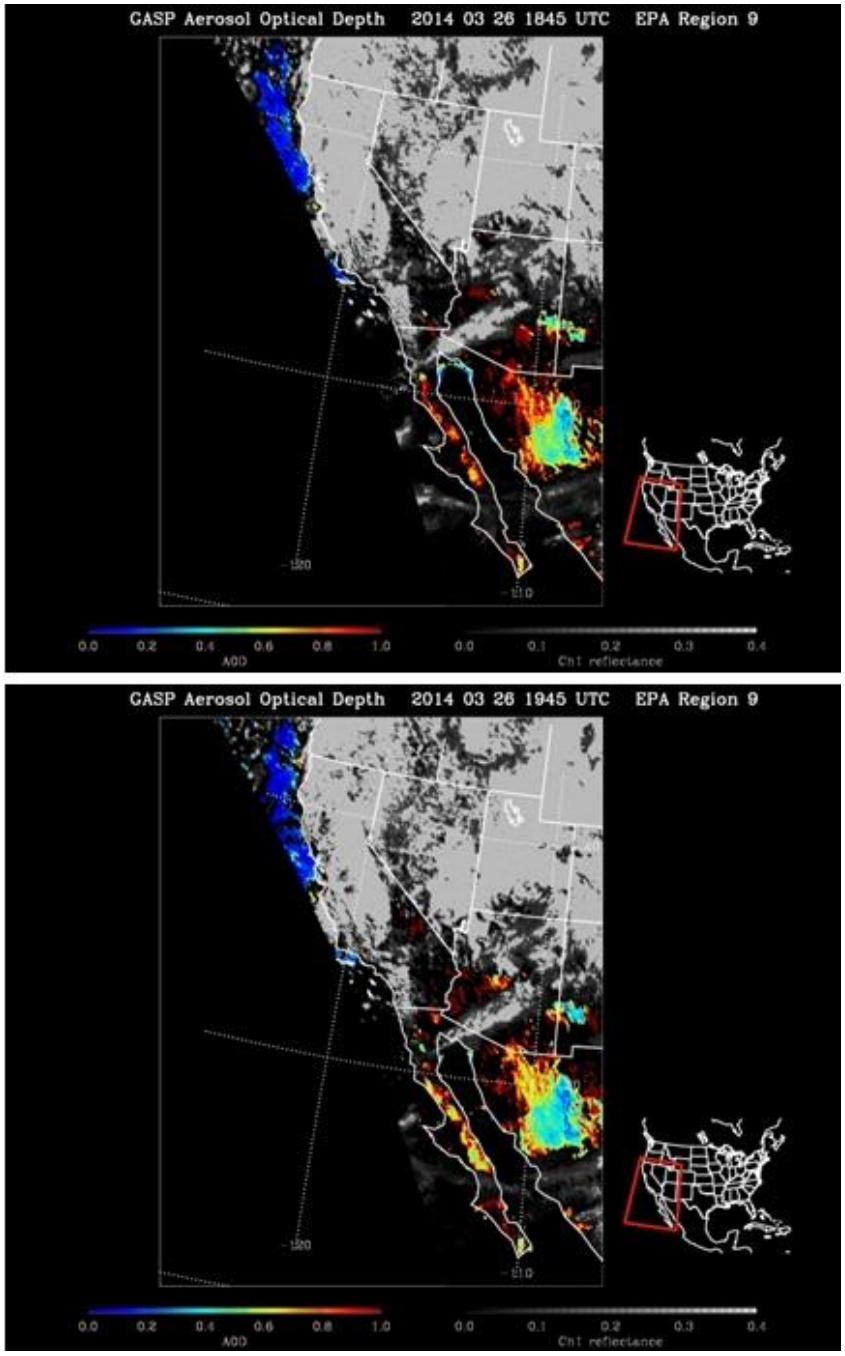

Fig 5-2: A GASP Aerosol Optical Depth (AOD) image shows there was some atmospheric dust over Imperial County on March 26. The top image is at 10:45 LST. The bottom image is at 11:45 LST. Warmer colors indicate a thicker AOD. Image from IDEA (Infusing Satellite Data into Environmental Applications, http://www.star.nesdis.noaa.gov/smcd/spb/aq/index.php

The NWS Phoenix office issued an Area Forecast Discussion at 03:08 MST on March 26 that predicted the strongest winds would remain west of the lower Colorado River valley in southeastern California. **Figure 5-3** shows the progression of the low pressure system, along with a modest tightening of the surface pressure gradient, as it moved across southern California.

FIGURE 5-3
GOES-W INFRARED SURFACE PRESSURE ANALYSIS IMAGES

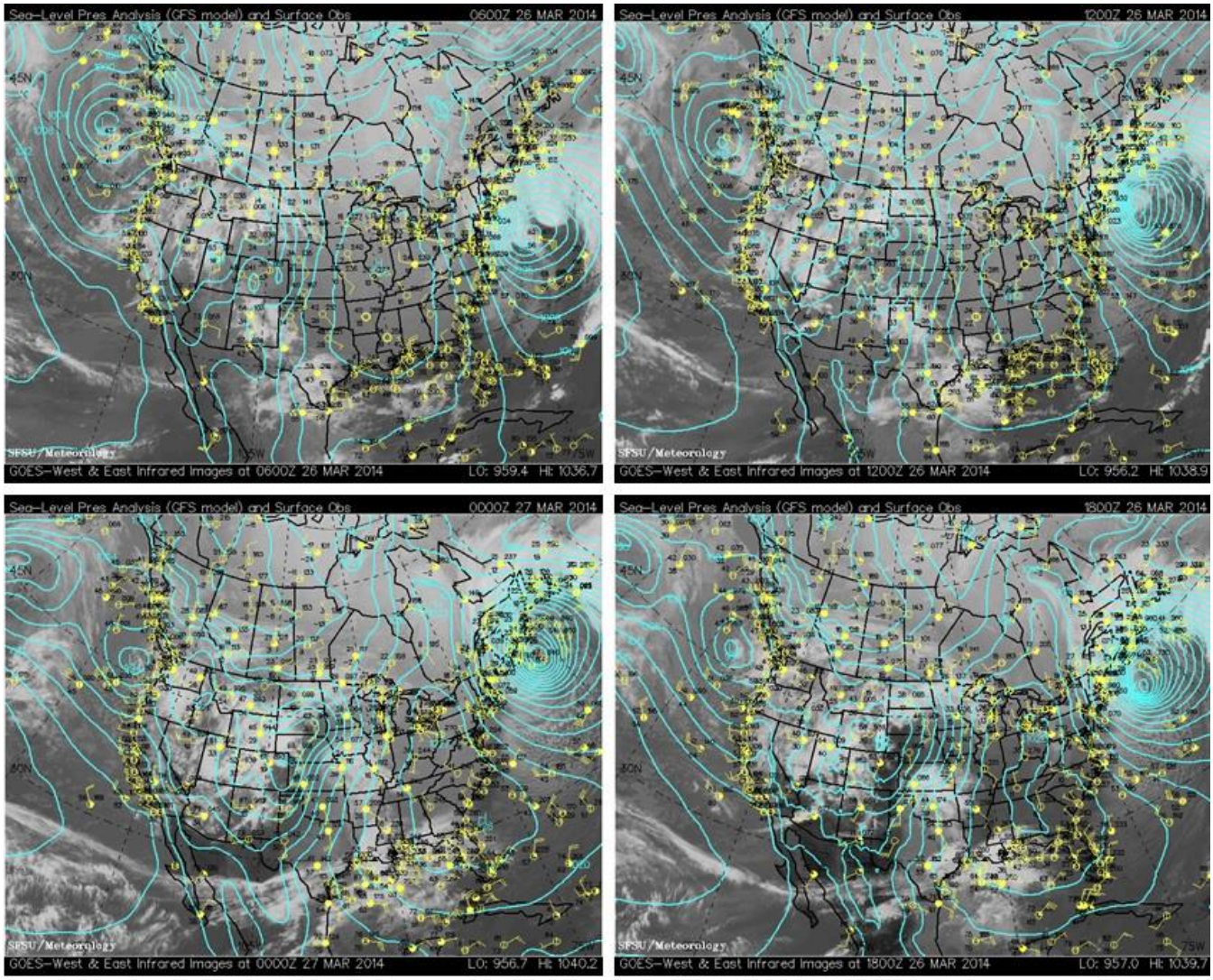

Fig 5-3: A collection of GOES-W infrared satellite surface pressure images shows the progression of the low pressure system as it moved across southern California and into southern Nevada. From upper left, clockwise: 22:00 LST on March 25; 04:00 LST on March 26; 10:00 LST on March 26; and 16:00 LST on March 26. Images from: Image courtesy of SFSU Department of Earth & Climate Sciences and the California Regional Weather Server, http://squall.sfsu.edu/crws/archive/sathts_arch.html

On March 25 at 02:41 MST the NWS Phoenix office issued a wind advisory (extended through

20:00 March 26), identifying the affected areas as Imperial County, including Brawley, Calexico, El Centro, Glamis, Imperial, and the Salton Sea. Winds were expected to be 25 to 35 mph with gusts up to 45 mph. On Wednesday, March 26, a Blowing Dust Advisory was issued for Imperial County (see **Appendix A, Figure A-7**). **Figure 5-4** shows wind speeds and gusts at key upstream sites in Imperial County, as well as surrounding areas.

FIGURE 5-4
REGIONAL WINDS ON MARCH 26, 2014

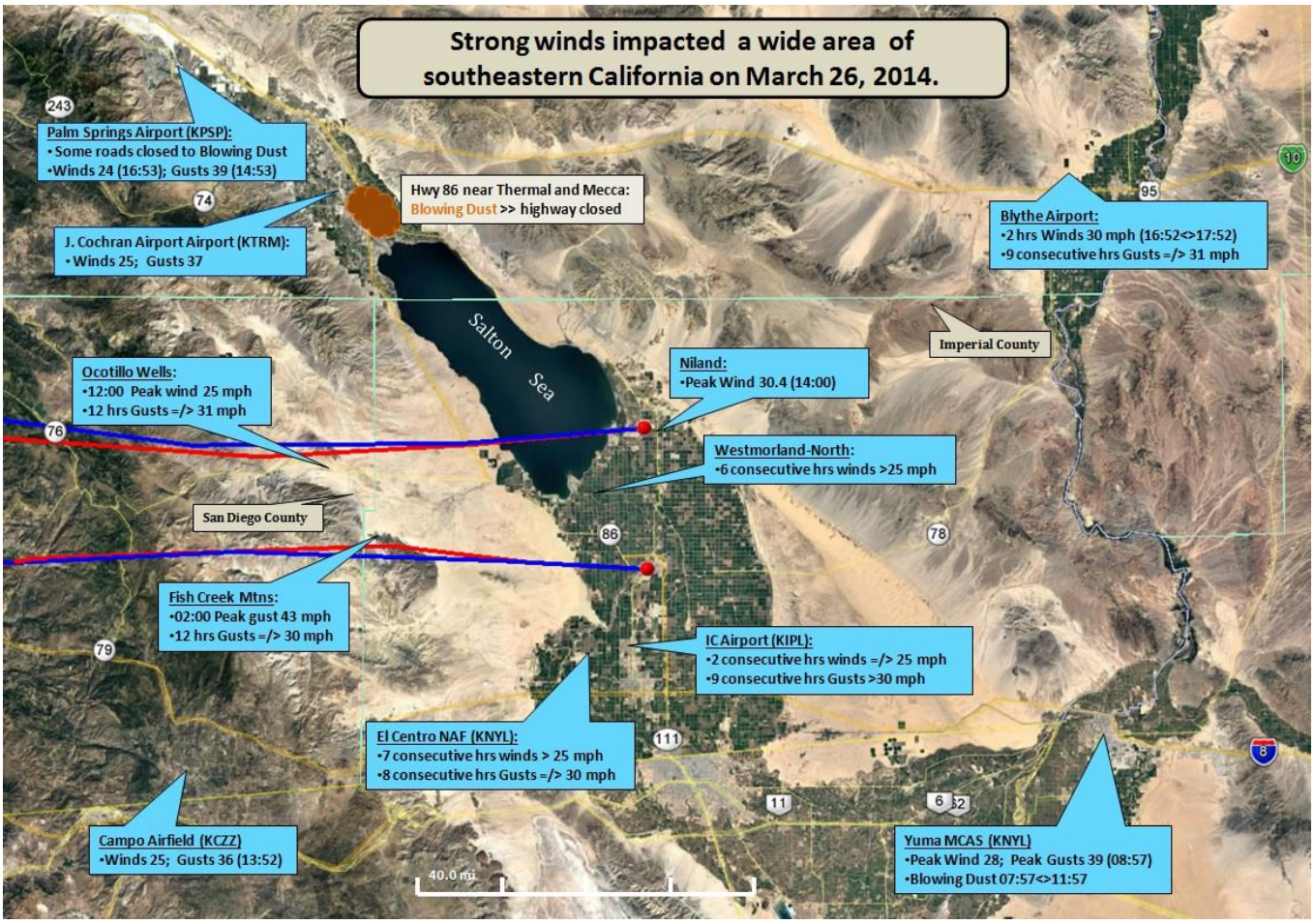

Fig 5-4: A 12-hour HYSPLIT back-trajectory (see also **Figure 2-11**) for Niland (upper symbol) and Brawley (lower symbol), show that high winds over source areas upstream of both sites passed over a wide fetch of arid, mostly barren soils on the western edge of the Sonoran Desert near the Imperial-San Diego County line. Red lines indicate air flow at 10 meters above ground; blue is 100 meters. Geographic base map from Google Earth. Wind data retrieved from NCEI QCLCD data bank; University of Utah's MesoWest data bank; the EPA's AQS data bank; and NOAA's Storm Events database

The upstream sites of Ocotillo Wells and the Fish Creek Mountains both reported strong winds and multiple consecutive hours of gusts at or above 30 mph. These sites corroborate that the Niland and Brawley monitors were impacted by the gusty west to west-southwest winds. El

Centro NAF (KNJK) reported seven consecutive hours of winds above 26 mph, and eight consecutive hours of gusts at or above 30 mph. Imperial County experienced two consecutive hours of winds at or above 25 mph, plus nine consecutive hours of gusts greater than 30 mph. Westmorland-North, positioned roughly between Niland to the north and Brawley to the south, recorded six consecutive hours of winds above 25 mph.

The exceptional event was regional in its scope. Blowing dust advisories were issued for Riverside County and the eastern deserts. The California Highway Patrol reported that blowing dust was the cause of a multi-car accident on Highway 86 near Thermal. Additionally, two major streets in Palm Springs were closed due to blowing dust (see **Appendix A**). These incidents of blowing dust support the suspended particulate matter captured by satellites in **Figures 5-1** and **5-2**. Wind advisories were issued for the San Diego mountains and deserts, west of Imperial County. The San Diego deserts were expected to see gusts up to 55 mph with areas of blowing dust and sand (see **Appendix A**). Campo Airfield, in the mountains of southeastern San Diego and upstream of Niland and Brawley, reported strong winds and powerful gusts. These strong upstream winds played a role in lofting and transporting dust into Imperial County. **Figure 5-5** is an illustration of the wind speeds[4] taken from regional sites.

FIGURE 5-5
72-HOUR WIND SPEEDS REGIONAL SITES

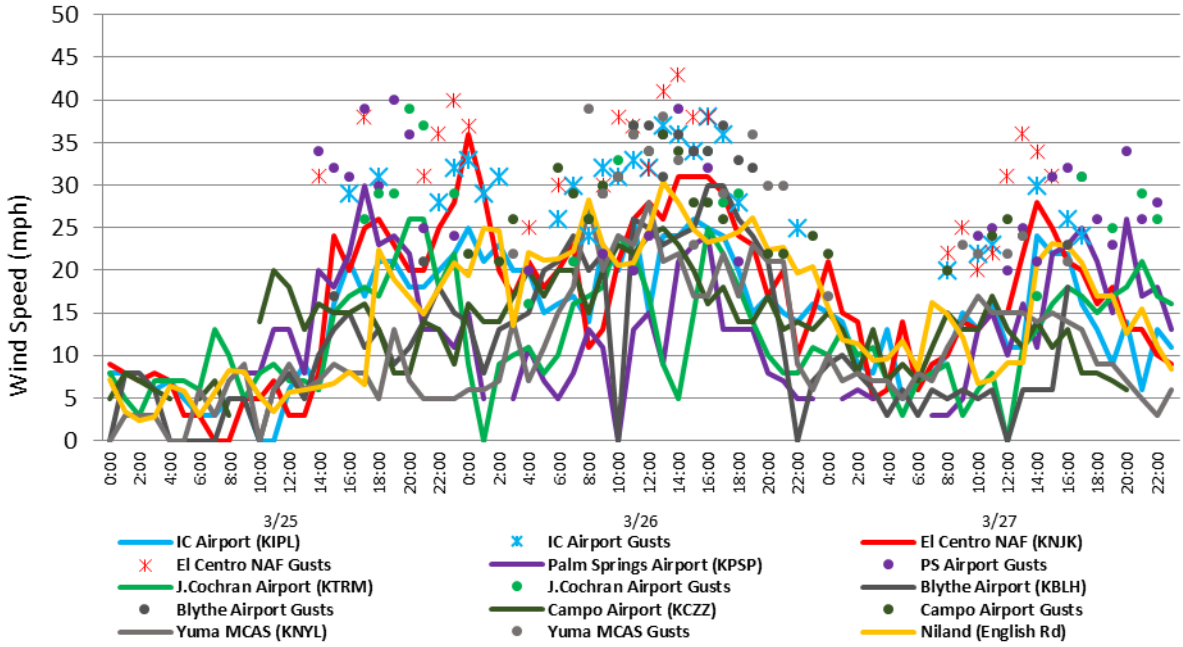

Fig 5-5: Wind sites in southeastern California show a uniform increase on March 25 as the system moved into the region. Winds continued to remain strong on March 26. Data from NCEI's QCLCD data bank; University of Utah's MesoWest; EPA's AQS data bank

[4] National Weather Service; NOAA's Glossary – Wind Speed: The rate at which air is moving horizontally past a given point. It may be a 2-minute average speed (reported as wind speed) or an instantaneous speed (reported as a peak wind speed, wind gust, or squall)[http://w1.weather.gov/glossary/index.php?letter=w]

All stations in **Figure 5-5** show a uniform increase during the afternoon (~14:00) of March 25 as the weather system moved into the region. As the system moved across southeastern California on March 26, wind speeds remained elevated until diminishing toward midnight. Winds were also strong downstream of Niland and Brawley. Blythe Airport reported two hours of winds at 30 mph, and nine consecutive hours of gusts at or above 31 mph. The Yuma MCAS (KNYL) in southwestern Arizona, experienced high winds and several hours of blowing dust. See **Appendix B** for supporting meteorological documentation.

Figures 5-6 and 5-7 demonstrate the relationship between the high winds and the transported entrained dust impacting the Brawley and Niland monitors. A comparison of hourly BAM 1020 data from the Brawley and Niland air monitoring stations and the elevated wind speeds over a 72-hour period, show that an increase of wind speeds and gusts on March 25 was soon followed by a rise in concentrations of PM_{10}. March 26 for both monitors shows a similar pattern. The peak hourly PM_{10} concentrations at both monitors occurred soon after winds and gusts began to increase. For Brawley, the Fish Creek Mountains represents the most direct upstream wind site. Imperial County Airport is the closest meteorological station to the Brawley monitor. For Niland, Ocotillo Wells represents the most direct upstream wind site. The Niland (English Rd) station has its own meteorological instrument. **Appendix C** contains additional graphs illustrating the relationship between the high PM_{10} concentrations and increased wind speeds at other monitoring sites within Imperial and Riverside counties on March 26, 2014**.** Refer to **Figure 2-12** for a 72-hour depiction of PM_{10} concentrations at regional sites.

FIGURE 5-6
BRAWLEY PM_{10} CONCENTRATION & UPSTREAM WIND SPEEDS

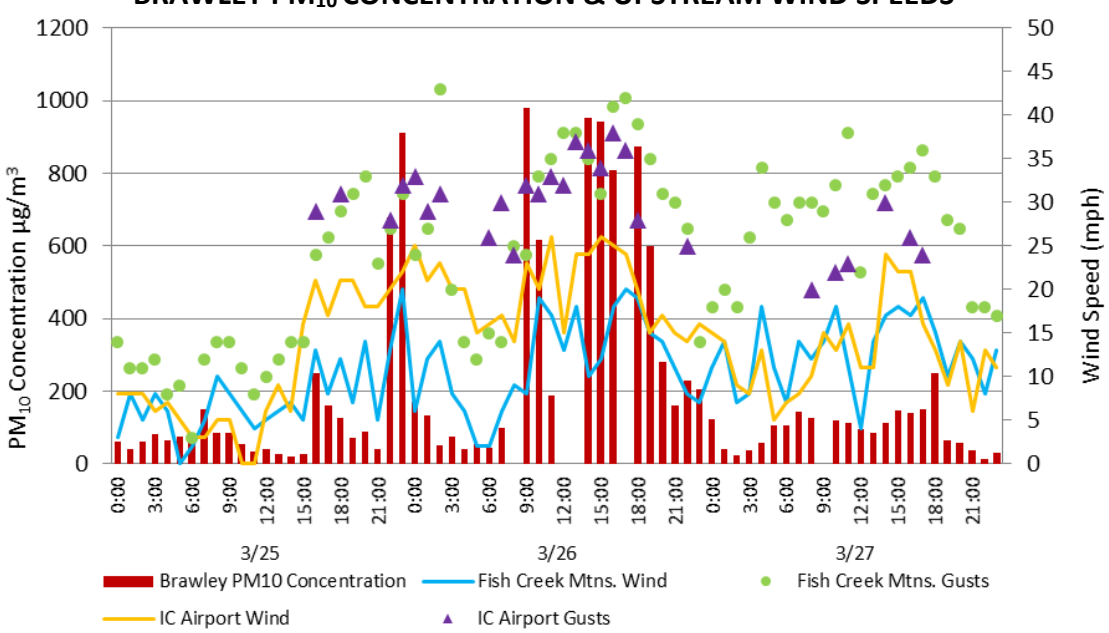

Fig 5-6: Brawley PM_{10} concentrations increased shortly after wind speeds and gusts increased. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD data bank and the University of Utah's MesoWest databank

FIGURE 5-7
NILAND PM_{10} CONCENTRATION & WIND SPEEDS

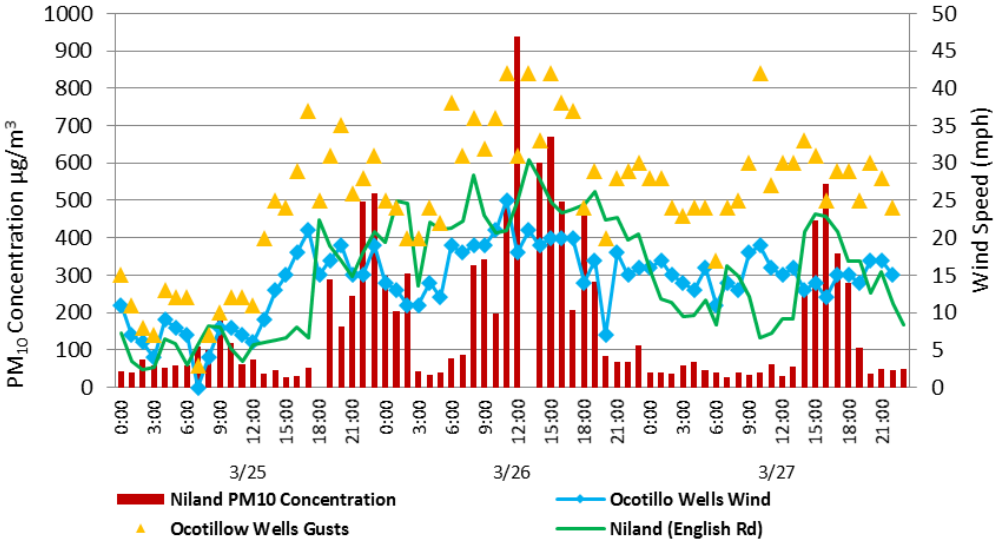

Fig 5-7: Niland PM_{10} concentrations increased shortly after wind speeds and gusts increased. Air quality and Niland wind data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD data bank and the University of Utah's MesoWest databank

Figure 5-8 depicts the observed visibility at Imperial County Airport (KIPL) and El Centro NAF (KNJK) relative to the PM_{10} concentrations at Brawley and Niland. Reduced visibility is near the time of greatest concentration for both sites.

FIGURE 5-8
PM_{10} CONCENTRATIONS & OBSERVED VISIBILITY

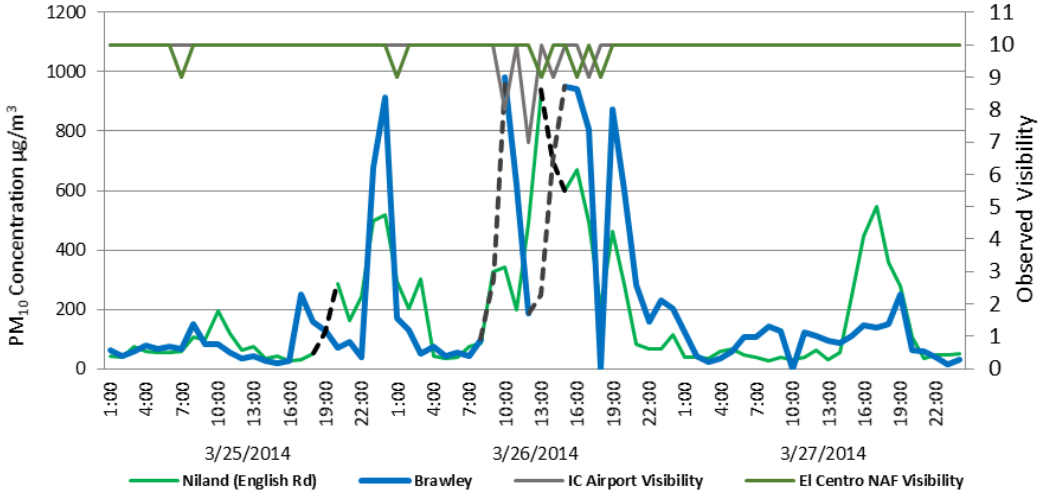

Fig 5-8: The graph illustrates the PM_{10} concentrations at Brawley and Niland relative to visibility at local airfields. Air quality data from the EPA's AQS data bank. Visibility data from the NCEI's QCLCD data bank

Figures 5-9 and 5-10 are the resultant Air Quality Indices (AQI) for Brawley and Niland on March 26, 2014.[5] The Air Quality Index for Brawley was in the "Moderate" or Yellow category from 1 a.m. to 10 a.m. From 11 a.m. to 3 p.m. the AQI increased to the "Unhealthy for Sensitive Groups" or Orange category. From 4 p.m. to 7 p.m. the AQI climbed to the "Unhealthy" or Red category, and from 8 p.m. to 12 a.m. the AQI elevated to "Very Unhealthy" or Purple category. The AQI alert supports that fugitive dust lofted by high winds had impacted the quality of air in Imperial County.

FIGURE 5-9
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY MARCH 26, 2014

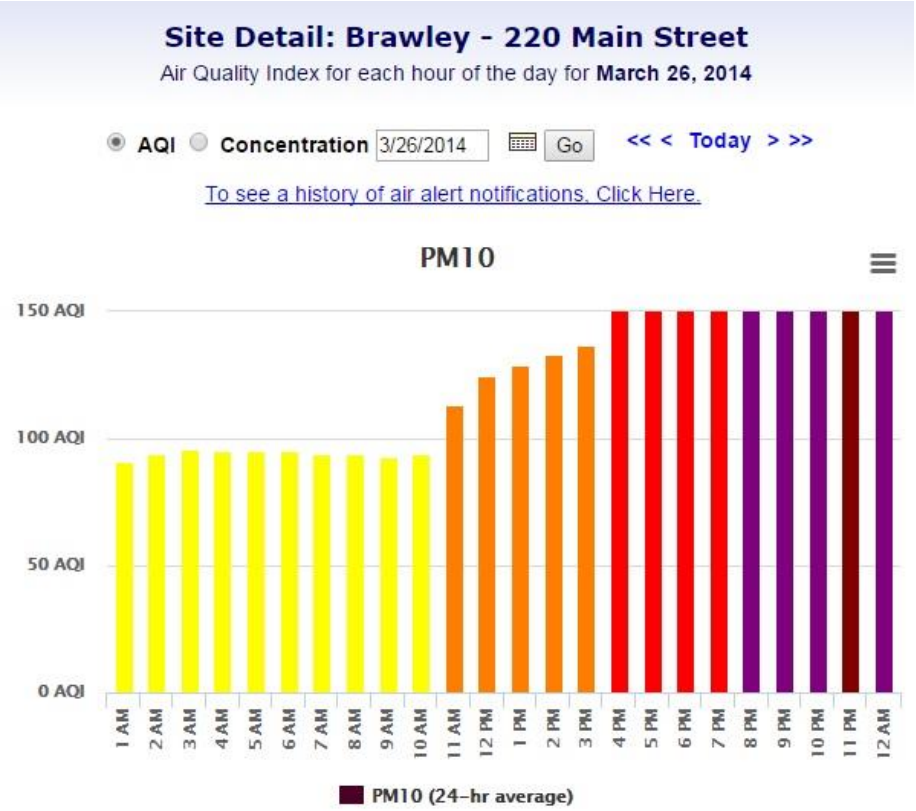

Fig 5-9: Demonstrates that air quality in Brawley was affected when an upper-level low pressure system and associated high winds passed through the area on March 26, 2014

The Air Quality Index for Niland on March 26 was in the "Moderate" or Yellow category from 1 a.m. to 9 a.m. From 10 a.m. to 3 p.m. the AQI increased to the "Unhealthy for Sensitive Groups" or Orange category. From 4 p.m. to 12 p.m. the AQI climbed to the "Unhealthy" or Red category.

[5] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. https://airnow.gov/index.cfm?action=aqibasics.aqi.

AQI alert supports that fugitive dust transported by high winds had impacted the quality of air in Imperial County.

FIGURE 5-10
IMPERIAL VALLEY AIR QUALITY INDEX IN NILAND MARCH 26, 2014

Fig 5-10: Demonstrates that air quality in Niland was affected when an upper-level low pressure system and associated high winds passed through the area on March 26, 2014

V.2 Summary

The preceding discussion, graphs, and figures provide wind speed and concentration data illustrating the spatial and temporal impact of the strong upper-level low pressure system and its associated winds on southeastern California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley and Niland monitors on March 26, 2014. Furthermore, the advisories and issued air quality alerts illustrate the effect upon air quality within the region extending from all of Imperial County and the southern portion of Riverside County and Yuma, Arizona. Large amounts of coarse particles (dust) and PM_{10} were carried aloft by strong westerly winds into the lower atmosphere. The area of origin was desert areas located in the Sonoran Desert on the western edge of Imperial County. Combined, the information demonstrates that the

elevated PM_{10} concentration measured on March 26, 2014, coincided with high wind speeds generated by a low pressure system, and that those winds effected the eastern portion of Riverside County, southeastern San Diego County, all of Imperial County, and portions of southwestern Arizona.

VI Conclusions

The PM_{10} exceedance that occurred on March 26, 2014, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1[6] Technical Elements Exceptional Event Demonstration for High Wind Dust Event (PM_{10})		Document Section
1	whether the event was **not reasonably controllable or preventable** (nRCP)	24-29
2	whether there was **a clear causal** relationship (CCR) "There is a clear causal relationship between the measurement under consideration and the event…"	30-39
3	whether the event **affects air quality** (AAQ) ...the event that is claimed to have affected the air quality in the area";	18-23; 41
4	whether the event was caused by human activity unlikely to recur or was a natural event (HAURL / **Natural Event**) "The event satisfies the criteria set forth in 40 CFR §50.1(j)" for the definition of an exceptional event (see above);	12-39

VI.1 Affects Air Quality

The preamble to the EER states that an event is considered to have affected air quality if it can be demonstrated that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that the event in question affected air quality.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." This requirement is met by demonstrating that, despite BACM in place in Imperial County, high winds overwhelmed all BACM controls. The PM_{10} exceedances measured at the Brawley and Niland monitors and discussed within this report was caused by naturally occurring strong gusty winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonora Desert regions to the west and west-southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedance on March 26, 2014, was not reasonably controllable or preventable.

[6] 40 CFR §50.1

VI.3 Natural Event

As discussed within this demonstration, the PM_{10} exceedances which occurred in Brawley and Niland on March 26, 2014, were caused by transport of fugitive dust into Imperial County by strong predominantly west to west-southwest winds behind an upper-level low pressure system. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at different areas in Imperial and Riverside County monitors demonstrates a consistency of elevated gusty winds and concentrations of PM_{10} at the Niland monitor on March 26, 2014 (section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty winds were an event that was widespread, regional and uncontrollable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty winds. Finally, days immediately before and after the high wind event had PM_{10} concentrations well below the NAAQS.

VI.5 Historical Norm

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley and Niland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1)(i))

This section contains wind advisories and blowing dust advisories issued by the NWS on March 26, 2014. In addition, this appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds.

Appendix B: Meteorological Data.

This appendix contains graphs and other supporting meteorological documentation for selected monitors in Imperial County, southeastern California, and Yuma, Arizona. These graphs demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds.

This appendix contains the graphs depicting the correlations between PM_{10} concentrations and elevated wind speeds for selected monitors in Imperial County, Riverside County, and Yuma, Arizona. These graphs demonstrate the regional impact of the wind event. These graphs show an increase in PM_{10} concentrations in Imperial County coincident with the arrival of high wind speeds and wind gusts.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.