IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

Isolated monsoon thunderstorm southwest of Winslow Coconino County Arizona –
https://www.flickr.com/photos/zoniedude1/14994829027/?ytcheck=1&new_session=1

July 16, 2014
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

August 24, 2018

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ACRONYM	DESCRIPTIONS
AOD	Aerosol Optical Depth
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)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
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/PSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Regional Airport)
LST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
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
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On July 16, 2014, a State and Local Ambient Air Monitoring Station (SLAMS), located in Westmorland (AQS Site Code 06-025-4003), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Westmorland Federal Referenced Method (FRM) Size-Selective Inlet (SSI) High Volume Gravimeter sampler measured a (midnight to midnight) 24-hour (hr) average Particulate Matter less than 10 microns (PM_{10}) concentration of 167 µg/m^3 (**Table 1-1**). The SLAMS network on July 16, 2014 included two Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020's (BAM 1020), located in Brawley and Niland, capable of measuring hourly concentrations. 24-hr measurements measured above the 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Westmorland was the only station, in Imperial County to measure an exceedance of the PM_{10} NAAQS on July 16, 2014.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON JULY 16, 2014

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
7/16/2014	**Westmorland**	**06-025-4003**	**1**	**24**	**167**	**150**
7/16/2014	Calexico	06-025-0005	1	24	43	150
7/16/2014	El Centro	06-025-1003	2	24	-	150
7/16/2014	Brawley	06-025-0007	1	24	148	150
7/16/2014	Brawley	06-025-0007	3	22	63	150
7/16/2014	Niland	06-025-4004	1	24	116	150
7/16/2014	Niland	06-025-4004	3	24	142	150

All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]
El Centro Hi Vol did not run as scheduled - Operator error

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). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On July 16, 2014, the Westmorland monitor was impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from winds associated with a somewhat complex weather pattern over the west. On July 16, 2014, a narrow ridge high pressure over the Great Basin squished from both sides by an upper

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term "standard time" or "daylight time". For year-round use, the designation can be left off inferring "local time" daylight or standard whichever is present. For 2014, Pacific Daylight Time (PDT) is March 9 through November 2. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

level low off the Southern California coast and a trough digging over the intermountain west allowed the strengthening of onshore pressure gradients over southern California.[2]

This report demonstrates that a naturally occurring event caused an exceedance observed on July 16, 2014, which elevated particulate matter and affected air quality. The report provides concentration-to-concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedance would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude the PM_{10} 24-hour NAAQS exceedance of 167 µg/m^3 (**Table 1-1**) 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)[3].

I.1 Demonstration Contents

Section II - Describes the July 16, 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 - Using time-series graphs, summaries and historical concentration comparisons of the Brawley, Niland and Westmorland stations this section discusses and establishes how the July 16, 2014 event affected air quality demonstrating that a clear causal relationship exists between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM_{10} data measured in both local conditions and standard conditions. Measured PM_{10} continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the July 16, 2014 event and its resulting emissions defining the event as a “natural event”.[4]

Section IV - Provides evidence that the event of July 16, 2014 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that

[2] Area Forecast Discussion National Weather Service San Diego CA 755 AM PST (855 AM PDT) Wednesday, July 16, 2014.
[3] "Treatment of Data Influenced by Exceptional Events; Final Rule", 72 FR 13560, March 22, 2007
[4] Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

I.2 Requirement 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 (40 CFR §50.14(c)(1))

The ICAPCD and the National Weather Service (NWS) provided notification via the ICAPCD's webpage that gusty westerly winds may affect Imperial County during the afternoon to evening hours. Forecast of west winds 10 to 20 mph with gust up to 20-30 mph could affect the 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 pertinent to the July 16, 2014 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

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) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification, accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place a preliminary flag on the SLAMS measured concentrations in Westmorland. The request dated May 28, 2015 requested an initial flag for the measured concentration from the Westmorland FRM SSI of 167 $\mu g/m^3$. Subsequently, after submittal of the request, CARB received corrected FEM data measurements in standard conditions, originally submitted in local conditions. USEPA requires data in standard conditions when making regulatory decisions. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for July 16, 2014. The submitted request included a brief description of the meteorological conditions for July 16, 2014 indicating that a potential natural event occurred.

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 March 12, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 167 µg/m^3 (**Table 1-1**) which occurred on July 16, 2014 in Westmorland. The final closing date for comments was April 11, 2018 **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)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

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 in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2014.

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 submittal of the January 31, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

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 July 16, 2014, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
- b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
- c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
- d The event “is not reasonably controllable and not reasonably preventable.”
- e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
- f 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 Westmorland supporting that the event affected the air quality in Imperial County.

C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II July 16, 2014 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the July 16, 2014 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)**. The Colorado Desert not only in includes Imperial County but a portion of San Diego County.

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 approximately 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, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6)**. Together, the incorporated cities, including Niland, and the 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.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK

Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS

Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Gorgonio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT

Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

Fig 2-6: 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

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County, four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedance on July 16, 2014, occurred at the Westmorland monitor. The Westmorland monitor is part of the "northern" monitoring sites within the Imperial County air-monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on July 16, 2014 other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

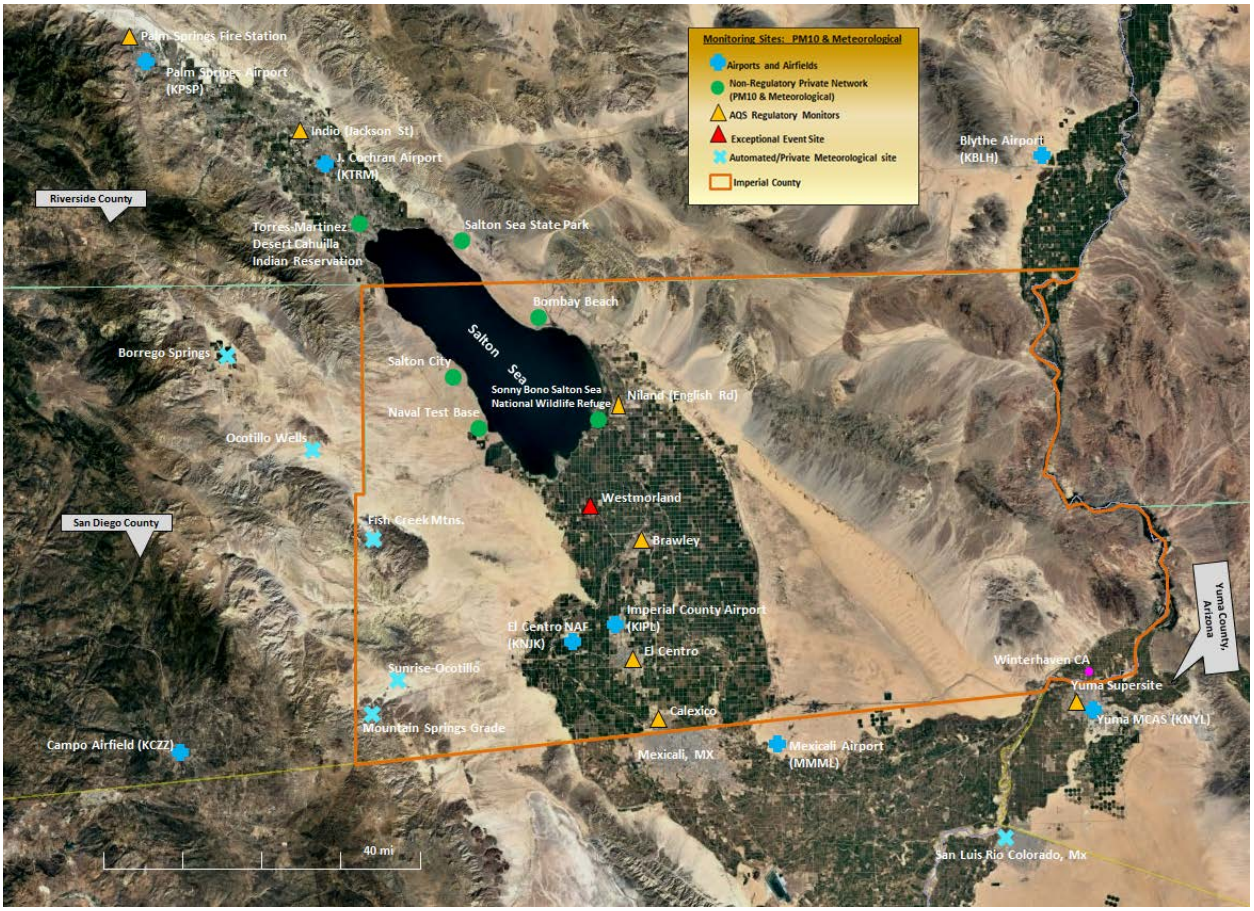


Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These privately owned stations are non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062˚W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593˚W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral

vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310˚W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST

Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION

Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST

Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe. https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION

Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

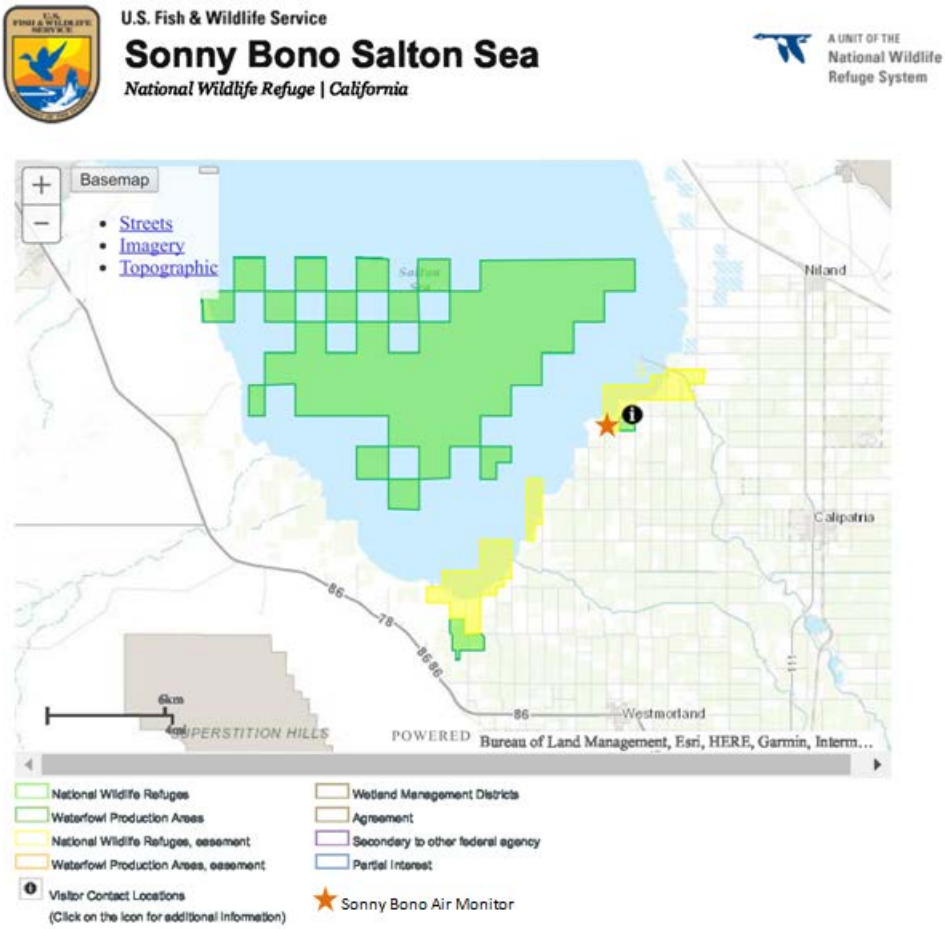


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U. S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/SonnyBonoSaltonSea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
JULY 16, 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 Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY											
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	148	-	-	-	-
		BAM 1020					63.7	397.9	16:00		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	43	-	-	14.8	17:00
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	-	-	-	10.8	16:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	116	-	-	21.5	19:00
		BAM 1020					142.6	655	18:00		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	167	-	-	-	-
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	32.6	66	19:00	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	84.7	383	20:00	-	-
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	37.1	110	20:00	-	-

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

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) 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 2-15
SONORAN DESERT REGION

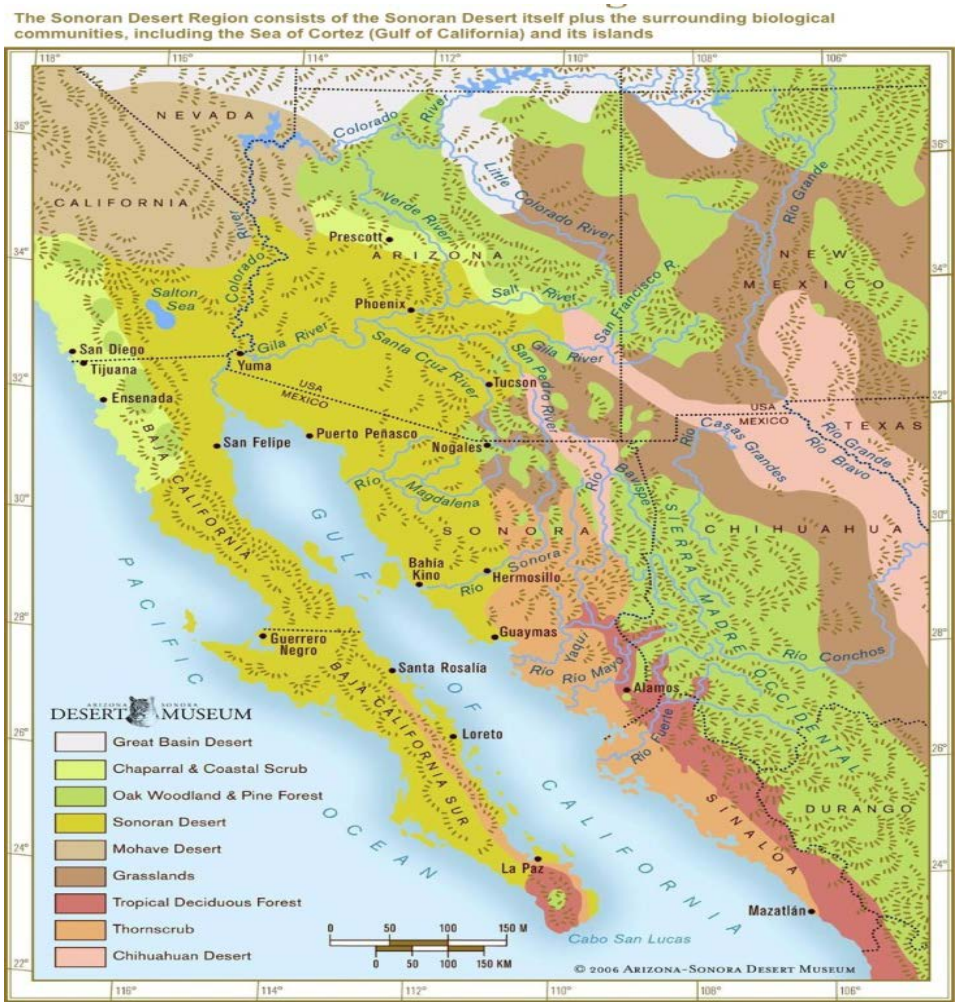


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

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 which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, 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).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 3.11" (**Figure 2-16)**. During the 12-month period prior to July 16, 2014, Imperial County measured total annual precipitation of 2.12 inches. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

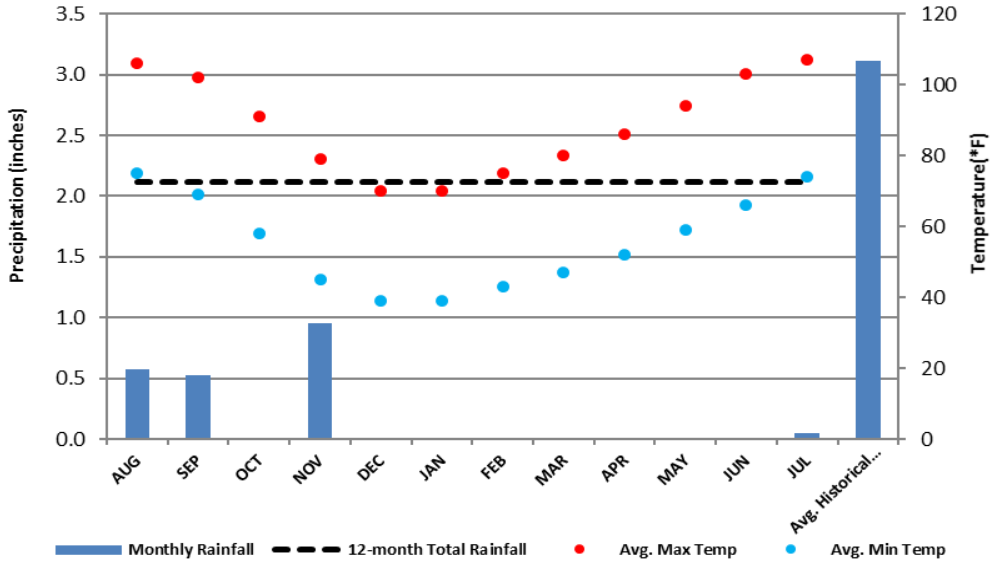


Fig 2-16: The total annual precipitation prior to the July 16, 2014 event measured an abnormally low total annual precipitation of 2.12 inches. Average annual precipitation is 3.11 inches (1971 through 2010). Meteorological data courtesy of Weather Underground, California Observed Climate Normals, and Western Regional Climate Center (WRCC) http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[5] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

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 causing variable west winds. These strong winds suspend dust into the atmosphere and transport windblown dust over long distances, especially if soils in the region are dry.

II.3 Event Day Summary

The exceptional event for July 16, 2014, caused by a somewhat complex weather pattern over the west, which was not a typical monsoonal event or a typical fall, spring or winter event. Essentially, the event was caused when a narrow ridge of high pressure over the Great Basin being squished from both sides by an upper-level low off the Southern California coast and a trough digging over the intermountain west, caused the strengthening of onshore pressure gradients.[6] As Southern California remained situated between a low pressure off the west coast and a high pressure to the east, cool conditions continued with a weak to moderate onshore flow. The strengthening of the onshore flow caused locally gusty winds across the mountains and deserts of San Diego County during the afternoon and evening.[7]

On July 16, 2014, moderately gusty west winds blew across the mountains and desert slopes of San Diego County, entraining fugitive windblown dust into Imperial County. **Figures 2-17 and 2-21** provide information regarding the expected movement of the low pressures and high

[5] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html
[6] Area Forecast Discussion National Weather Service San Diego CA, 755 AM PST (855 AM PDT), Wednesday, July 16, 2014
[7] Area Forecast Discussion National Weather Service San Diego CA, 804 PM PST (904 PM PDT) Wednesday, July 16, 2014

pressures and the position of the accompanying trough extending southward from southern Nevada into southeast California, southwest Arizona, and the northern part of Mexico.

FIGURE 2-17
FORECAST MODEL FOR JULY 16, 2014

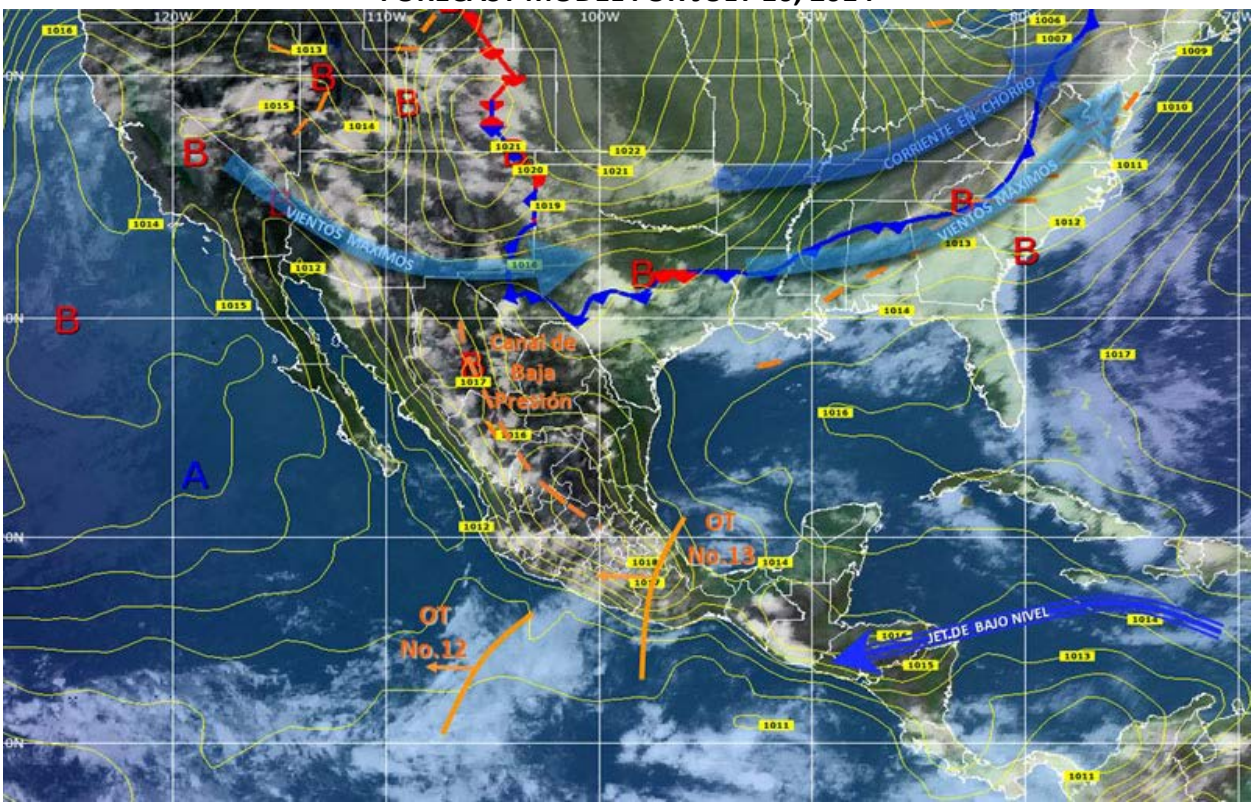


Fig 2-17: A forecast model for July 16, 2014 issued by e-consulta.com in Oaxaca Mexico. The article found in **Appendix A** describes a low-pressure channel located northwest to the west of the national territories in Mexico. The forecast model illustrates the path and expected low-pressure (B) position over southeastern California near the Nevada and Arizona borders and the expected flow of the maximum winds (blue arrow sweeping east "Vientos Maximos"). Note the estimated proximity of the high pressure (A) with the low pressure (B). Image courtesy of e-consulta.com Oaxaca

FIGURE 2-18
FORECAST MODEL FOR JULY 17, 2014

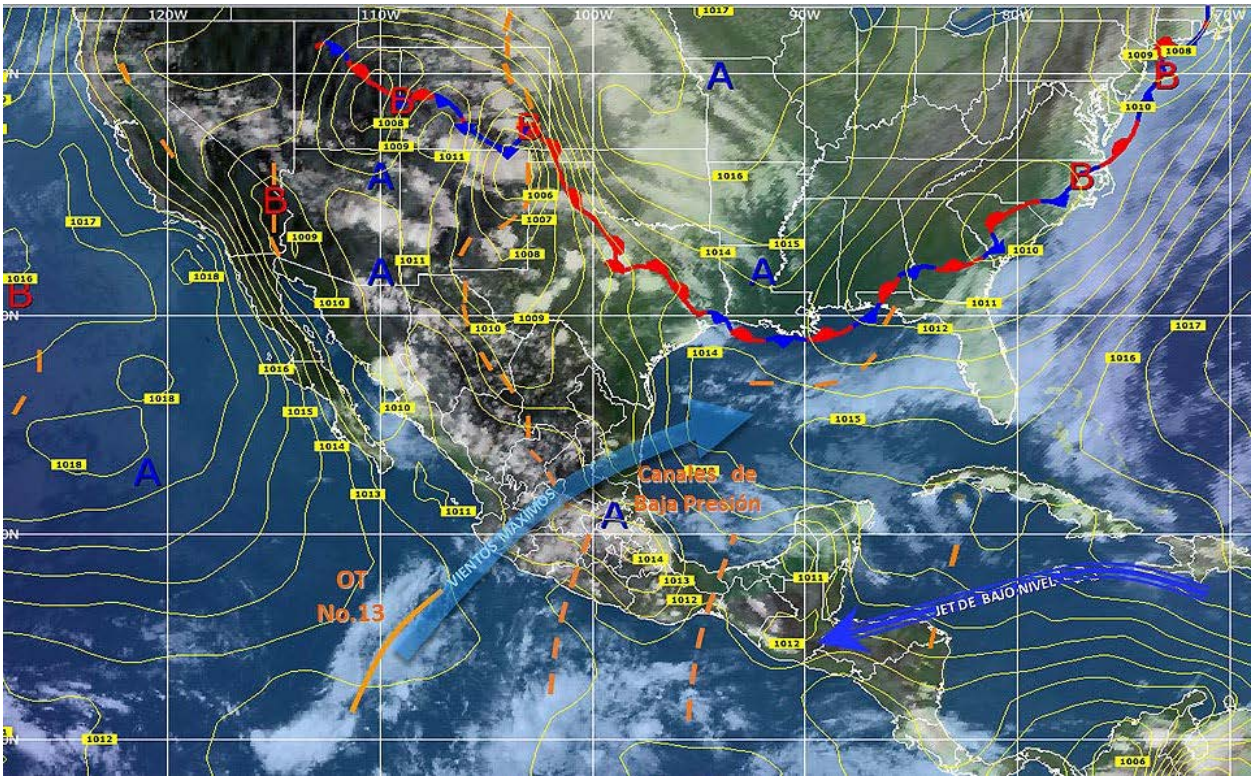


Fig 2-18: A forecast model for July 17, 2014 issued by e-consulta.com in Oaxaca Mexico illustrated here to allow for the emphasis of the movement of the anticipated high pressure (A) ridge over the Great Basin. The article found in **Appendix A** describes two tropical waves and a low-pressure channel continuing to affect the territories of Mexico (northwest and north). The forecast model illustrates the path and expected low-pressure (B) position over southeastern California near the Nevada and Arizona borders and the continued estimated proximity of the high pressure (A) to the east of the low pressure (B). Image courtesy of e-consulta.com Oaxaca

FIGURE 2-19
DAILY WEATHER MAP JULY 16, 2014

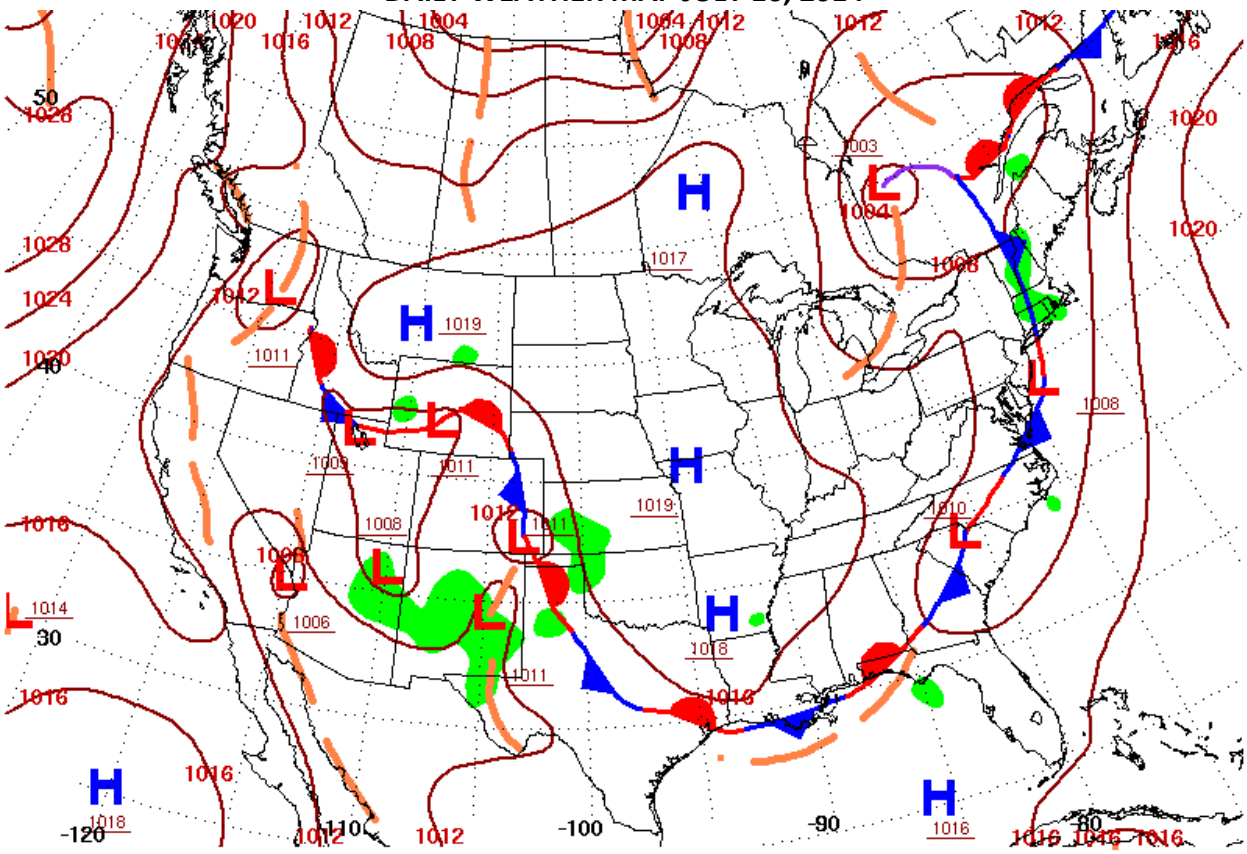


Fig 2-19: A daily weather map, issued at 0400 PST on July 16, 2014 illustrates a low-pressure system centered just to the north of Imperial County, with a trough sitting on the California-Arizona border. The image similarly illustrates the position of the High Pressure to the east and west of the low pressure that affected Imperial County. Image courtesy of the National Centers for Environmental Prediction, Weather Prediction Center

FIGURE 2-20
DAILY WEATHER MAP JULY 16, 2014

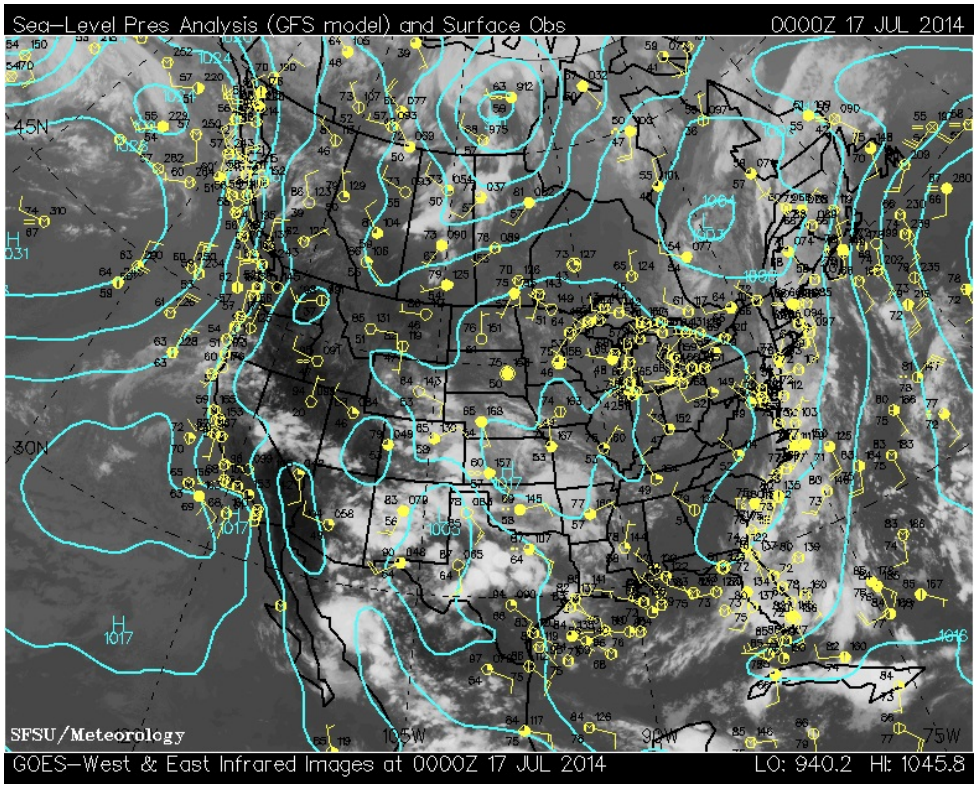


Fig 2-20: A GOES E-W infrared satellite image (1600 PST July 16, 2014) shows the pressure system over CA-NV-AZ and the packing of the surface gradient that created the gusty westerly winds. Source: SFSU Department of Earth and Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/sathts_arch.html

FIGURE 2-21
GOES-W VISIBLE INFRARED SATELLITE IMAGES JULY 16, 2014

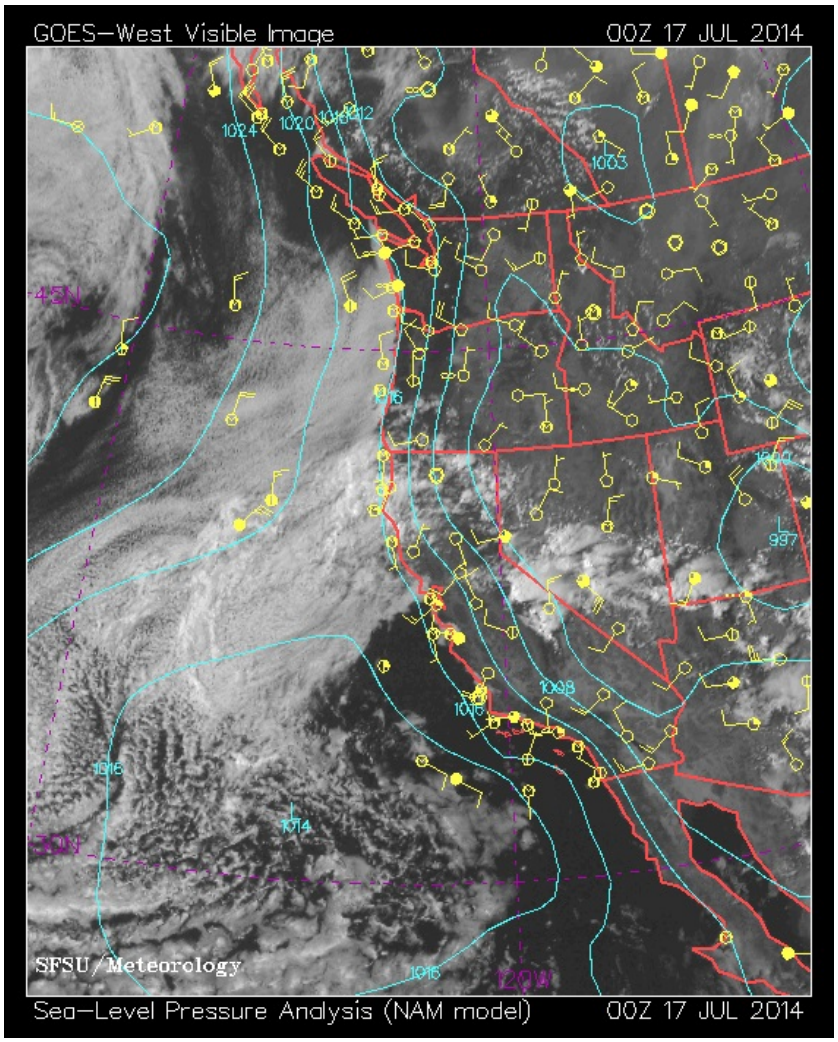


Fig 2-21: A GOES-W visible satellite image (1600 PST) captured on July 16, 2014, shows wind barbs indicating moderately strong southwest to west winds over southeastern California. Source: SFSU Department of Earth and Climate Sciences and the California Regional Weather Server; http://squall.sfsu.edu/crws/archive/wcsathts_arch.html

As explained above, the July 16, 2014 event was not a typical monsoonal or spring event. While the NWS Phoenix office grappled with monsoonal activity along the central and eastern portions of Arizona, forecast models as early as July 14, 2014 indicated a drying and warming trend devoid of convection for Southeast California and Southwest Arizona.[8] The NWS Phoenix office published several notices indicating a transition of monsoonal moisture plumes transitioning eastward from Maricopa and Gila Counties. The San Diego NWS office confirmed the potential for drier air and an end to any chances for diurnal driven convection as early as July 14, 2014.

[8] Area Forecast Discussion National Weather Service Phoenix AZ 733 PM PST (833 PM MST) and San Diego CA 830 PM PST (930 PM PDT), Monday, July 14, 2014.

There was an expected shift from an east to southeasterly flow aloft by the evening hours of July 15, 2014 to a south and southwest flow pattern. By July 16, 2014, the San Diego NWS office identified an increasing onshore flow with potential winds 23 to 28 mph and gusts 46 mph mainly through the mountain passes and desert slopes. The published July 16, 2014 at 8:45pm MST (7:45pm PST) discussion by the Phoenix NWS office confirmed a shift in the weather pattern.

Figure 2-20 provides times, wind speeds and gusts for July 16, 2014. Gusty winds commenced during the evening to morning hours of July 15, 2016 to July 16, 2014 within the mountain passes and desert slopes of San Diego County. However, by noon, local airports, Imperial County Airport (KIPL) and the Naval Air Facility (KNJK) both measured west to southwest elevated winds and gusts. As winds continued through the day, both the Niland and Brawley, monitors measured elevated concentrations of PM_{10}. The Jacqueline Cochran Regional Airport (KTRM) and Palm Springs International Airport (KPSP) in Riverside County, the Naval Air Facility (KNJK) in Imperial County, and Imperial County Airport (KIPL), all measured wind gusts of 30 mph or above.

FIGURE 2-22
RAMP-UP ANALYSIS JULY 16, 2014

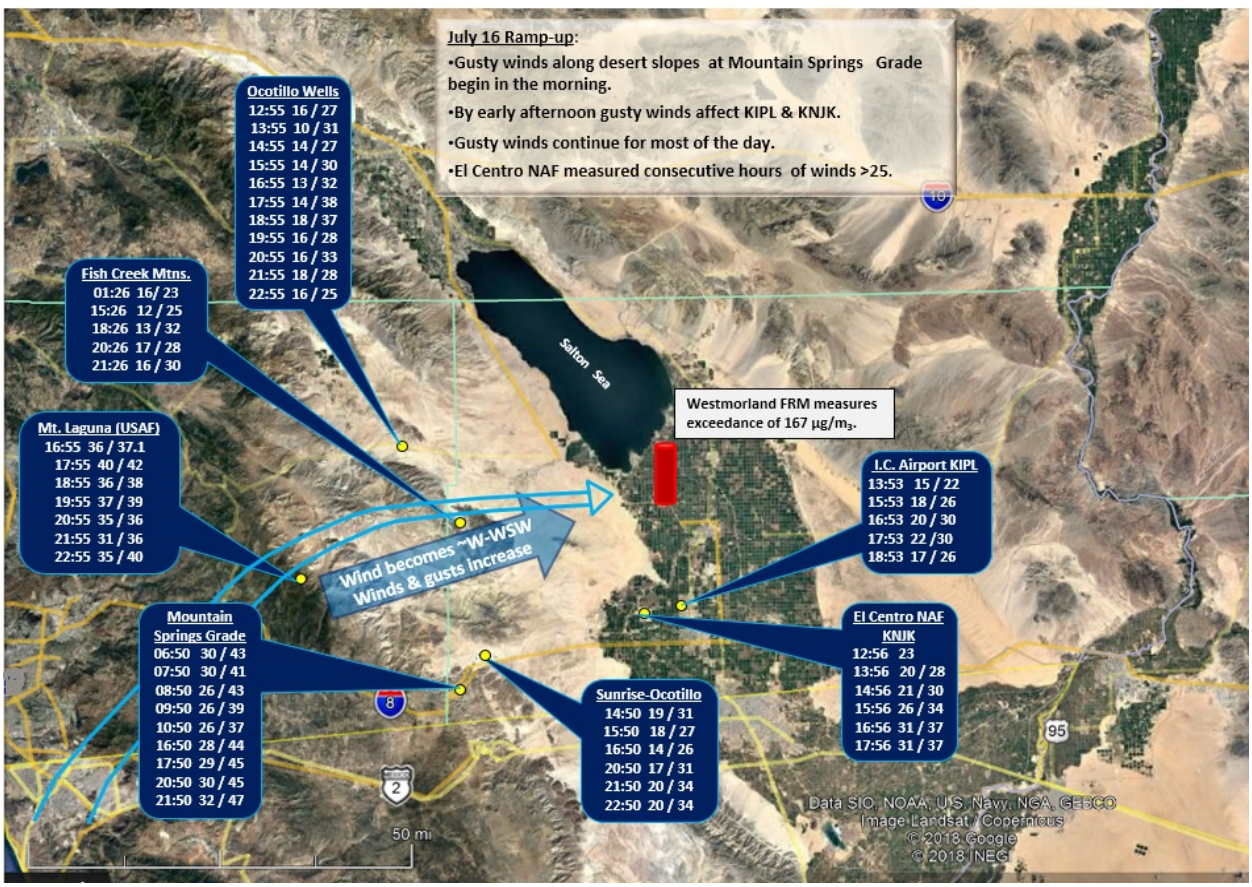


Fig 2-22: Gusty winds early in the morning at Mountain Springs Grade travelled into Imperial County reaching KIPL and KNJK by noon coincident with elevated wind speeds, gust and a shift to a westerly wind direction. Wind data from the NCEI's QCLCD system. Air quality data is from the EPA's AQS system. Google base map

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON JULY 16, 2014

Station Monitor Airport Meteorological Data	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed Niland
IMPERIAL COUNTY						
Imperial Airport (KIPL)	22	260	17:53	30	16:53	243
Naval Air Facility (KNJK)	31	250	16:56	37	16:56	97
Calexico (Ethel St)	14.8	275	17:00	-	-	243
El Centro (9th Street)	10.8	272	16:00	-	-	97
Niland (English Rd)	21.5	259	19:00	-	-	596
RIVERSIDE COUNTY						
Blythe Airport (KBLH)	20.7	220	14:52	29.9	12:52	29.9
Palm Springs Airport (KPSP)	25	320	16:53	32	15:53	97.2
Jacqueline Cochran Regional Airport (KTRM) - Thermal	24	340	19:52	33	20:52	596.0
ARIZONA - YUMA						
Yuma MCAS (KNYL)	15	300	19:57	22	19:57	596.0
MEXICALI - MEXICO						
Mexicali Int. Airport (MXL)	18.4	280	17:41	-	-	243.0

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back-trajectory model,[9] **Figure 2-23**, indicates that airflow passed through the San Diego mountain passes and desert slopes into Imperial County. The HYSPLIT model confirms that airflow passed over the mountains and desert areas west of the monitors allowing gusty westerly winds to transport windblown dust affecting PM_{10} monitors throughout southeastern California and Arizona. On July 16, 2014, a scheduled run day for FRM SSI's, Westmorland, Niland and Brawley measured 24-hr concentrations above 100 µg/m^3. The Calexico FRM SSI measured a 24-hr concentration below 50 µg/m^3 while the El Centro monitor had equipment failure. The elevated levels of PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties illustrate the regional nature of the event (**Tables 2-1 and 2-2**). Of note, modeled winds differ

[9] 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.

from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-23
HYSPLIT MODEL JULY 16, 2014

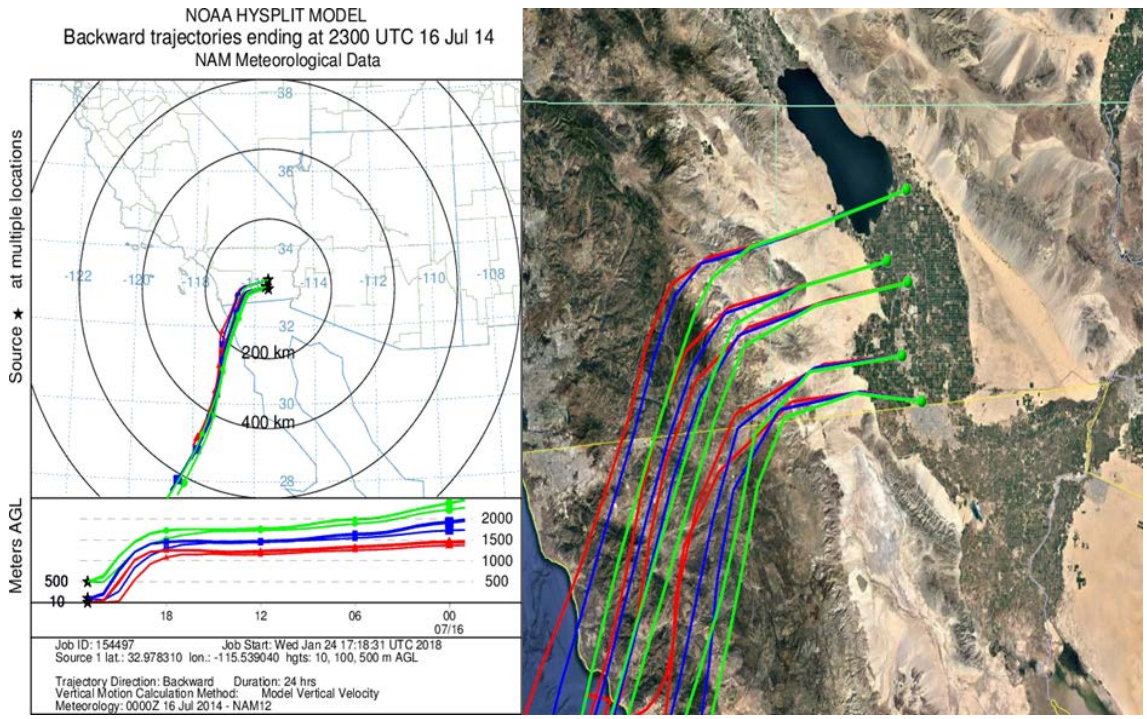


Fig 2-23: A 24-hour back trajectory ending at Westmorland at 1600 PST illustrates the southwesterly airflow over the San Diego Mountains and into Imperial County. The ending trajectory time is coincident with the maximum hourly measured concentration at the Brawley monitor. The maximum hourly concentration measured at the Niland monitor occurred at the 1800 hour PST. Red HYSPLIT indicates air movement ending at the 10 meter AGL (above ground height); blue is 100 meters AGL, and green is 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory

Figures 2-24 and 2-25 illustrate the measured wind speeds and elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties on July 15, 2014 through July 17, 2014. The Westmorland monitor measured elevated concentrations coincident with continual measured wind speeds and gusts above 20mph, with more than one hour at or above 25pmh.

The resulting entrained dust and accompanying winds, particularly wind gusts from the system qualify this event as a "high wind dust event".[10] High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where

[10] Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the July 16, 2014 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-24
72 HOUR PM_{10} CONCENTRATIONS AT VARIOUS STATIONS

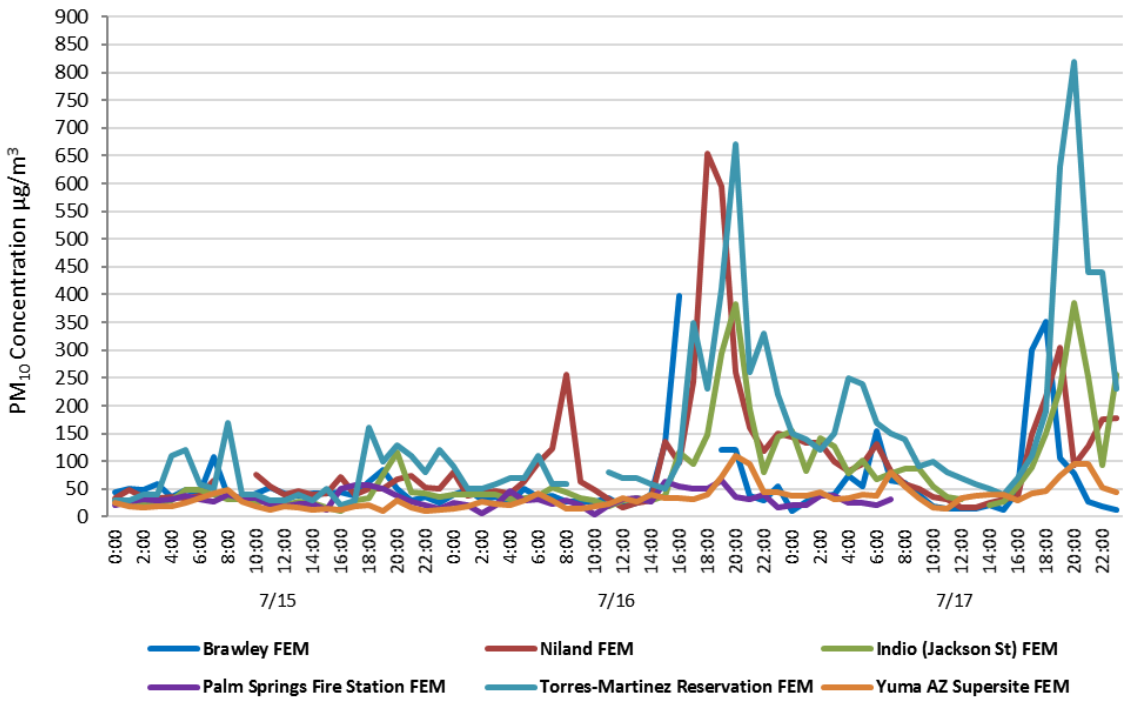


Fig 2-24: Is the graphical representation of the 72-hour relative PM_{10} concentrations at various monitoring locations throughout Riverside, Imperial, and Yuma counties. The graph clearly demonstrates the elevation of PM_{10} concentration on July 16, 2014 at most sites. Air quality data from the EPA's AQS data bank

FIGURE 2-25
72 HOUR WIND SPEEDS AT AIRPORTS AND NEIGHBORING SITES

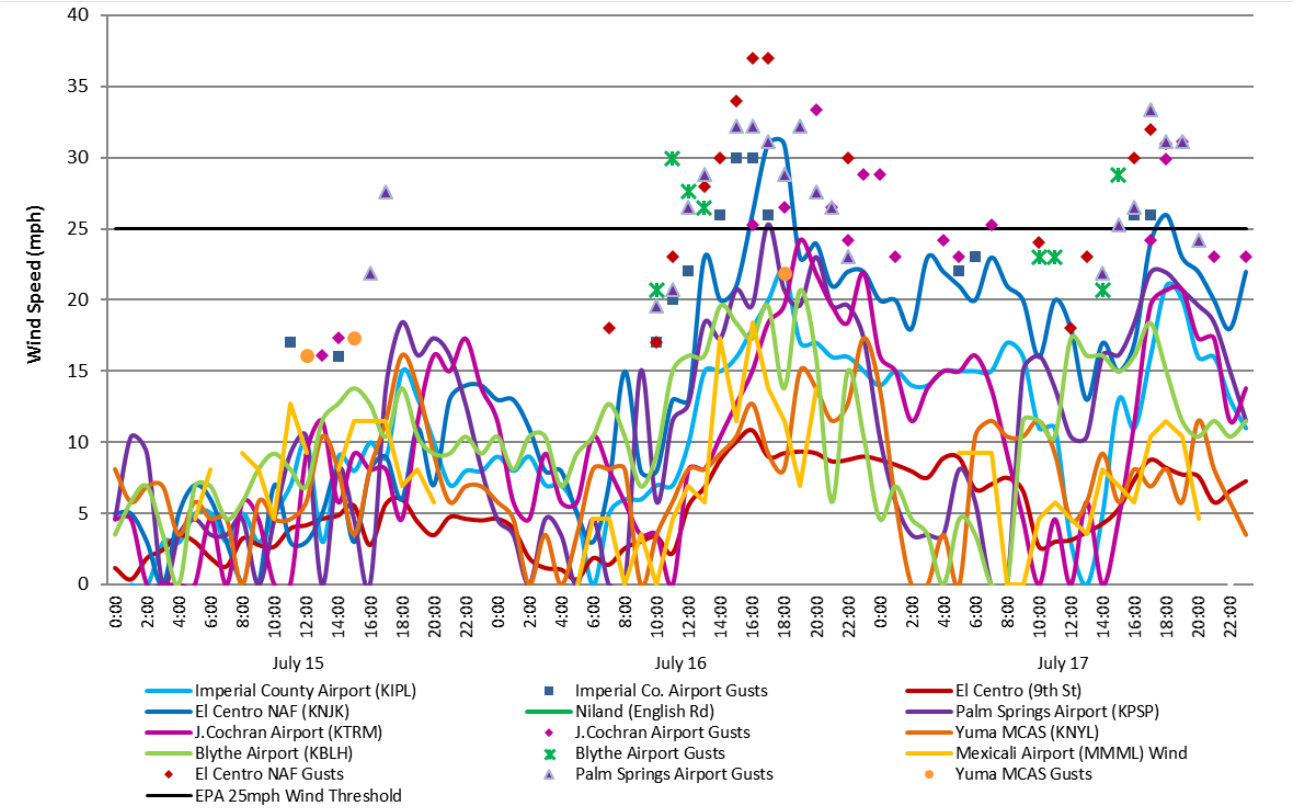


Fig 2-25: Meteorological data collected from regional sites over a three-day period from July 15, 2014 to July 17, 2014 illustrates a uniform spike in wind speed during the July 16, 2014 exceptional event. Wind data from the EPA's AQS system, the Weather Underground, and the NCEI's QCLCD data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Westmorland monitor on July 16, 2014 compared to non-event and event days demonstrate the variability over several years and seasons. The analysis also provides supporting evidence that there exists a clear causal relationship between the July 16, 2014 high wind event and the exceedance measured at the Westmorland monitor.

Figures 3-1 and 3-2 shows the time series of available FRM 24-hr PM_{10} concentrations at the Westmorland monitor for the period of January 1, 2010 through July 16, 2014.[11] Between January 1, 2010 and July 16, 2014 a continuous BAM monitor did not exist at the Westmorland site, thus no hourly concentrations are available for analysis. Properly establishing the variability of the event, as it occurred on July 16, 2014, 24-hour averaged PM_{10} concentrations between January 1, 2010 and July 16, 2014 were compiled and plotted as a time series. The figures illustrate that the exceedance, which occurred on July 16, 2014, was outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[11] No operating continuous monitors installed between January 1, 2010 and July 16, 2014 in Westmorland.

FIGURE 3-1
WESTMORLAND HISTORICAL COMPARISON
FRM 24 HR AVG PM_{10} CONCENTRATIONS
JANUARY 1, 2010 TO JULY 16, 2014

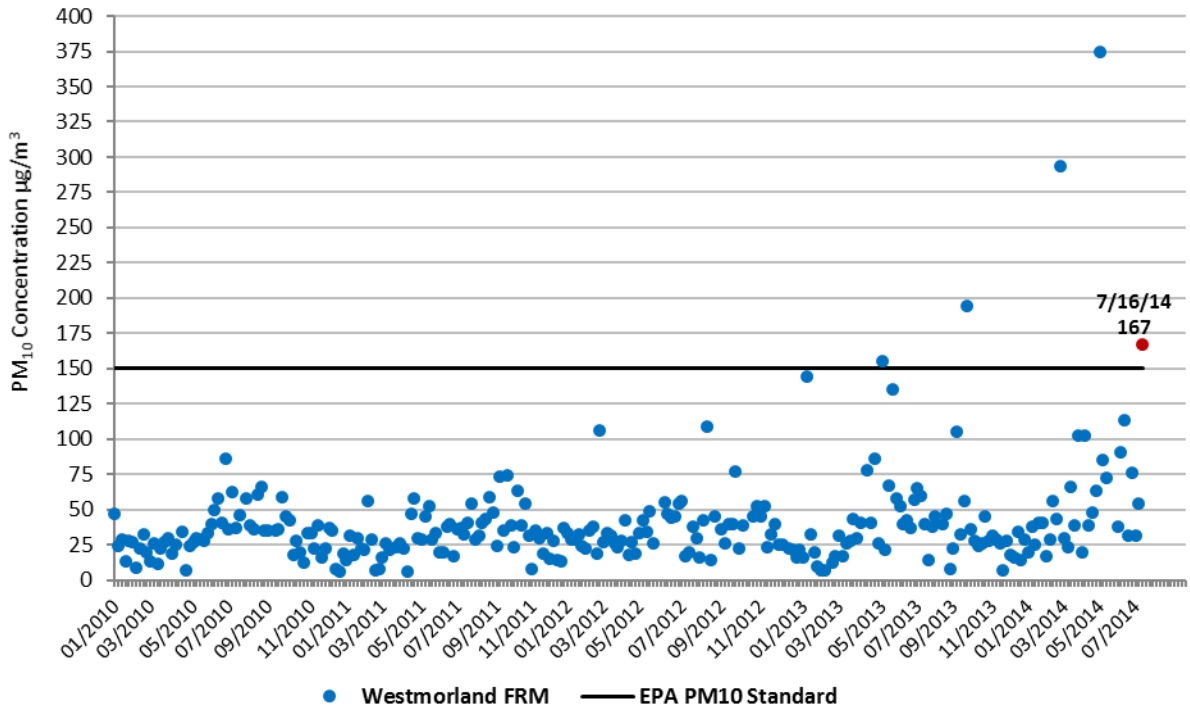
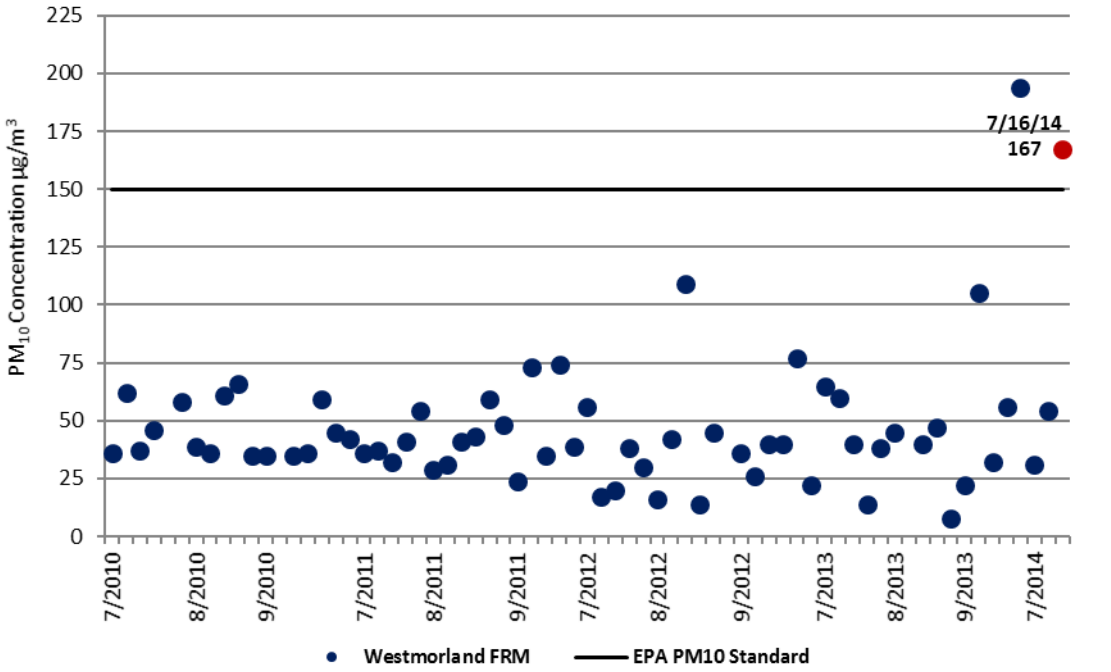


Fig 3-1: A historical comparison of PM_{10} concentrations demonstrates that the measured concentration of 167 µg/m^3 on July 16, 2014 by the Westmorland monitor was outside the normal historical concentration when compared to similar event days and non-event days. Of the 277 sampling day there were 5 measured exceedance days which is less than a 2.0% occurrence rate

The time series, **Figure 3-1**, for Westmorland included 274 credible samples measured between January 1, 2010 and July 16, 2014, or 277 sampling days.

Overall, the time series illustrates that the Westmorland monitor, measured five (5) exceedance days out of the 274 credible samples, which is less than a 2.0% occurrence rate. Of the five (5) exceedance days, two where measured during the third quarter (July through September). The remaining three (3) exceedance days occurred during the first, second and fourth quarters. No exceedances of the standard occurred during 2010.

FIGURE 3-2
WESTMORLAND SEASONAL COMPARISON
FRM 24 HR AVG PM_{10} CONCENTRATIONS
***JULY 1, 2010 TO JULY 16, 2014**



***Quarterly; July 1, 2010 to September 30, 2013 and July 1, 2014 to July 16, 2014**

Fig 3-2: A comparison of PM_{10} seasonal concentrations demonstrate that the measured concentration of 167 µg/m^3 by the Westmorland monitor on July 16, 2014 was outside the normal seasonal concentrations when compared to similar days and non-event days. Of the 66 sampling day there were two (2) measured exceedance days which is less than a 3.5% occurrence rate

Figure 3-2 displays the seasonal fluctuation over 66 sampling days at the Westmorland monitor third quarter (July to September) between 2010 and 2014. The Westmorland monitor measured 65 credible samples over 66 sampling days. Of the 66 sampling days, there were two (2) measured exceedance days, which equates to less than a 3.5% occurrence rate. The July 16, 2014 measured concentration at the Westmorland monitor was outside the normal historical and seasonal concentrations when compared to both event days and non-event days.

FIGURE 3-3
WESTMORLAND HISTORICAL
FRM 24 HR AVG PM_{10} CONCENTRATIONS
JANUARY 1, 2010 TO JULY 16, 2014

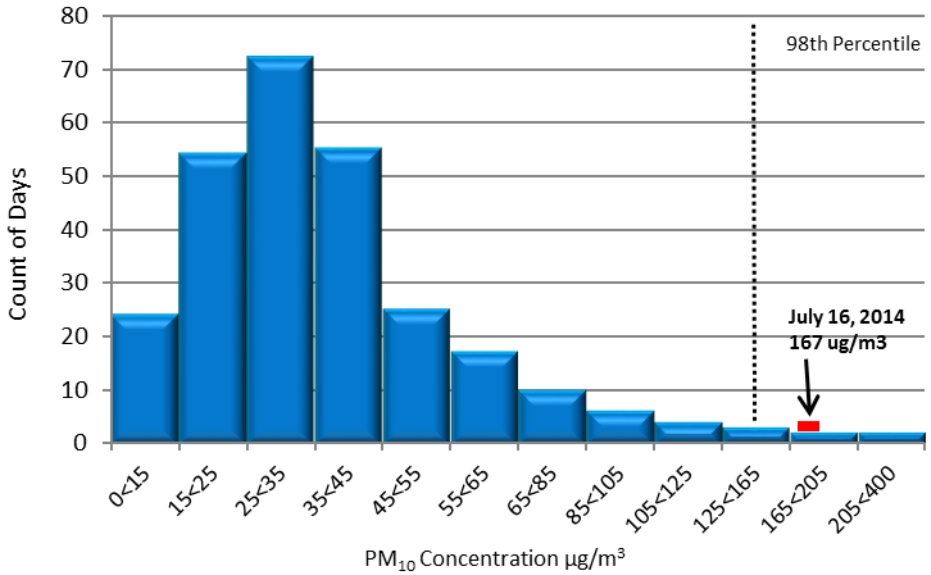


Fig 3-3: The 24-hr average PM_{10} concentrations measured at the Westmorland monitor demonstrates that the July 16, 2014 event was in excess of the 98th percentile

Figure 3-3 is a percentile ranking of historical concentrations. The July 16, 2014 value is in excess of the 98th percentile

For the FRM data set the annual historical and the seasonal historical PM_{10} concentration of 167 µg/m^3 is above the 98th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile ranking, the July 16, 2014 measured exceedances of 167 µg/m^3 is clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plot, seasonal time series plot, and the percentile ranking illustrate that the PM_{10} concentration observed on July 16, 2014 occur infrequently. When comparing the measured PM_{10} levels on July 16, 2014 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedance measured at the Westmorland site was outside the normal historical and seasonal historical concentrations.

The historical concentration analysis provided here supports the determination that the July 16, 2014 natural event affected the concentrations levels at the Westmorland monitor causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured

exceedance on July 16, 2014 and the natural event, qualifying the natural event as an Exceptional Event.

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IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the "not reasonably controllable or preventable" (nRCP) criterion as two prongs. To address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures to consider the measures as enforceable. USEPA considers control measures enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for "high wind events" when PM_{10} concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a "natural event" where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for July 16, 2014. In addition, this July 16, 2014 demonstration provides technical and non-technical evidence that a somewhat complex weather pattern over the west, which was not a typical monsoonal event or a typical fall, spring or winter event occurred.[12] Essentially, the event was caused when a narrow ridge of high pressure over the Great Basin, squished from both sides by an upper-level low off the Southern California coast and a trough digging over the intermountain west, caused the strengthening of onshore pressure gradients.[13] As Southern California remained situated between a low pressure off the west coast and a high pressure to the east, cool conditions continued with a weak to moderate onshore flow. The strengthening of the onshore flow caused locally gusty winds across the mountains and deserts of San Diego County during the afternoon and evening hours of July 16, 2014.[14] This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the July 16, 2014 EE.

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

[12] Area Forecast Discussion National Weather Service San Diego CA 755 AM PST (855 AM PDT) Wednesday, July 16, 2014.
[13] Area Forecast Discussion National Weather Service San Diego CA 1225 PM PST (125 PM PDT) Wednesday, July 16, 2014.
[14] Area Forecast Discussion National Weather Service San Diego CA 804 PM PST (904 PM PDT) Wednesday, July 16, 2014.

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

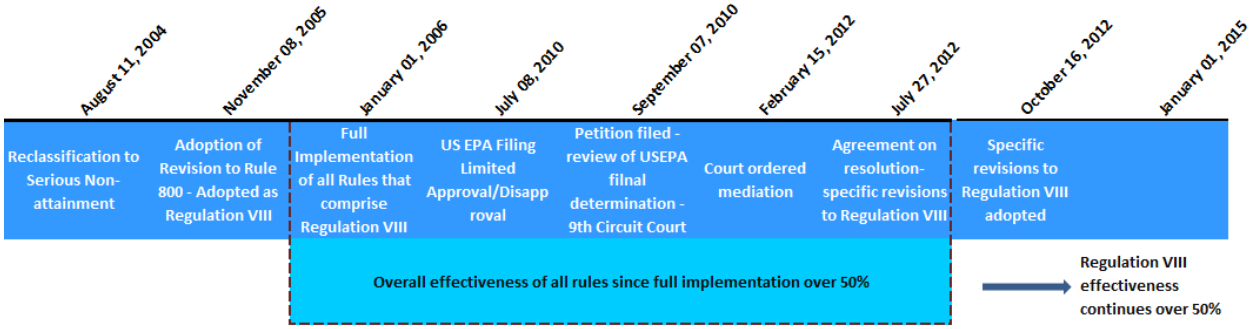

Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

Below is a brief summary of Regulation VIII, which is comprised of seven fugitive dust rules. **Appendix D** contains a complete set of the Regulation VIII rules.

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 Rule 800 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, carryout 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 landowners 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 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 July 16, 2014, declared a No Burn day, the ICAPCD did not receive any complaints related to agricultural burning. **Appendix A** contains copies of notices pertinent to the July 16, 2014 event.

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 Westmorland during the July 16, 2014 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on July 16, 2014, officially declared a No Burn day, related to agricultural burning, waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

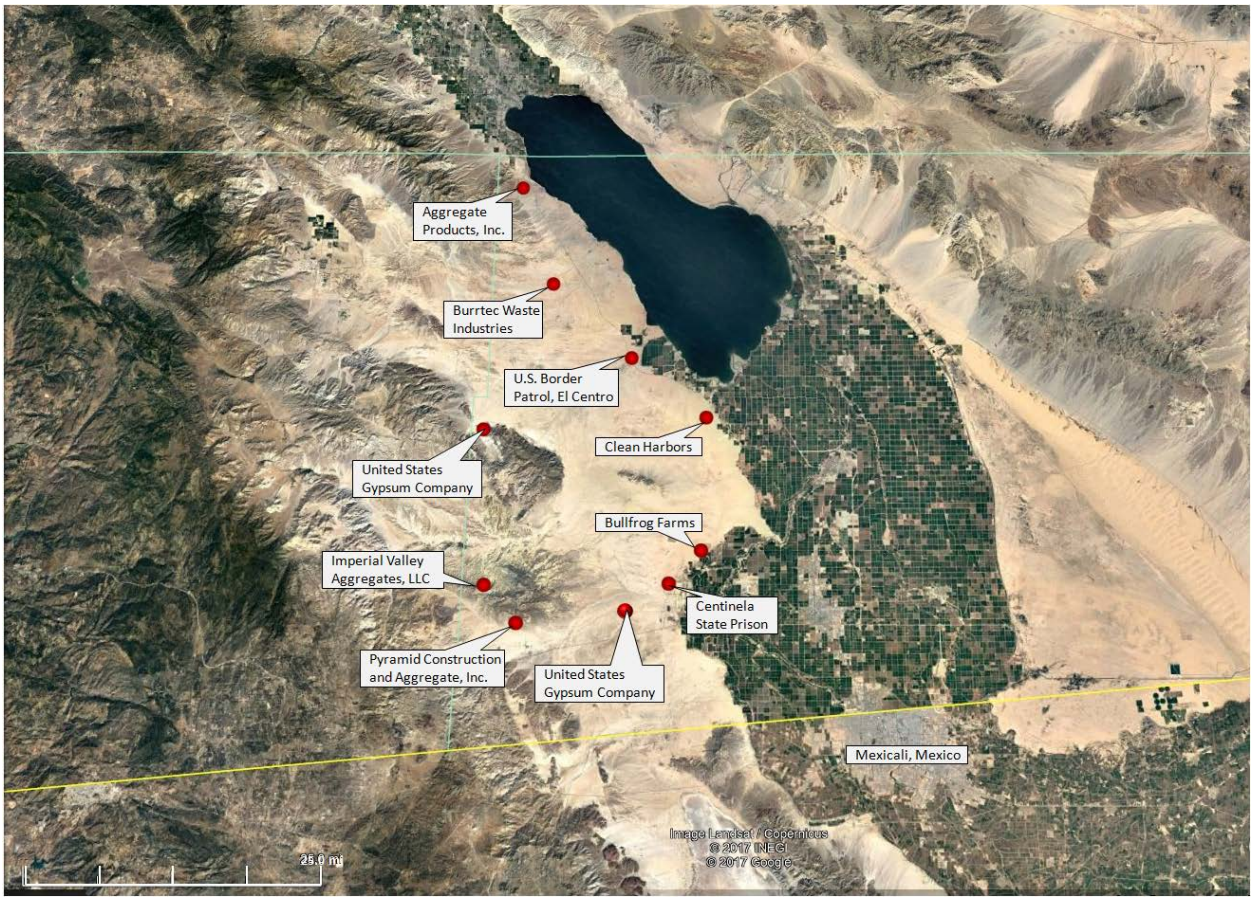

Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Westmorland monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, either the Bureau of Land Management or the California Department of Parks manages the desert areas. Base map from Google Earth

FIGURE 4-3
NON-PERMITTED SOURCES

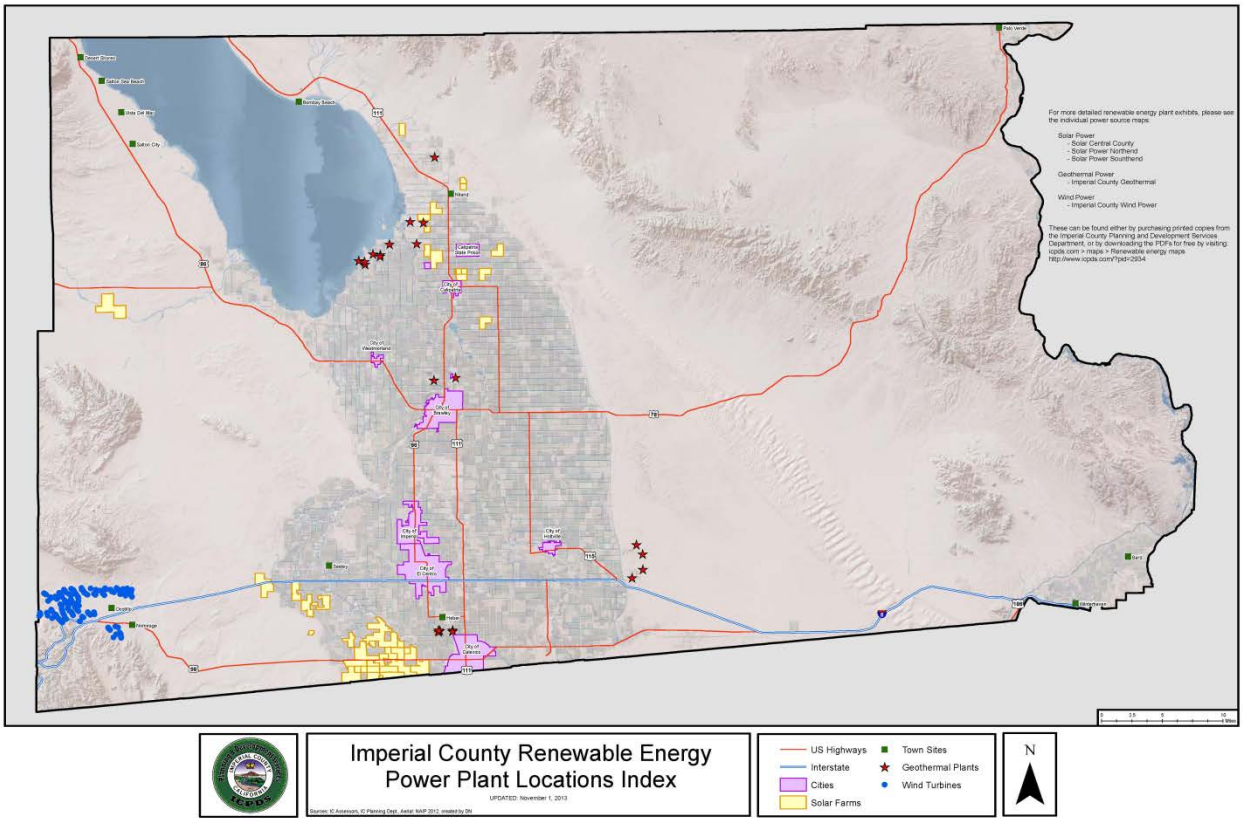

Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Westmorland monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

Early morning information from the NWS offices in Phoenix and San Diego gave little indication of the increasing onshore flow that was to come later in the day. Therefore, the ICAPCD only posted brief summaries without the expectation of gusty winds. However, unlike the Phoenix NWS office the San Diego NWS office identified a somewhat complex pattern over the west during the late morning hours of July 16, 2014. The San Diego NWS office described a narrow ridge of high-pressure over the Great Basin squished from both sides by an upper level low off the southern California coast and a trough digging over the intermountain west. Onshore pressure gradients as a result continued to strengthen over southern California.[15] Aviation discussions from the San Diego NWS office identified westerly winds 23 to 28 mph with potential gusts up to 46 mph along the mountain passes and desert slopes west of Imperial County. Forecasted increases of nighttime winds between 20 to 30 mph with gusts up to 50 mph. The Phoenix NWS office only identified forecast information for Arizona. **Appendix A** contains copies

[15] Area Forecast Discussion National Weather Service San Diego CA, 755 AM PST (855 AM PDT) Wednesday, July 16, 2014

of notices pertinent to the July 16, 2014 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County. As mentioned above the event unfolded in a somewhat complex pattern that was not typical for the time of season. Typical monsoonal activity was occurring in areas east of Imperial County in central and eastern Arizona. As a stronger onshore pressure gradient developed in the Pacific, a southerly flow brought drier air and gusty winds into Southeastern California and specifically into the mountains passes and desert slopes of San Diego County. While, meteorological stations within the mountains of San Diego measured elevated winds and continued gust the local airports measured elevated wind speeds during the afternoon to evening hours of July 16, 2014. The El Centro NAF (KNJK) measured higher winds speeds than the Imperial County Airport (KIPL). While both airports measured, wind gusts 17 to 37mph during the afternoon and evening hours KNJK measured three consecutive hours of winds at or above 25 mph. Additionally, while the NWS did not release special weather statements or notices blowing dust was observed for three hours at KNJK. Winds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the July 16, 2014 event sufficient wind gusts with intermittent wind speeds at or above 25mph continued overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts outlined in this section demonstrate that a somewhat complex weather pattern over the west, which was not a typical monsoonal event or a typical fall, spring or winter event occurred. Essentially, the event was caused when a narrow ridge of high pressure over the Great Basin, squished from both sides by an upper-level low off the Southern California coast and a trough digging over the intermountain west, caused the strengthening of onshore pressure gradients. The strengthening of the onshore pressure gradients caused locally gusty winds across the mountains and deserts of San Diego County during the afternoon and evening hours of July 16, 2014. 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 Westmorland 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 July 16, 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 July 16, 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 for July 16, 2014 identified a somewhat complex weather pattern over the west, which was not a typical monsoonal event or a typical fall, spring or winter event. Essentially, the event was caused when a narrow ridge of high pressure over the Great Basin being squished from both sides by an upper-level low off the Southern California coast and a trough digging over the intermountain west, caused the strengthening of onshore pressure gradients.[16]

On July 16, 2014 as Southern California remained situated between a low pressure off the west coast and a high pressure to the east, cool conditions continued with a weak to moderate onshore flow. The strengthening of the onshore flow caused gusty westerly winds to blow across the mountains and deserts of San Diego County during the afternoon and evening hours of July 16, 2014 transporting windblown dust into Imperial County.

Entrained windblown dust from natural open areas, particularly from the desert areas west of the Westmorland monitor, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations of July 16, 2014.

Figure 5-1 is an Aqua MODIS satellite image captured at ~ 1330 PST by the MODIS instrument onboard the Aqua satellite.[17] The satellite captured visible dust over the Salton Sea, confirmed by the descriptive text narrative for smoke/dust released by the Satellite Services Division July 16, 2014. The descriptive text narrative for smoke/dust observed in satellite imagery identified an area of blowing dust visible in southern California moving eastward, extending from the Anza-Borrego desert to the California/Arizona border (**Appendix A**). The transported windblown dust affected air quality in Imperial County and caused an exceedance of the NAAQS at the Westmorland monitor on July 16, 2014.

[16] Area Forecast Discussion National Weather Service San Diego, 755 AM PST (855 AM PDT) and 1225 PM PST (125 PM PDT) Wednesday, July 16, 2014

[17] MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. MODIS Technical Specifications identify the Terra orbit at 10:30am and the Aqua at 130pm.

FIGURE 5-1
AQUA MODIS SATELLITE IMAGE JULY 16, 2014

Fig 5-1: An Aqua MODIS satellite image captured at approximately 1330 PST July 16, 2014 identifies dust carried by gusty winds blowing eastward towards Arizona. Source: NASA Worldview; https://worldview.earthdata.nasa.gov

Figure 5-2 is a satellite image of the Aerosol Optical Depth (AOD)[18] as captured by the MODIS instrument onboard the Terra satellite at ~1030 PST. Warmer colors indicate increasing thickness. The image utilizes the Deep Blue Angstrom Exponent[19] layer to help differentiate larger aerosols that are likely dust. As can be seen in the image, the greenish color indicates a patch of aerosols drifting eastward towards Westmorland.

[18] Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is "clean" - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: https://worldview.earthdata.nasa.gov

[19] The MODIS Deep Blue Aerosol Ångström Exponent layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke). Source: https://worldview.earthdata.nasa.gov

FIGURE 5-2
TERRA MODIS SATELLITE IMAGE JULY 16, 2014

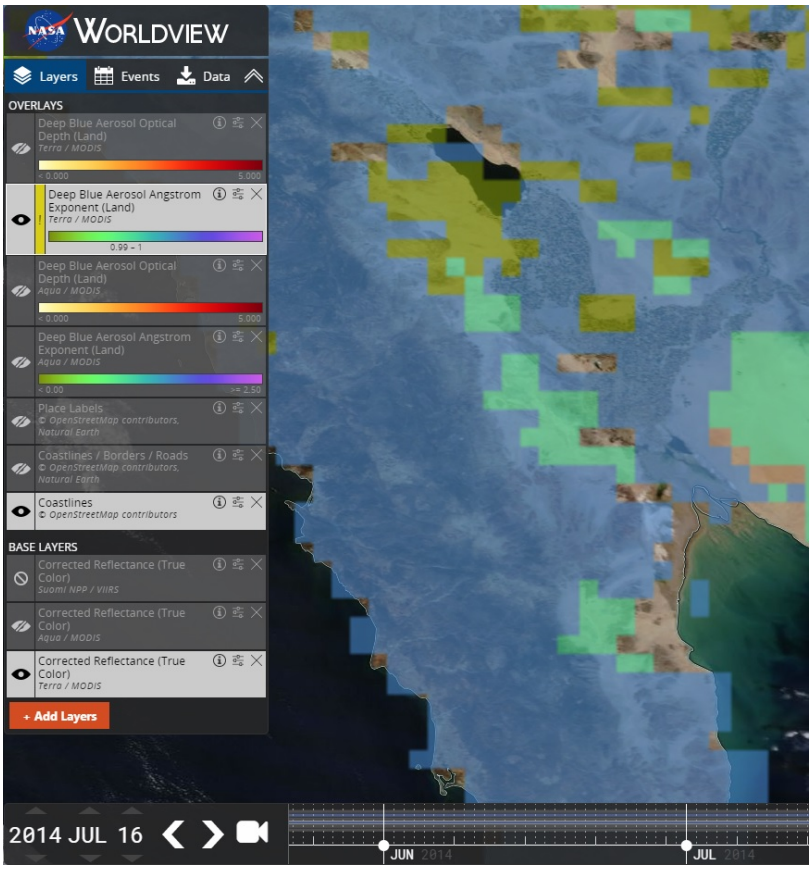

Fig 5-2: A patch of rather large aerosols that is likely dust was captured moving east across Imperial County at ~1030 PST by the Terra satellite. Source: NASA Worldview

FIGURE 5-3
AQUA MODIS SATELLITE IMAGE JULY 16, 2014

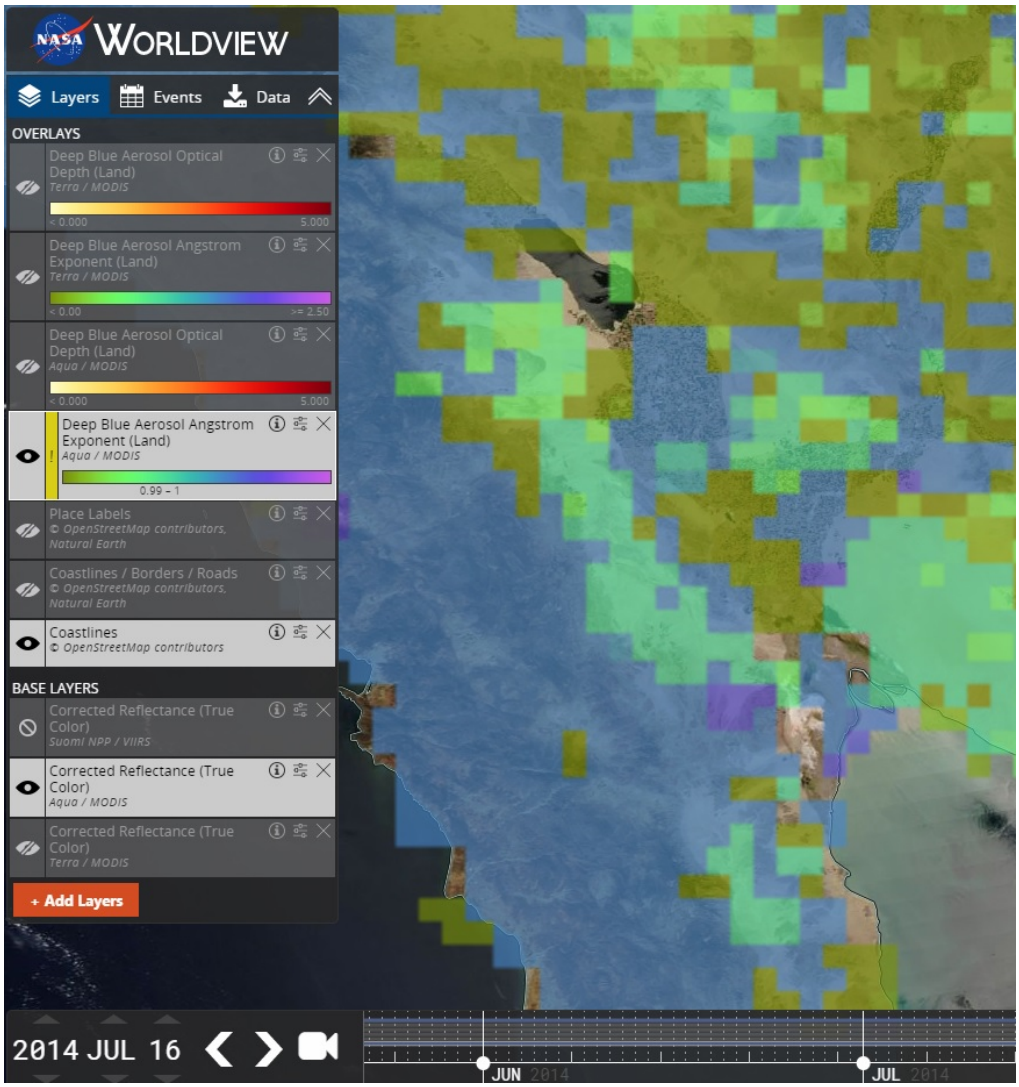

Fig 5-3: The Aqua satellite captured a thicker layer of aerosols drifting across Imperial County near Westmorland at ~1330 PST. Source: NASA Worldview

Figure 5-4 is a quad of surface analysis maps that show the low-pressure system more or less centered over southern Nevada and the tightening of the surface gradient across southeast California that created the high winds that swept through Imperial County on July 16, 2014.

FIGURE 5-4
SURFACE ANALYSIS MAPS

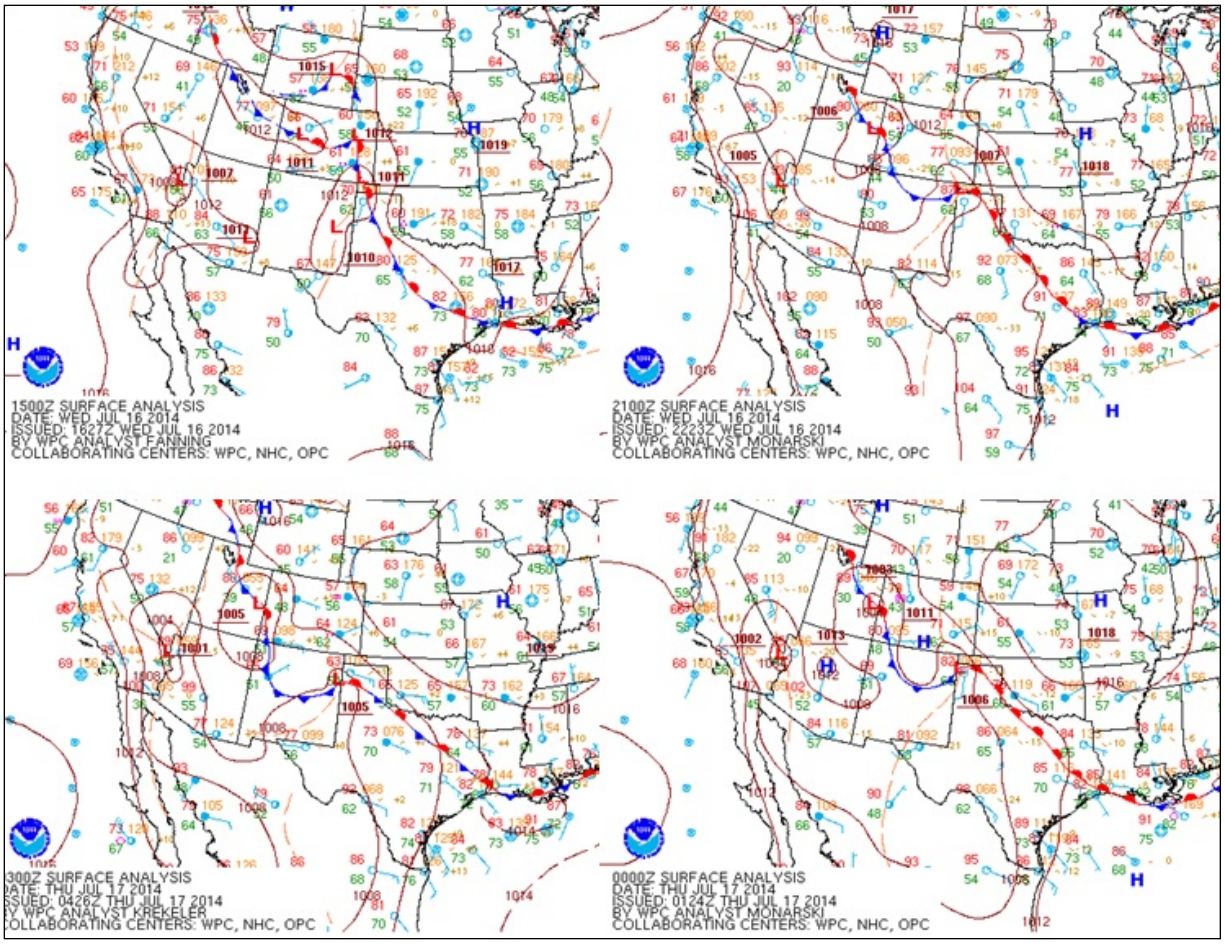

Fig 5-4: From left, clockwise: 0700 PST; 1300 PST; 1600 PST; 1900 PST July 16, 2014. The tightening of the gradient led to gusty winds across parts of southeastern California. Source: Weather Prediction Center Surface Analysis Archive

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[20] Because there was no available hourly measured concentrations available at the Westmorland site, **Tables 5-1 and 5-2** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the Brawley and Niland monitors, the only two stations with continuous monitors.

The data analysis indicates that the strongest wind speeds and gusts came through the San Diego mountain passes along Mountain Springs Grade (I-8). However, elevated winds were consistent among meteorological stations located within San Diego County and to the west of Imperial County. Local airports measured the strongest wind speeds and measured elevated wind gusts coincident with elevated concentrations at the Niland and Brawley monitors.

[20] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

TABLE 5-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR BRAWLEY JULY 16, 2014

Mountain Springs Grade (TNSC1)				Sunrise-Ocotillo (IMPSD)				El Centro NAF					Imperial County Airport				Brawley	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	Obs.	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (µg/m³)
0:50	24	34	214	0:50	14	22	216	0:56	13		260		0:53	8		280	0:00	39
1:50	25	35	207	1:50	15	20	205	1:56	11		260		1:53	9		250	1:00	49
2:50	22	34	212	2:50	13	19	219	2:56	8		200		2:53	7		230	2:00	32
3:50	23	33	214	3:50	14	20	220	3:56	8		190		3:53	7		200	3:00	34
4:50	25	38	210	4:50	15	24	210	4:56	5		210		4:53	5		220	4:00	25
5:50	29	39	208	5:50	13	18	221	5:56	3		220		5:53	0		0	5:00	50
6:50	30	43	211	6:50	18	26	209	6:56	7		220		6:53	5		210	6:00	36
7:50	30	41	209	7:50	16	24	215	7:56	15	18	260		7:53	6		240	7:00	38
8:50	26	43	213	8:50	9	19	240	8:56	8		220		8:53	6		230	8:00	26
9:50	26	39	211	9:50	13	24	222	9:56	8		220		9:53	7		230	9:00	27
10:50	26	37	222	10:50	10	18	238	10:56	13	17	280		10:53	7		210	10:00	27
11:50	22	36	237	11:50	15	26	231	11:56	13	23	270		11:53	10	17	250	11:00	32
12:50	22	35	240	12:50	12	22	233	12:56	23		260		12:53	15	20	270	12:00	19
13:50	22	34	226	13:50	15	27	229	13:56	20	28	230		13:53	15	22	260	13:00	26
14:50	23	39	232	14:50	19	31	219	14:56	21	30	240		14:53	16		250	14:00	39
15:50	**26**	**40**	235	**15:50**	18	**27**	223	**15:56**	**26**	**34**	250		**15:53**	**18**	**26**	260	**15:00**	**132**
16:50	**28**	**44**	233	**16:50**	14	**26**	238	**16:56**	**31**	**37**	250	**BLDU**	**16:53**	**20**	**30**	260	**16:00**	**397**
17:50	**29**	**45**	225	**17:50**	13	**23**	262	**17:56**	**31**	**37**	250	**BLDU**	**17:53**	**22**	**30**	260	**17:00**	
18:50	**28**	**42**	225	**18:50**	14	**25**	255	**18:56**	**23**		260	**BLDU**	**18:53**	**17**	**26**	260	**18:00**	
19:50	**28**	**41**	222	**19:50**	11	**25**	249	**19:56**	**24**		250		**19:53**	**17**		260	**19:00**	**121**
20:50	**30**	**45**	210	**20:50**	17	**31**	233	**20:56**	**21**		260		**20:53**	**16**		270	**20:00**	**120**
21:50	32	47	211	21:50	20	34	228	21:56	22		250		21:53	16		260	21:00	38
22:50	27	47	215	22:50	20	34	229	22:56	22	30	260		22:53	15		280	22:00	29
23:50	30	45	220	23:50	21	34	223	23:56	20		270		23:53	14		280	23:00	54

Wind data for Mount Laguna (former UASF site), Mountain Springs Grade, and Sunrise-Ocotillo is from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees. Because different instruments measure at different times throughout the day, the measured concentrations are compared to the closest hour of measured winds and gusts at local meteorological stations, not necessarily an averaged hour

TABLE 5-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS FOR NILAND JULY 16, 2014

Mountain Springs Grade (TNSC1)				Sunrise-Ocotillo (IMPSD)				El Centro NAF					Imperial County Airport				Niland	
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	Obs	HOUR	W/S	W/G	W/D	HOUR	PM_{10} (µg/m³)
0:50	24	34	214	0:50	14	22	216	0:56	13		260		0:53	8		280	0:00	79
1:50	25	35	207	1:50	15	20	205	1:56	11		260		1:53	9		250	1:00	38
2:50	22	34	212	2:50	13	19	219	2:56	8		200		2:53	7		230	2:00	44
3:50	23	33	214	3:50	14	20	220	3:56	8		190		3:53	7		200	3:00	46
4:50	25	38	210	4:50	15	24	210	4:56	5		210		4:53	5		220	4:00	42
5:50	29	39	208	5:50	13	18	221	5:56	3		220		5:53	0		0	5:00	62
6:50	30	43	211	6:50	18	26	209	6:56	7		220		6:53	5		210	6:00	96
7:50	30	41	209	7:50	16	24	215	**7:56**	**15**	18	260		**7:53**	**6**		240	**7:00**	**123**
8:50	26	43	213	8:50	9	19	240	**8:56**	**8**		220		**8:53**	**6**		230	**8:00**	**256**
9:50	26	39	211	9:50	13	24	222	9:56	8		220		9:53	7		230	9:00	63
10:50	26	37	222	10:50	10	18	238	10:56	13	17	280		10:53	7		210	10:00	47
11:50	22	36	237	11:50	15	26	231	11:56	13	23	270		11:53	10	17	250	11:00	31
12:50	22	35	240	12:50	12	22	233	12:56	23		260		12:53	15	20	270	12:00	17
13:50	22	34	226	13:50	15	27	229	13:56	20	28	230		13:53	15	22	260	13:00	26
14:50	23	39	232	14:50	19	31	219	14:56	21	30	240		14:53	16		250	14:00	29
15:50	26	40	235	**15:50**	18	27	223	**15:56**	26	34	250		**15:53**	**18**	26	260	**15:00**	**135**
16:50	28	44	233	**16:50**	14	26	238	**16:56**	31	37	250	**BLDU**	**16:53**	**20**	30	260	**16:00**	97
17:50	29	45	225	**17:50**	13	23	262	**17:56**	31	37	250	**BLDU**	**17:53**	**22**	30	260	**17:00**	**243**
18:50	28	42	225	**18:50**	14	25	255	**18:56**	**23**		260	**BLDU**	**18:53**	**17**	26	260	**18:00**	**654**
19:50	28	41	222	**19:50**	11	25	249	**19:56**	**24**		250		**19:53**	**17**		260	**19:00**	**595**
20:50	30	45	210	**20:50**	17	31	233	**20:56**	**21**		260		**20:53**	**16**		270	**20:00**	**260**
21:50	32	47	211	21:50	20	34	228	**21:56**	**22**		250		**21:53**	**16**		260	**21:00**	**161**
22:50	27	47	215	22:50	20	34	229	**22:56**	**22**	30	260		**22:53**	**15**		280	**22:00**	**118**
23:50	30	45	220	23:50	21	34	223	**23:56**	**20**		270		**23:53**	**14**		280	**23:00**	**149**

Wind data for the Fish Creek Mountains is from the University of Utah's MesoWest system. Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind speeds = mph; Direction = degrees. BLDU = blowing dust. Because different instruments measure at different times throughout the day, the measured concentrations are compared to the closest hour of measured winds and gusts at local meteorological stations, not necessarily an averaged hour

Figure 5-5 is a graphical representation of the conditions contributing to the exceedance at the Westmorland monitor on July 16, 2014. On July 16, 2014, a scheduled sampling day, Westmorland, Niland and Brawley measured 24-hr PM_{10} concentrations above 100 µg/m^3. The Calexico monitor measured a 24-hr PM_{10} concentration below 50 µg/m^3 while the El Centro monitor experienced equipment failure. Analysis of meteorological and concentration data indicates that a greater effect upon air quality within the northern section of Imperial County occurred on July 16, 2014. As discussed above, a dry south flow aloft between a low pressure off the coast and a high pressure over the southern Rockies allowed for strong onshore pressure gradients creating gusty west to southwest winds to blow through the San Diego Mountain passes and desert slopes and into Imperial County. These gusty winds transported windblown dust onto the natural open desert floor and over agricultural lands in Imperial County affecting air quality and causing an exceedance at the Westmorland monitor.

Closer to Westmorland, KIPL and KNJK measured gusty winds primarily during the afternoon to evening hours. KNJK had three consecutive hours of winds above the 25 mph threshold as seen in **Table 5-1 and 5-2**, along with four hours of gusts 30 mph or above. KIPL had two hours of gusts 30 mph or above.

FIGURE 5-5
WESTMORLAND EXCEEDANCE FACTORS

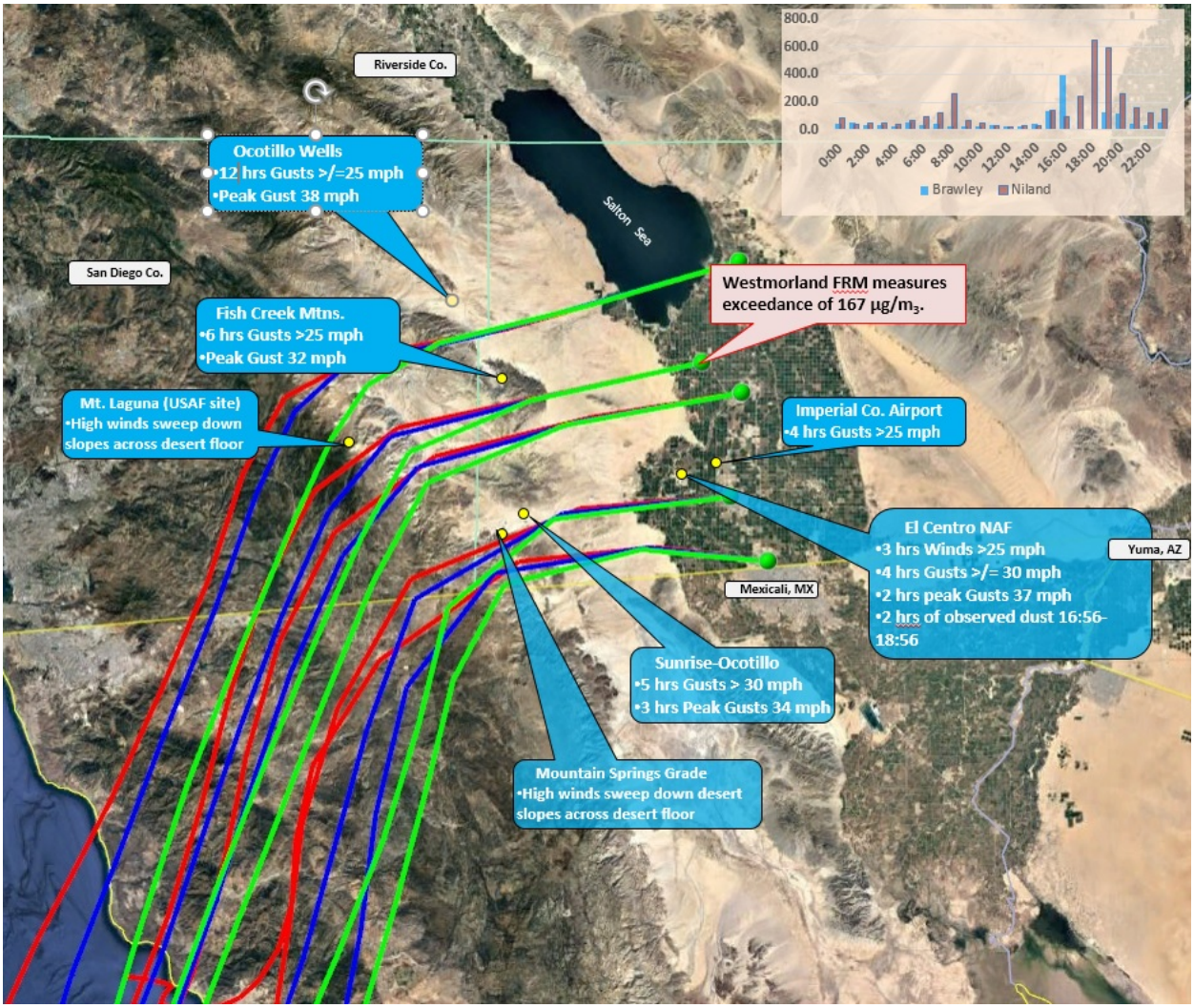

Fig 5-5: A 24-hour HYSPLIT shows that air approached Westmorland from the WSW in the final hours before reaching the monitor. Gusty westerly winds blew over the San Diego Mountains transporting windblown dust into Imperial County. Red HYSPLIT indicates air movement ending at the 10 meter AGL (above ground height); blue is 100 meters AGL, and green is 500 meters AGL. Dynamically generated through NOAA's Air Resources Laboratory. Yellow line is the international border. Google base map

As mentioned above, the event affected the monitors located within the northern part of Imperial County much more than the monitors located further south. Because measured hourly concentrations were not available from the Westmorland site, the following analysis utilizes the Brawley and Niland continuous measured hourly concentrations. Conclusions derived from the analysis may be applied to the Westmorland site in general.

Figures 5-6 and 5-7 provide information as to the spatial and temporal relationship between the high winds and the transported windblown dust as it affected the Brawley and Niland monitors

and by inference, how the transported windblown dust affected the Westmorland site. Fluctuations in hourly concentration at the Brawley and Niland monitors over a three-day period illustrate a positive correlation with wind speeds, and gusts, at the Imperial County Airport (KIPL) and the El Centro NAF (KNJK)

Appendix C contains additional graphs illustrating the relationship between the high PM_{10} concentrations and increased wind speeds from other monitoring sites within Imperial and Riverside counties on July 16, 2014**.**

FIGURE 5-6
72 HOUR PM_{10} CONCENTRATIONS AND WIND SPEED CORRELATION

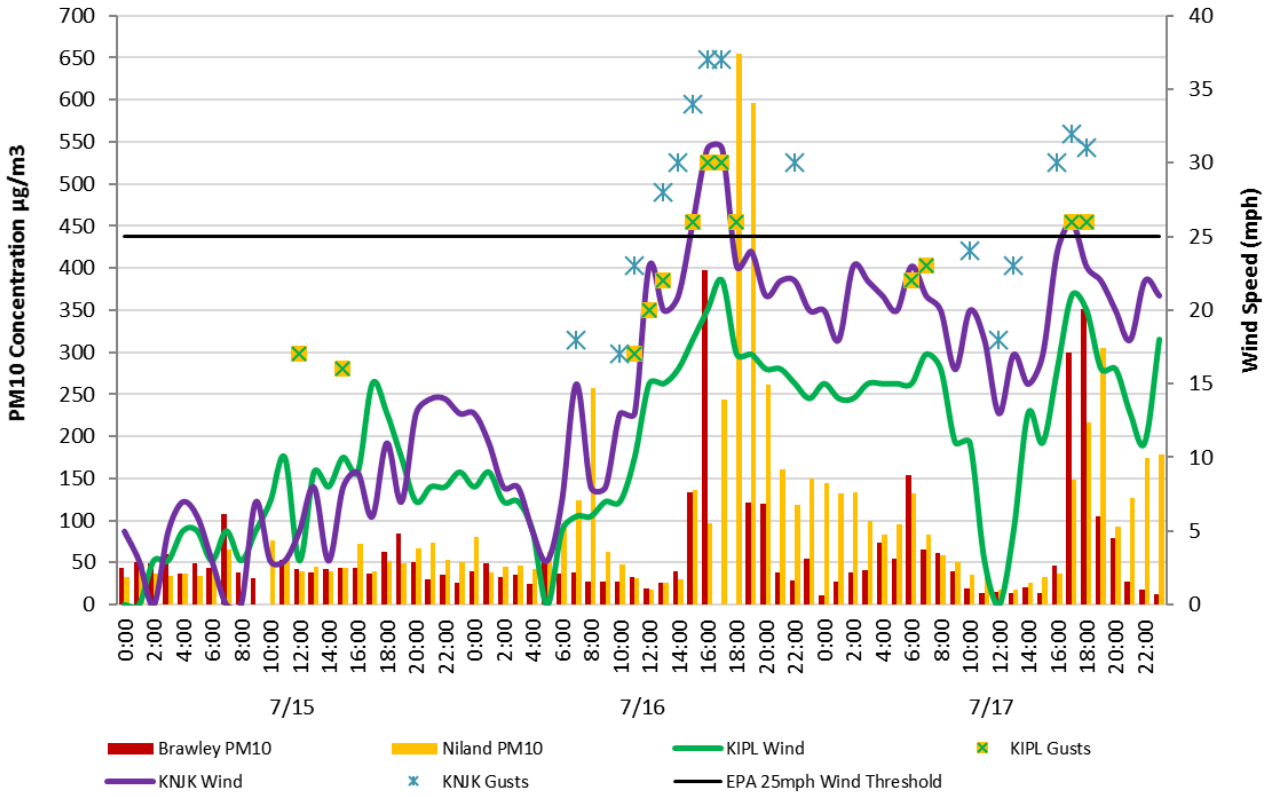

Fig 5-6: This graph illustrates the concentration levels, wind speed and wind gusts for three days, July 15, 2014 through July 16, 2014 for the Brawley and Niland monitors

FIGURE 5-7
72 HOUR PM_{10} CONCENTRATIONS AND UPSTREAM WIND SPEEDS

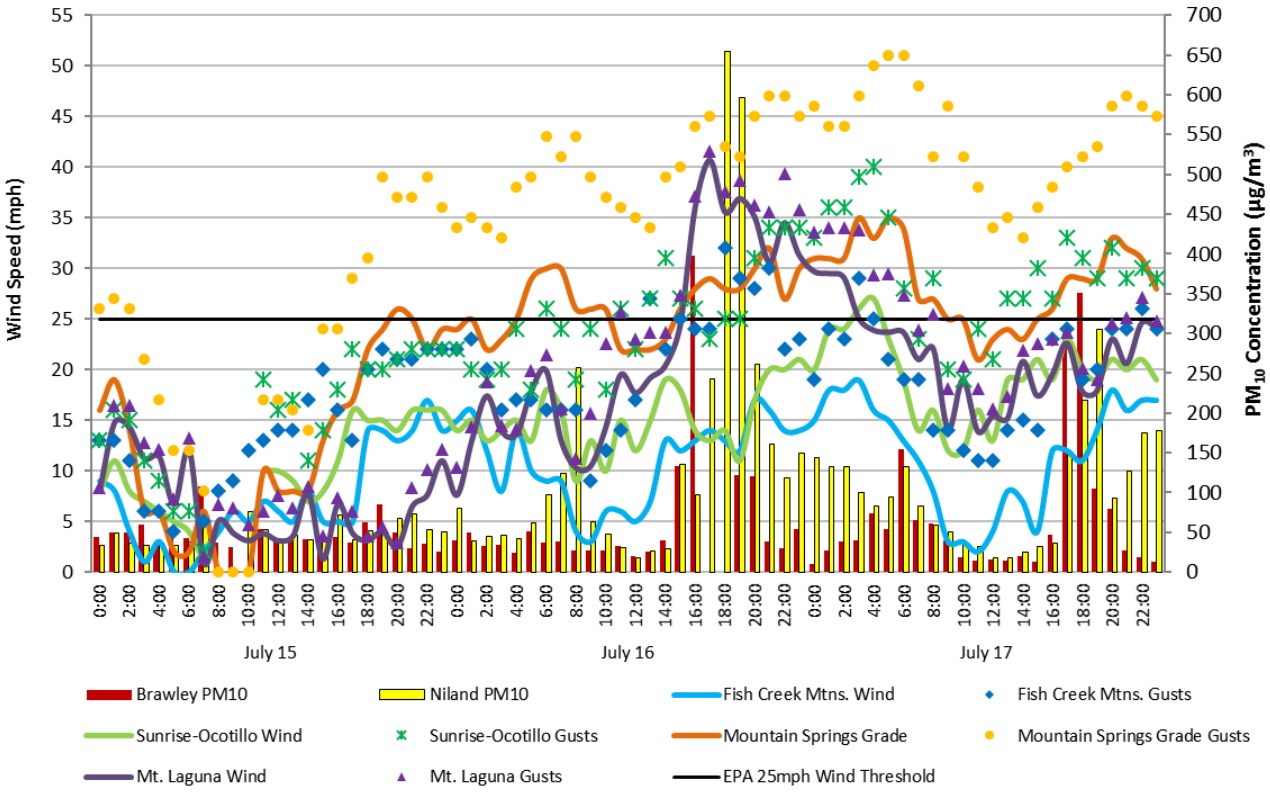

Fig 5-7: A graphical illustration of the concentration levels, wind speeds, and gusts for a three-day period at Brawley and Niland. Air quality is data from the EPA's AQS data bank. Wind data is from the NCEI's QCLCD data bank

Figure 5-8 contrasts the hourly PM_{10} concentrations measured at the Niland and Brawley monitors with the observed visibility at the El Centro NAF (KNJK) over a three-day period. From 1656 through 1856 on July 16, 2014, KNJK reported visibility at six miles. Blowing dust was observed at the airport and was coincident with the highest hourly concentrations measured at the Brawley and Niland monitors.

FIGURE 5-8
72 HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY
EL CENTRO NAF (KNJK)

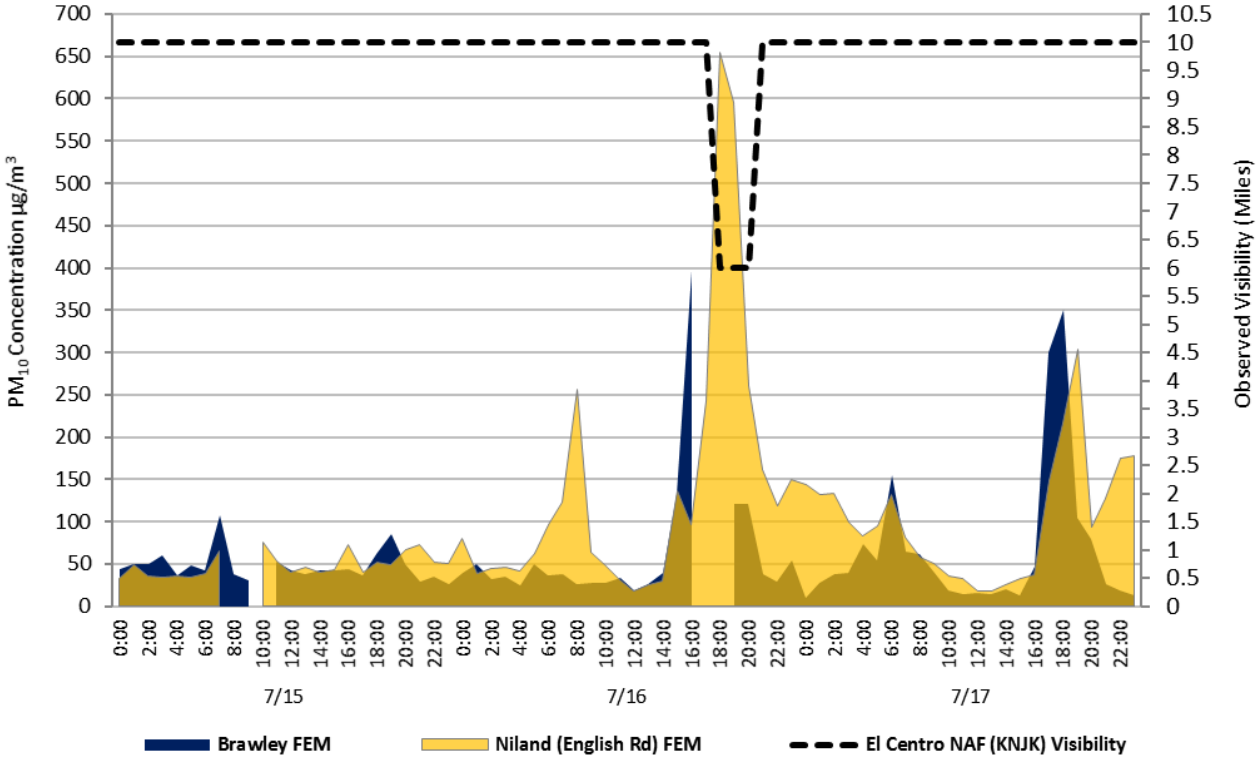

Fig 5-8: Visibility, as reported from the El Cento NAF (KNJK) over a three-day period. Both Niland and Brawley PM_{10} concentrations are highest during the period of minimum visibility at KNJK. Air quality is data from the EPA's AQS data bank. Visibility data is from the NCEI's QCLCD data bank

As mentioned above, the July 16, 2014 event was not an expected or anticipated event. As such, neither the San Diego nor the Phoenix NWS offices issued any advisories or notices advising of increased gusty winds. In any event, the squishing of a weak ridge of high-pressure between an upper level low off the coast of California and a trough of low-pressure digging across the intermountain west caused moderate onshore flow to continue. This allowed gusty westerly winds to blow across the San Diego mountain passes over open natural deserts and agricultural lands in Imperial County affecting air quality. A useful measurement of the degradation of air quality is the Air Quality Index (AQI).[21]

[21] 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 affects 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.

Figure 5-9 provides the resultant AQI for July 16, 2014. As the gusty westerly winds blew through the afternoon to evening hours of July 16, 2014, reduced air quality became evident when the AQI level went from "Green" or good to "Yellow" or moderate. The lower air quality affirms that on July 16, 2014 gusty westerly winds transported windblown dust into Imperial County affecting air quality.

FIGURE 5-9
AIR QUALITY INDEX FOR NILAND JULY 16, 2014

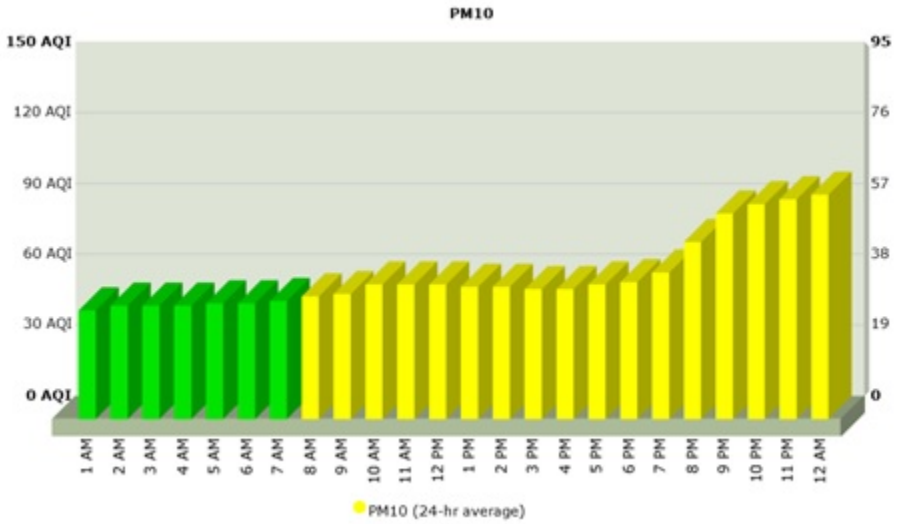

Fig 5-9: Demonstrates that air quality in Imperial County was affected by gusty westerly winds created when a narrow ridge of high pressure over the Great Basin squished from both sides by an upper-level low off the Southern California coast and a trough digging over the intermountain west caused the strengthening of the onshore gradients

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, wind speed, and concentration data illustrating the spatial and temporal representation of the gusty westerly winds caused by the strengthening of the onshore flow. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Westmorland monitor on July 16, 2014. Furthermore, the forecasts and issued air quality index 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. Gusty westerly winds, which blew through and over the San Diego mountain passes and desert slopes transported large amounts of coarse particles (dust) and PM_{10} into the lower atmosphere reaching the desert floor and agricultural lands in Imperial County on July 16, 2014. Combined, the information demonstrates that the elevated PM_{10} concentrations measured on July 16, 2014 coincided with high wind speeds and that elevated winds were experienced over the southern portion of Riverside County, all of Imperial County, and southwestern Arizona.

FIGURE 5-10
TAKEAWAY POINTS FOR THE JULY 16, 2014 EXCEPTIONAL EVENT

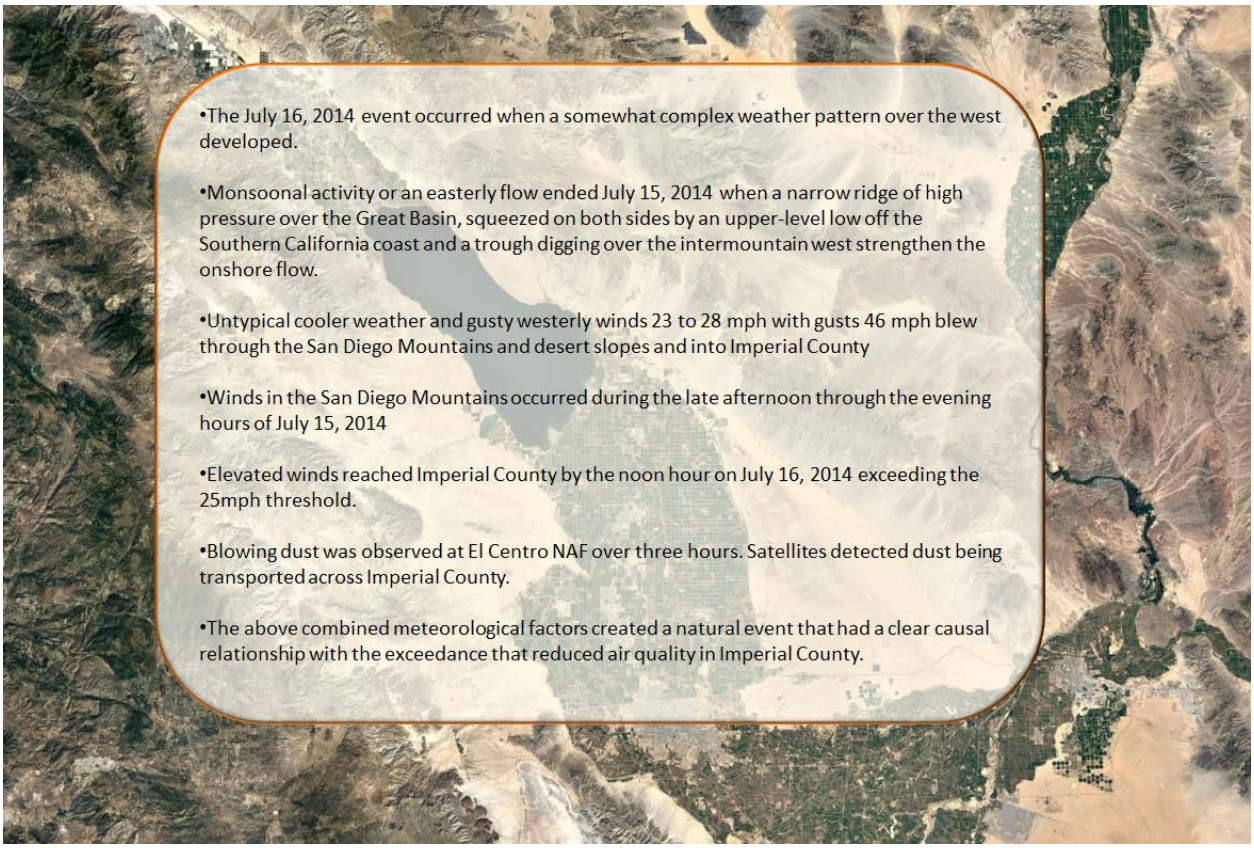

Fig 5-10: Illustrates the factors that qualify the July 16, 2014 natural event, which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedance that occurred on July 16, 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 TECHNICAL ELEMENTS CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-31
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	46-58
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	32-36
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	37-45
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	21-31;46-58

VI.1 Affects Air Quality

The preamble to the revised EER states that an event has affected air quality if the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the July 16, 2014 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

Section 50.1(j) of 40 CFR Part 50 defines an exceptional event as an event that must be "not reasonably controllable or preventable" (nRCP). The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. A natural wind event, which transports dust from natural open deserts, meets the nRCP, when sources are controlled by BACM and when human activity plays little to no direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The

PM_{10} exceedance measured at the Westmorland monitor caused by naturally occurring strong gusty west winds transported windblown dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west and southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedance at Westmorland on July 16, 2014 was not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a "Natural Event" (50.1(k) of 40 CFR Part 50), which may recur at the same location, is an event where human activity plays little or no direct causal role. The criteria that human activity played little or no direct causal role occurs when the event, along with its resulting emissions, are solely from natural sources or where all significant anthropogenic sources of windblown dust have been reasonably controlled. As discussed within this demonstration, windblown dust anthropogenic sources reasonably controlled with BACM in and around Westmorland on July 16, 2014 meet the criteria that human activity played little or no direct causal role therefore, the event qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at Westmorland during different days, and the comparative analysis of different monitors in Imperial and Riverside counties demonstrates a consistency of elevated gusty westerly winds and concentrations of PM_{10} on July 16, 2014 (Section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty westerly winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty westerly winds. Days immediately before and after the high wind event PM_{10} concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the windblown dust emissions to the exceedances on July 16, 2014.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM_{10} concentrations measured at the Westmorland monitor 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))

This section contains issued notices by the NWS and Imperial County pertinent to the July 16, 2014. Along with NWS notices, this Appendix contains any issued air quality alerts. Air quality alerts advise sensitive receptors of potentially unhealthy conditions in Imperial County resulting from a natural event. On July 16, 2014, the data illustrates an unexpected increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data.

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside counties along with other pertinent graphs, time series plots for other areas if applicable. These plots, graphs and tables 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 within Imperial, Riverside, San Diego, and Yuma counties if applicable. Other areas are also included if applicable such as Mexico. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

This Appendix contains a description of the compilation of the BACM adopted by the ICAPCD and approved by the USEPA. Seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.