IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

The Centinela and Imperial Solar South projects nearly surround Interstate 98, just west of Calexico. / Photo courtesy of SDG&E: https://www.voiceofsandiego.org/topics/science-environment/imperial-countys-renewable-power-explosion-in-one-map/

May 18, 2015
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

March 16, 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	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl 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 May 18, 2015, a State and Local Ambient Air Monitoring Station (SLAMS) located in Brawley (AQS Site Code 06-025-0007), California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The exceedance occurred when the Federal Referenced Method (FRM) Size-Selective Inlet (SSI) high volume sampler measured a (midnight to midnight) 24-hour (hr) average Particulate Matter less than 10 microns (PM_{10}) concentration of 304µg/m^3. PM_{10} 24-hr measurements measured above the 150µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley was the only station in Imperial County to measure an exceedance of the PM_{10} NAAQS on May 18, 2015.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON MAY 18, 2015

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION ug/m^3	PM_{10} NAAQS ug/m^3
5/18/2015	**Brawley**	**06-025-0007**	**1**	**24**	**304**	**150**
5/18/2015	Brawley	06-025-0007	3	22	152	150
5/18/2015	Niland	06-025-4004	3	24	74	150
5/18/2015	Niland	06-025-4004	1	24	39	150
5/18/2015	Westmorland	06-025-4003	1	24	111	150
5/18/2015	El Centro	06-025-1003	1	24	17	150
5/18/2015	Calexico	06-025-0005	1	24	18	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]

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 Federal Equivalent Method (FEM) PM_{10} data from Beta Attenuation Monitor Models 1020 (BAM 1020) 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 May 18, 2015 the Brawley monitor was impacted by elevated concentrations of particulate matter when strong westerly winds associated with an upper level low pressure trough moving over California entrained fugitive windblown dust into Imperial County.

This report demonstrates that a naturally occurring event caused an exceedance observed on May 18, 2015, which elevated particulate matter and affected air quality. The report provides concentration to concentration monitoring site analyses supporting a clear causal relationship

[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 2015 Pacific Daylight Time (PDT) is March 8 through October 31. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

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 exceedances 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 measured exceedance of 304µg/m^3 as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the May 18, 2015 event as it occurred in California and into Imperial County, providing background information on the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley monitor.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley monitor this section discusses and establishes how the May 18, 2015 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 May 18, 2015 event and its resulting emissions defining the event as a “natural event”.[3]

Section IV - Provides evidence that the event of May 18, 2015 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 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, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

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

[3] 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.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published the San Diego and Phoenix National Weather Service (NWS) offices Area Forecast information indicating gusty west winds 15 to 25 miles per hour (mph) with potential gusts up to 30 miles per hour (mph) blowing along the desert mountain slopes and adjacent desert areas. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County. **Appendix A** contains copies of notices pertinent to the May 18, 2015 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 is 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. Although the development of the May 18, 2015 demonstration preceded the promulgation of the INPEE process the ICAPCD has communicated with the State and US EPA regarding the development and submittal of this EE demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} concentration from the Brawley monitor on March 07, 2016. Subsequently there after the ICAPCD sent a revised request requesting preliminary flags on corrected data, from local conditions to standard conditions, fulfilling USEPA requirements. The difference in concentrations between local conditions and standard conditions has an insignificant impact on any data analysis. **Table 1-1** above provides the PM_{10} measured concentrations for all monitors in Imperial County for May 18, 2015. The submitted request included a brief description of the meteorological conditions for May 18, 2015 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 published a notice of availability, for a 30-day period, in the newspaper of greatest circulation, the Imperial Valley Press and on the ICAPCD webpage on November 20, 2017. The published notice invited comments from the public regarding the request, by the ICAPCD, to

exclude the measured concentration of 304 µg/m^3, measured on May 18, 2015 in Brawley. The final closing date for comments was December 20, 2017. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(i)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(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)(i)). As explained above, this EE demonstration was prepared prior to the promulgated revision on October of 2016 and while there is no specific due date there is an agreement between agencies, (CARB, USEPA and Imperial County) that the May 18, 2015 EE demonstration will be submitted in 2017 (40 CFR §50.14(c)(2)(i)(B)).

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 May 18, 2015 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 May 18, 2015, 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 the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley.

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 May 18, 2015 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the May 18, 2015 event unfolded in Imperial County. The subsection elements include

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

II.1 Geographic Setting and Monitor Locations

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

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

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

A notable feature in Imperial County is the Salton Sea which is at 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

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

All of the seven incorporated cities, 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 deserts and mountains 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 affect 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

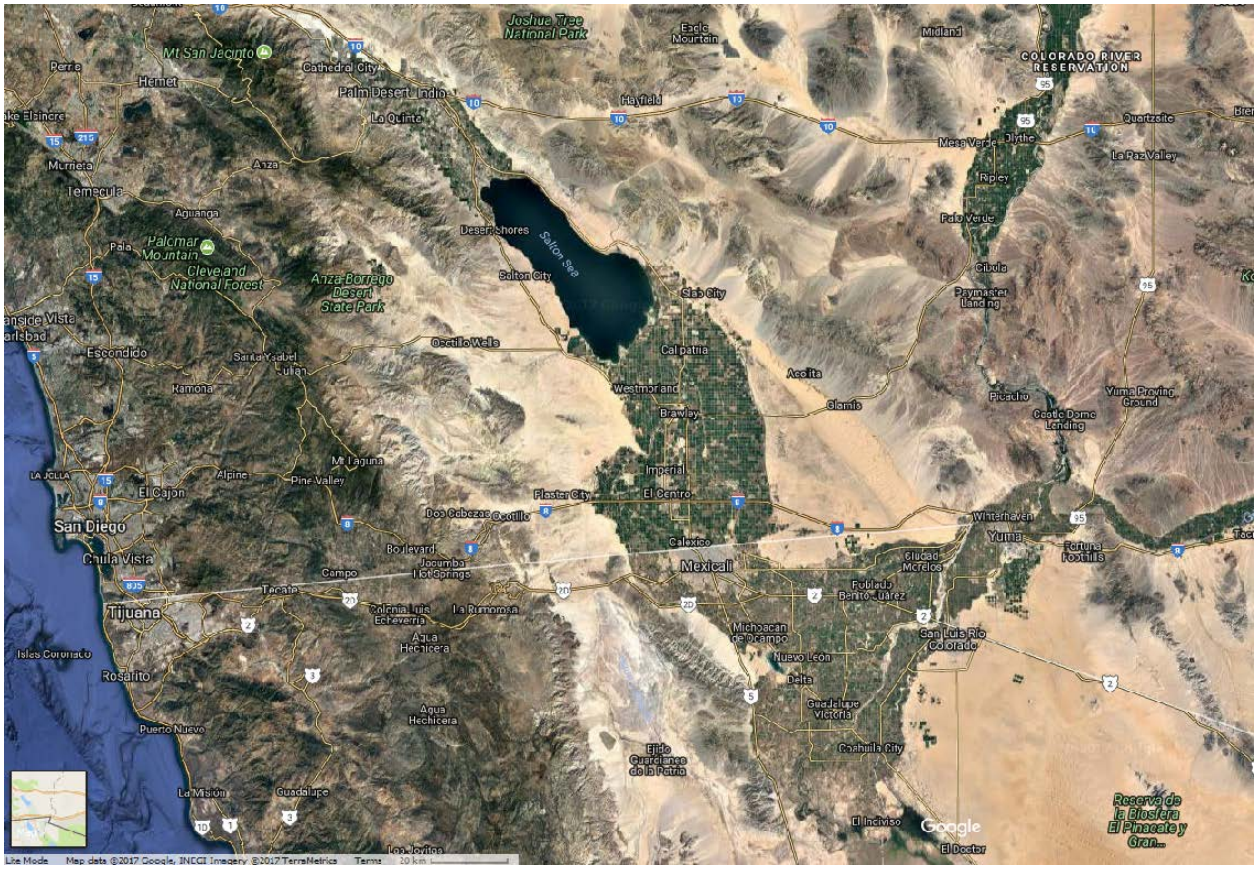

Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

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 and southwestern Arizona (**Figure 2-8 and Table 2-1)**.

As mentioned above, the PM_{10} exceedance on May 18, 2015, occurred at the Brawley station. The Brawley station is regarded as one of the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions of meteorological conditions occurring on May 18, 2015, other meteorological sites were used in this demonstration which include airports within eastern Riverside County, southeastern San Diego County, southwestern Yuma (Arizona) County, Imperial County, and other sites relevant to the wind event, such as within northern Mexico (**Figures 2-8).**

FIGURE 2-8
MONITORING SITES IN IMPERIAL COUNTY

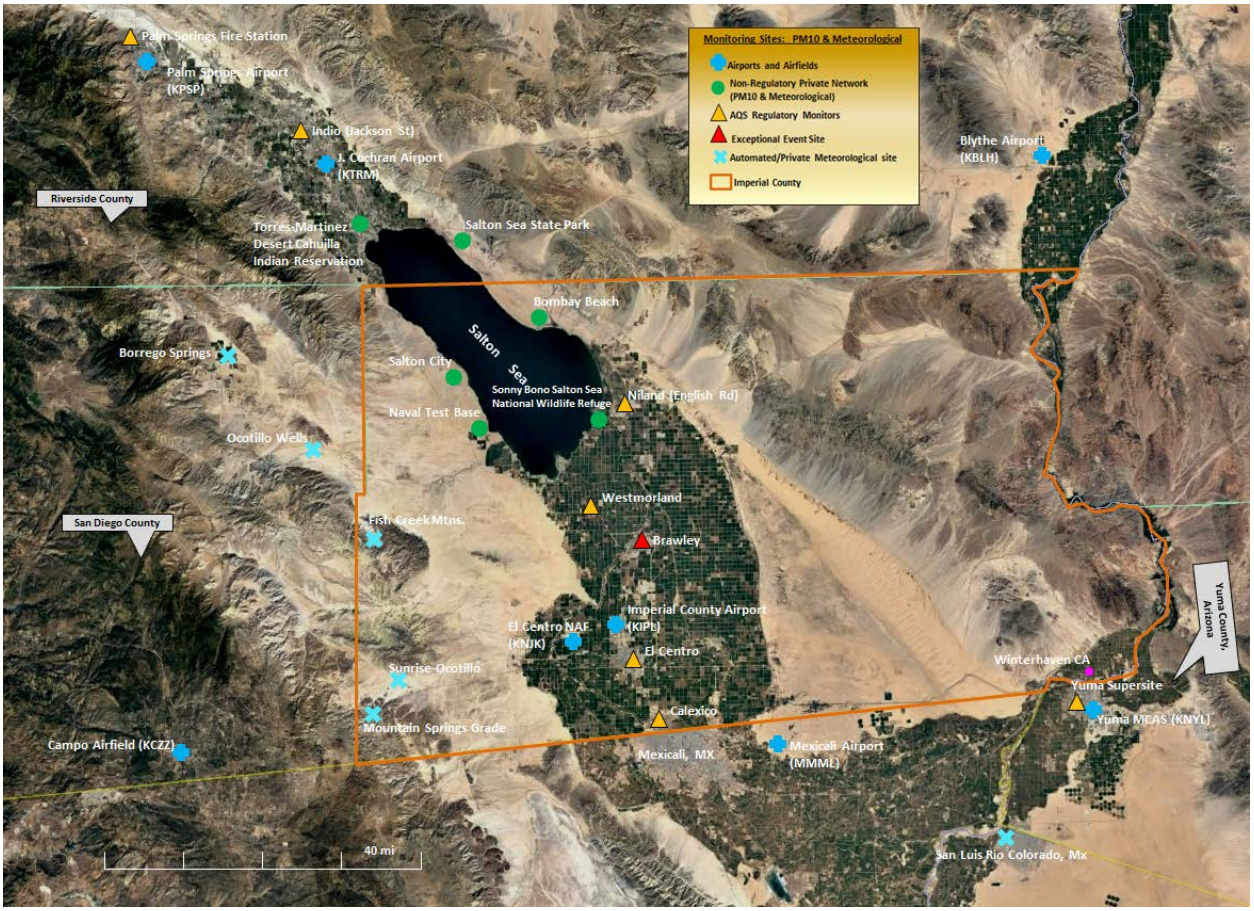

Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an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

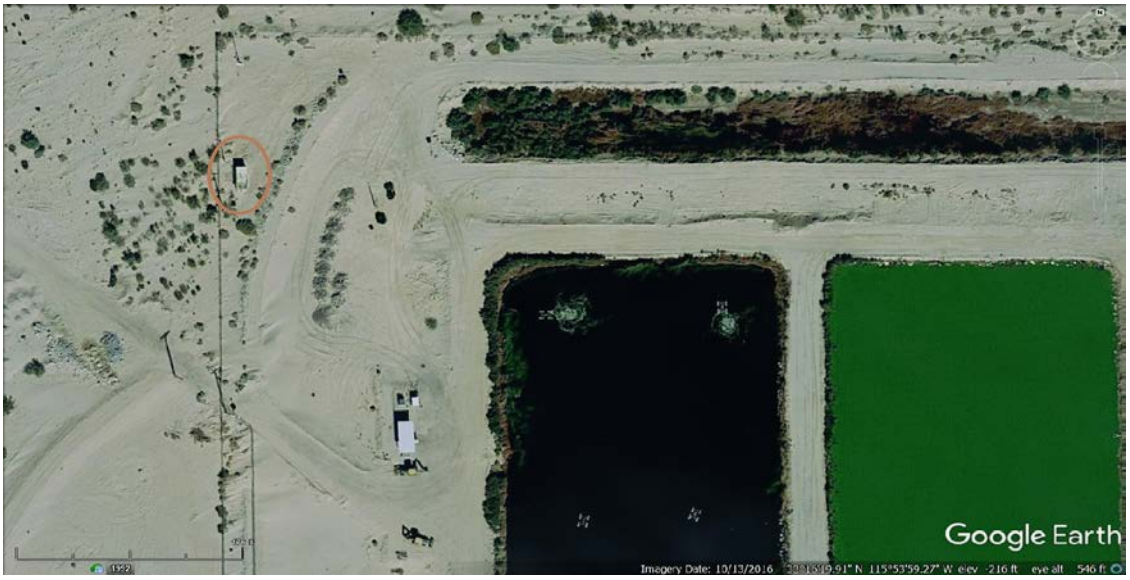

Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. View site photos at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

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

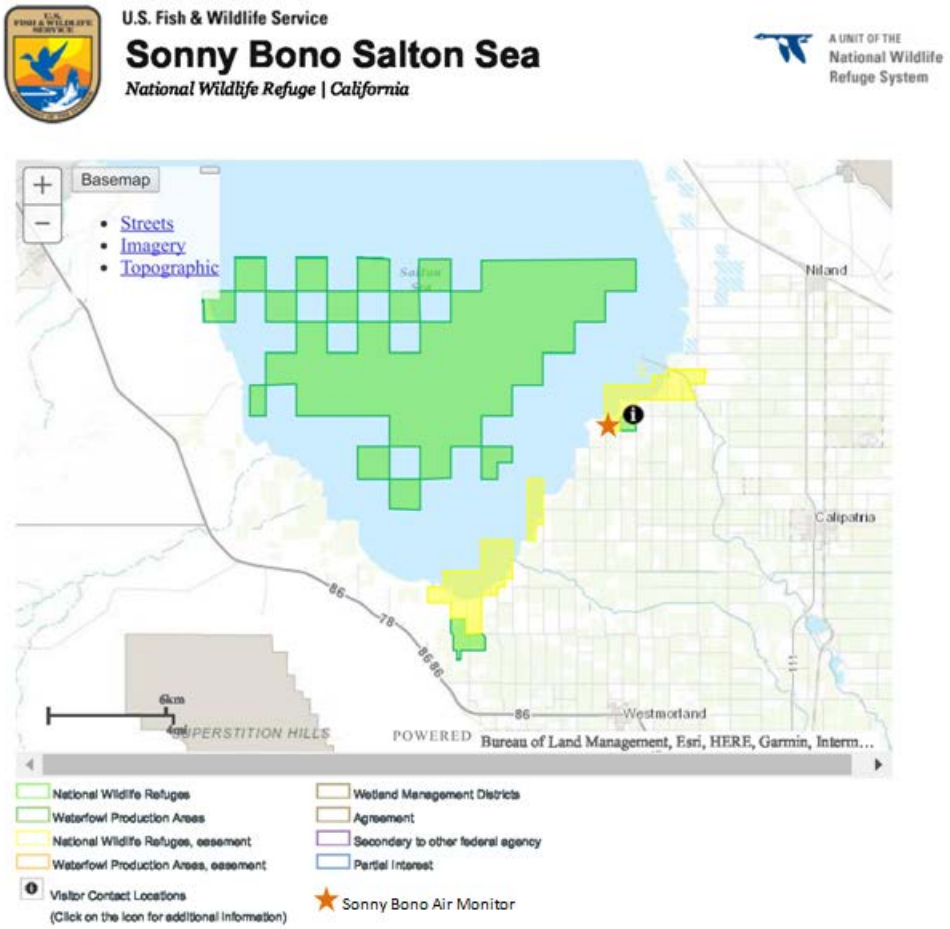

Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to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

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MAY 18, 2015

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) 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	304	-	-	-	-
		BAM 1020					152.1	838	21:00		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	18	-	-	16	17:00
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	17	-	-	13.7	19:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	39	-	-	21.9	18:00
		BAM 1020					74.7	446	17:00		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	111	-	-	-	-
RIVERSIDE COUNTY											
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	15.1	25	18:00	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	-	-	-	-	-
ARIZONA – YUMA											
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	32.3	114	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

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

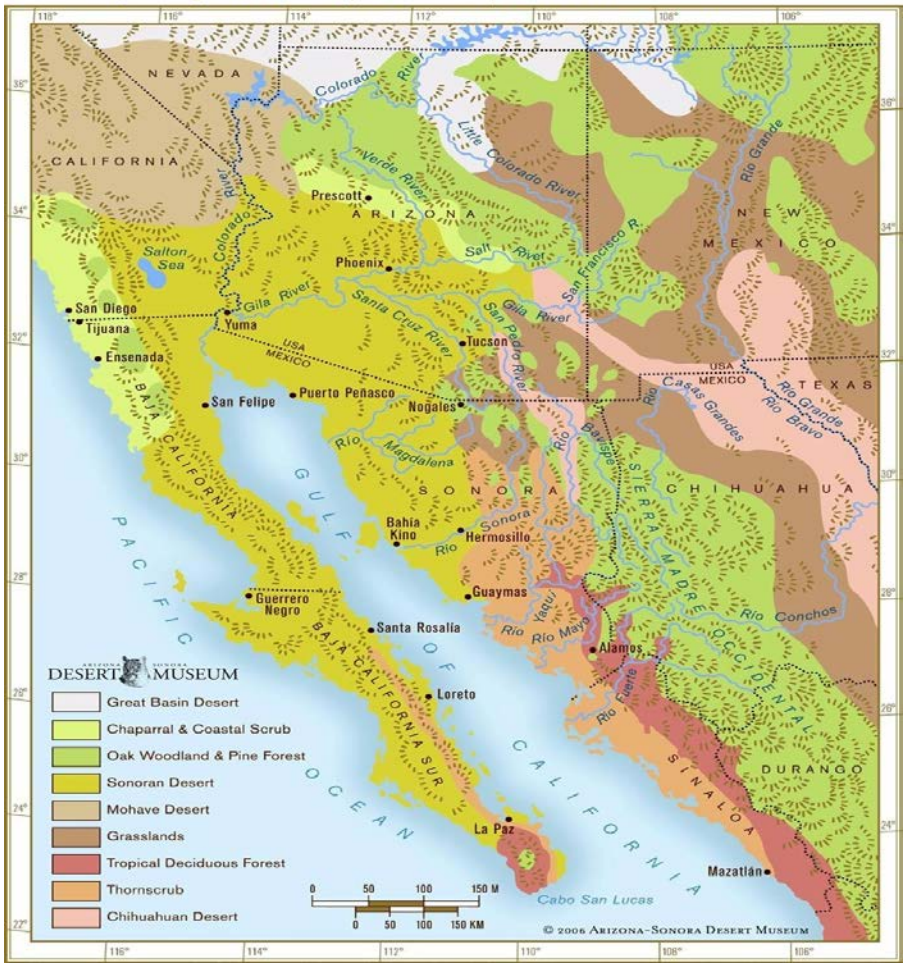

Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

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 the May 18, 2015 event, Imperial County measured a total annual precipitation of 3.22 inches. The slight increase in precipitation of .011 inches was insufficient to relieve the existing arid conditions that result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

FIGURE 2-16
IMPERIAL COUNTY HISTORICAL WEATHER

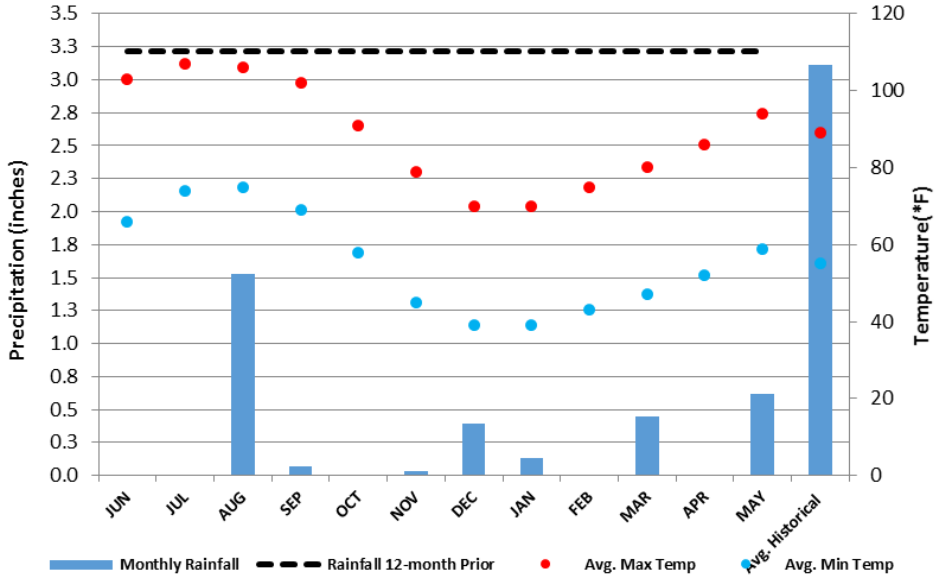

Fig 2-16: The total annual precipitation prior to May 18, 2015 event measured 3.22 inches, which was slightly above the average annual precipitation of 3.11 inches, was insufficient to relieve the arid conditions existing in Imperial County. Meteorological data courtesy of Weather Underground, California 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.[4] Because the pressure gradient is simply the difference in pressure between the 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 entrain dust into the atmosphere and transport dust over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for May 18, 2015, was caused when steep pressure gradients over southern California created high westerly winds that were associated with a low-pressure system that was enhanced by the presence of both a fairly stationary surface trough and an upper level low-pressure trough, which was situated in southern Nevada, which moved over California. The weather system brought strong and gusty westerly winds across the mountains and deserts of southeastern California and into the Imperial County. **Figures 2-17 and 2-18** illustrate the conditions across the region responsible for the high westerly winds (exceptional event) that affected the Brawley monitor and affected air quality in Imperial County on May 18, 2015.

[4] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

FIGURE 2-17
DAILY WEATHER MAP AND SATELLITE SURFACE MAP
MAY 18, 2015

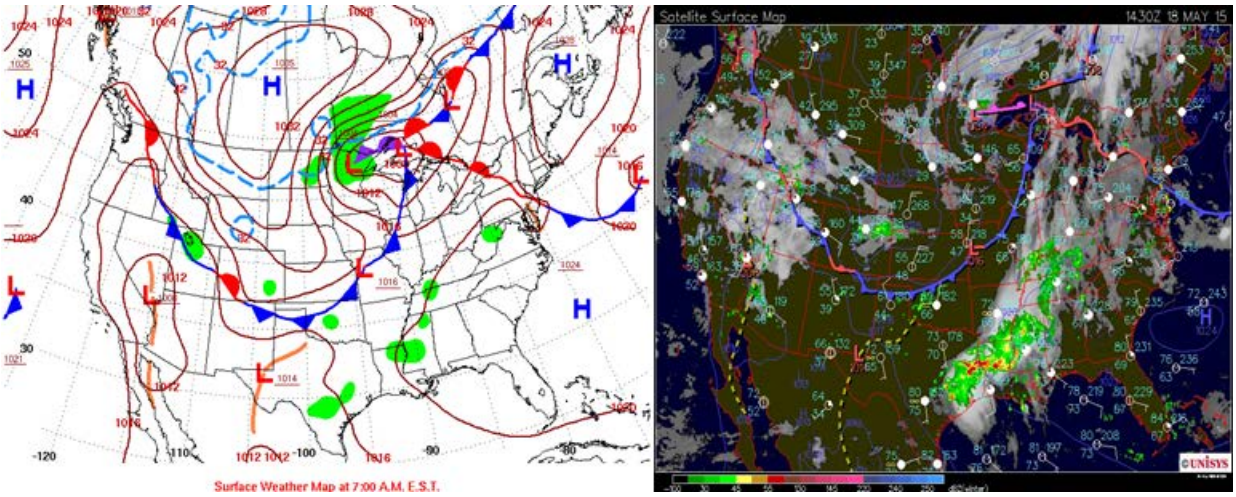

Fig 2-17: The image to the left is a surface weather taken at 04:00am PST (07:00am EST) depicting early morning potential conditions while the image to the right is a satellite surface map taken approximately two hours later (6:30am PST; 1430Z), confirming the early morning conditions. Map courtesy of the National Centers for Environmental Prediction, Weather Prediction Center and Unisys

Figure 2-17 supports the expected conditions that brought high westerly winds to Imperial County affecting air quality and the Brawley monitor on May 18, 2015. The image to the left highlights the low pressure as it sits over southern Nevada, western Arizona and eastern California, right over Imperial County and northern Mexico. A surface trough (orange dashed line) is depicted just east of California. As mentioned above, most troughs bring clouds, showers, and a wind shift as they pass. The image to the right is a satellite surface map taken approximately two hours after the first image, which supports the presence of the low pressure and trough. **Figure 2-18** (GOES-W Satellite Images) provides support of the forecasted strong west-southwest wind 26 to 31 mph for Imperial County on May 18, 2015.

FIGURE 2-18
GOES-W SATELLITE IMAGES

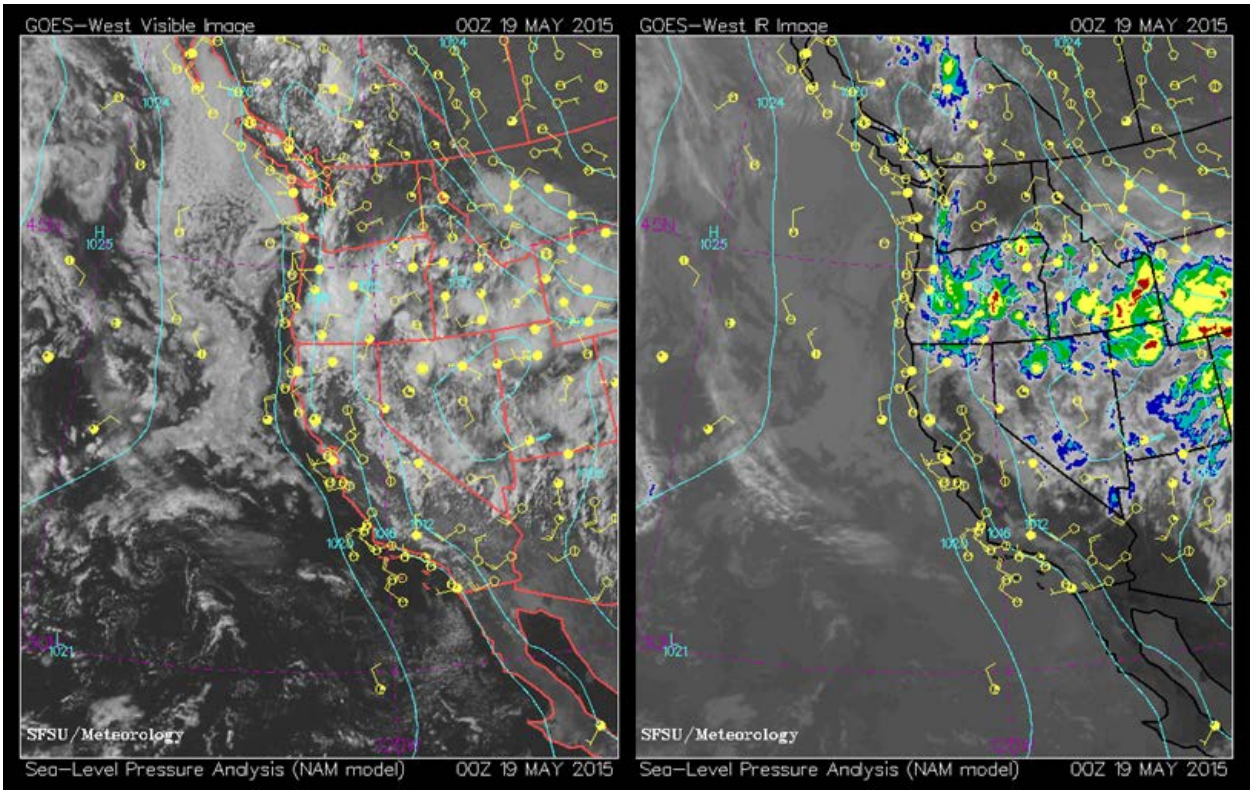

Fig 2-18: GOES-W visible (left) and infrared (right) satellite images captured at 4:00pm PST (00Z) display the wind barbs indicating that southeastern California experienced strong WSW winds of 26-31 mph. Both the Niland and Brawley FEM monitors measured its highest PM_{10} concentrations during the evening hours of May 18, 2015. Courtesy of SFSU Department of Earth and Climate Sciences and the California Regional Weather Server

The NWS, for the San Diego and Phoenix offices both began issuing weather forecast that included information regarding the movement of a "series of weak low-pressure systems" as early as May 17, 2015. Both NWS offices advised that increased cloud coverage, a slight chance for rain, and gusty winds, primarily for the mountains and deserts were possible by Monday, May 18, 2015. While the Phoenix NWS office indicated gusty westerly winds for KIPL, the San Diego, NWS office, issued a wind advisory via an Urgent Weather Message at 12:10pm PST (1:10pm PDT) for the lower deserts and adjacent desert mountain slopes. With west winds 20 to 30 mph and with local gusts 50 to 55 mph the wind advisory was in effect from 10:00pm PST (11:00pm PDT) Monday, May 18, 2015 through 8:00am PST (9:00am PDT) Tuesday, May 19, 2015. As the weather system moved into Imperial County, gusty westerly winds did in fact occur. A visual demonstration of the ramp up of the event is in **Figure 2-19.**

According to meteorological instruments at various locations including the Imperial County Airport (KIPL) and the El Centro NAF (KNJK), westerly winds prevailed and were variable as early

as May 17, 2015. Measurable elevated winds begin the evening of May 17, 2015 fluctuating between 11 and 21 mph at KNJK.[5] By May 18, 2015, wind speeds remain consistently elevated throughout the day with measurable gust as early as 10:56am PST at KNJK and 11:53am PST at KIPL. The strongest wind speeds measured at or above 20 mph occurred between the hours of 12:56pm and 8:56pm PST at KNJK and 2:53pm and 7:53 pm PST at KIPL coincident with the elevated concentrations at the Brawley and Niland monitors (**Figure 2-20**). The airports in Imperial County measured more than one hour above 25 mph with at least two consecutive hours for both, during the same period. As wind speeds begin to decrease so do concentrations of PM_{10}.

The elevated wind speeds and 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**). A summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico, is shown in **Table 2-2**. For detailed meteorological station, graphs see **Appendix B**.

[5] Quality Controlled Local Climatological Data (QCLCD) reports for the Naval Air Facility and the Imperial County Airport report the approximate time of consistent elevated wind speeds at 6:56pm PST (1856 LST). See **Appendix B** for full reports

FIGURE 2-19
BRAWLEY RAMP-UP ANALYSIS MAY 18, 2015

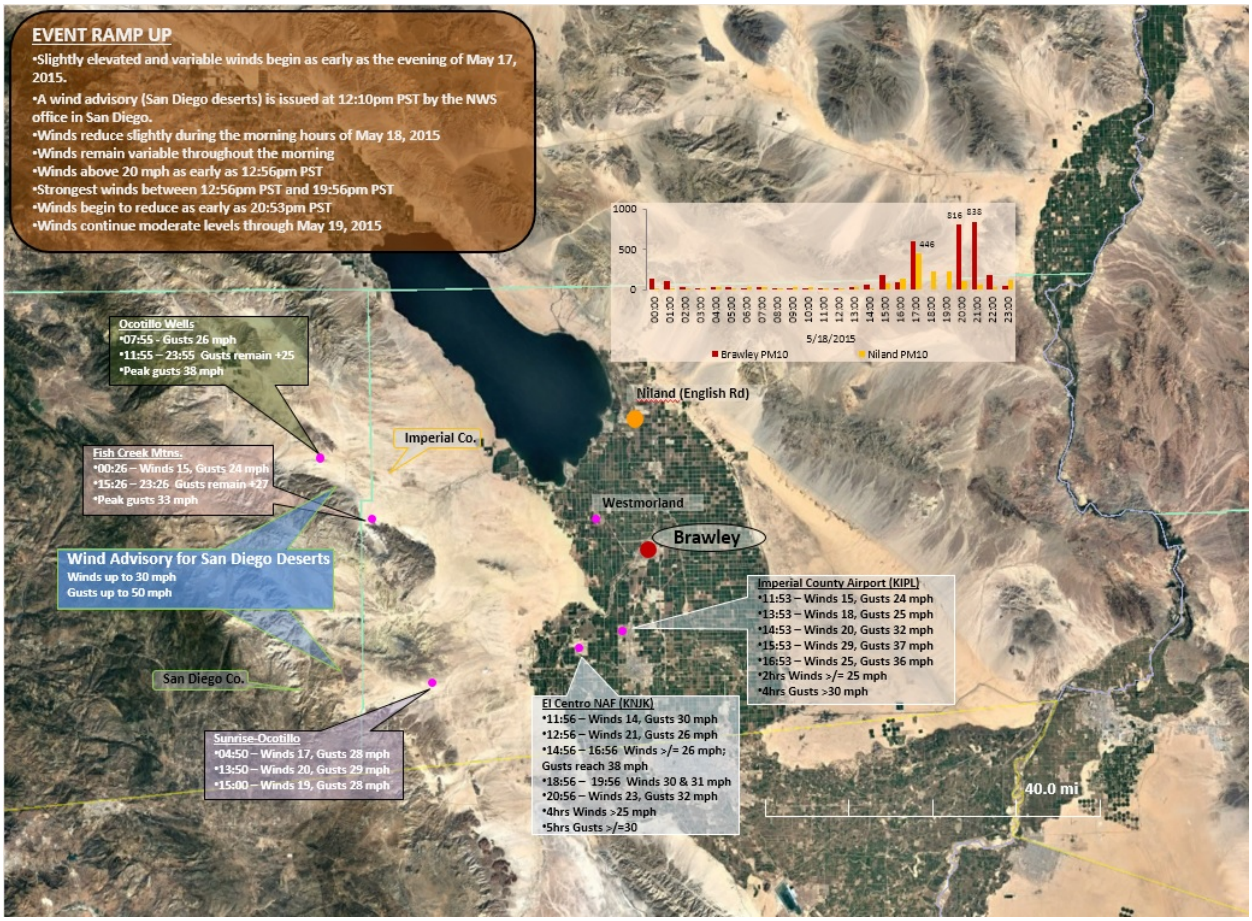

Fig 2-19: Ramp-up analysis for the Brawley monitoring station identifying increases in wind speed and subsequent spikes in PM_{10} that occurred as the weather system moved into the region on May 18, 2015. Air quality data from the EPA's AQS data bank. Wind data for KIPL and KNJK from the NCEI's QCLCD system

FIGURE 2-20
BRAWLEY AND NILAND WIND AND CONCENTRATIONS

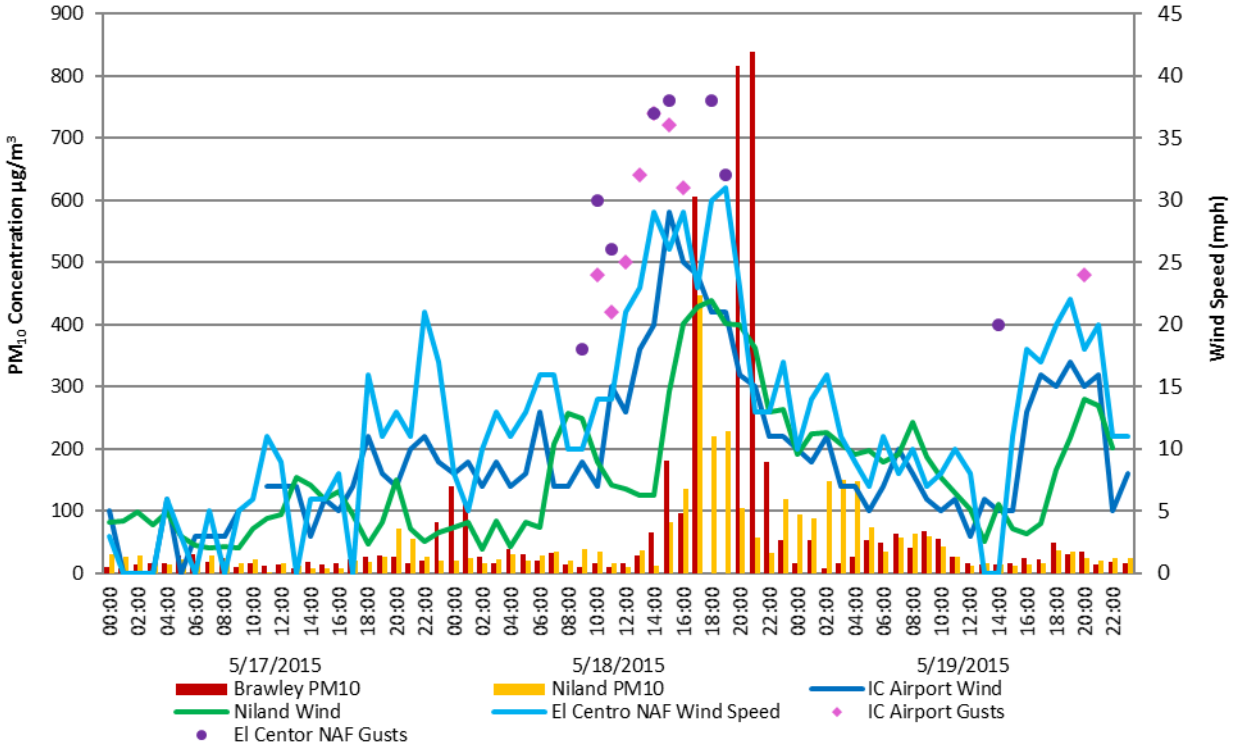

Fig 2-20: Measureable gusts at both KIPL and KNJK, along with the strongest wind speeds is coincident with the elevated concentrations at the Niland and Brawley monitors. Air quality data from the EPA's AQS data bank. Wind data for KIPL and KNJK from the NCEI's QCLCD system

TABLE 2-2
***WIND SPEEDS ON MAY 18, 2015**

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	
						**Brawley	Niland
IMPERIAL COUNTY							
Imperial Airport (KIPL)	29	250	15:53	37	15:53	181	83
Naval Air Facility (KNJK)	31	260	19:56	38	19:56	995	228
Calexico (Ethel St)	16	278	17:00	-	-	600	600
El Centro (9th Street)	13.7	268	19:00	-	-	995	228
Niland (English Rd)	21.9	249	18:00	-	-	995	221
RIVERSIDE COUNTY							
Blythe Airport (KBLH)	18	240	14:52	24	14:52	65	13
Palm Springs Airport (KPSP)	24	320	12:53	36	9:53	16	10
Jacqueline Cochran Regional Airport (KTRM) - Thermal	24	330	21:52	34	21:52	838	58
ARIZONA - YUMA							
Yuma MCAS (KNYL)	15	290	20:57	-	21:57	816	105
MEXICALI - MEXICO							
Mexicali Int. Airport (MXL)	24.2	280	17:00	-	-	606	446

*Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)
**Brawley hours 18:00 and 19:00 inlet flow overcome pressure drop 995 values invalided for not meeting critical criteria requirements

The back trajectory National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT model,[6] **Figure 2-20,** indicates the path of the airflow 24 hours ending at 4:00pm PST when elevated wind speeds measured 20mph and above with coincident elevated concentrations at the Niland and Brawley monitors. Similarly, the path indicates a west-southwesterly path, critical for the discussion in the causal section explaining why Niland did not exceed.

Gusty west winds traveled over and through the mountain and deserts slopes of San Diego, within the western section of Imperial County, across largely barren soils and over agricultural farmland reaching the Brawley and Niland monitors. Entrained dust particles where transported by these gusty west winds, affecting PM_{10} monitors throughout southeastern California and Arizona.

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

FIGURE 2-21
HYSPLIT BACK-TRAJECTORY MODEL

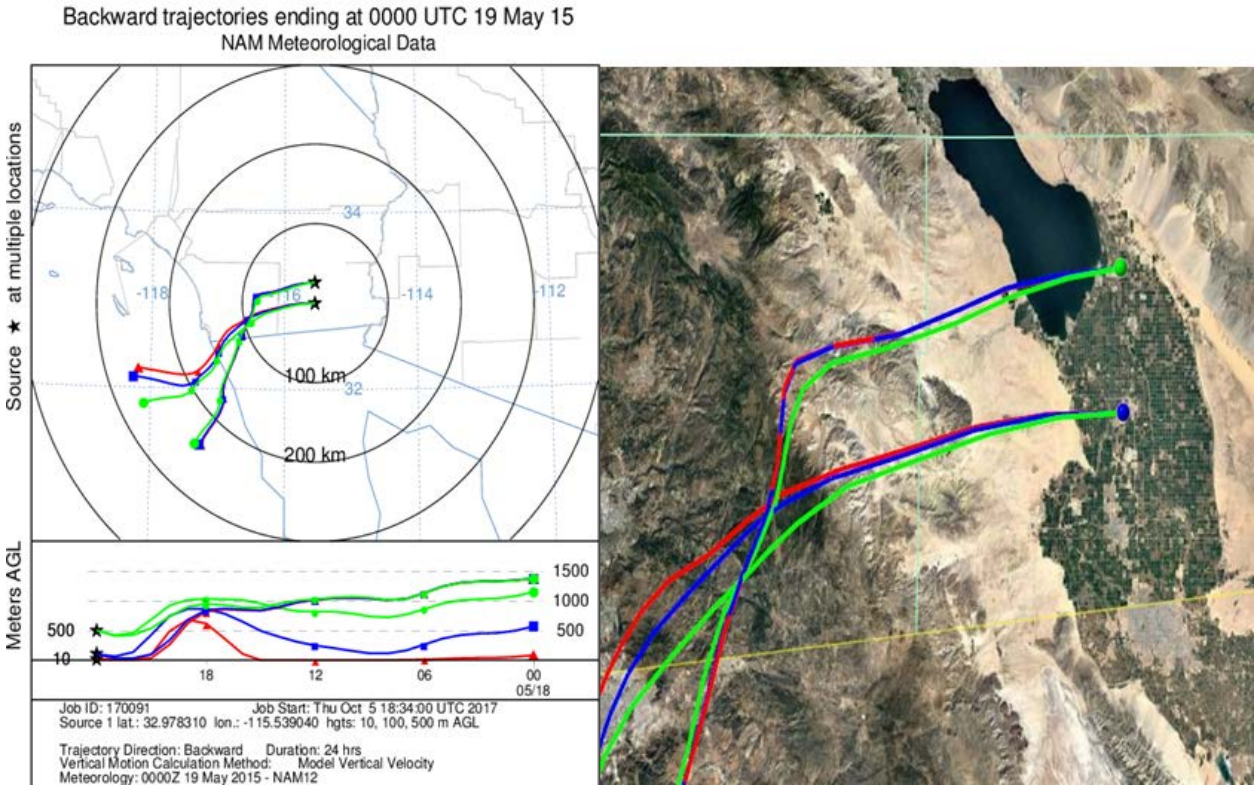

Fig 2-21: 24-hour back trajectory ending at 4:00pm PST on May 18, 2015 and base map. Red line indicates airflow at 10 meters AGL (above ground level); blue=100m; green=500 meters AGL (above ground level). Generated through NOAA Air Resources Laboratory HYSPLIT

Figure 2-21 illustrates the elevated levels of hourly PM_{10} concentrations, measured in Riverside, Imperial and Yuma Counties for the day before, after and during the wind event. Elevated emissions where entrained into Imperial County affecting the Brawley monitor when gusty west winds that were associated with the passage a low-pressure system that was situated in southern Nevada moved over California passing through Imperial County on May 17, 2015 and continued through May 19, 2015.

While the wind driven entrained dust particles resulted in elevated concentrations of PM_{10} within the northern section of Imperial County (**Table 1-1**) only the Brawley monitor measured an exceedance of the NAAQS with a (midnight to midnight) 24-hr average concentration of 304 $\mu g/m^3$.[7] Although the Niland and Westmorland sites measured elevated concentrations of PM_{10} on May 18, 2015, it was not enough to cause an exceedance. Like Brawley, the Niland FEM monitor measured its highest elevated concentration during late afternoon hours, measurement of 446$\mu g/m^3$ during the 17:00 hour.

[7] The Brawley FEM monitor experienced a critical criteria issue that stemmed from clogging of the inlet causing a pressure drop and flow error. Because the flow rates dropped below regulatory critical limits, the concentrations were invalidated.

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[8] High wind dust events are considered natural events when the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the May 18, 2015 high, wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-22
72 HOUR CONCENTRATIONS AT NEIGHBORING SITES

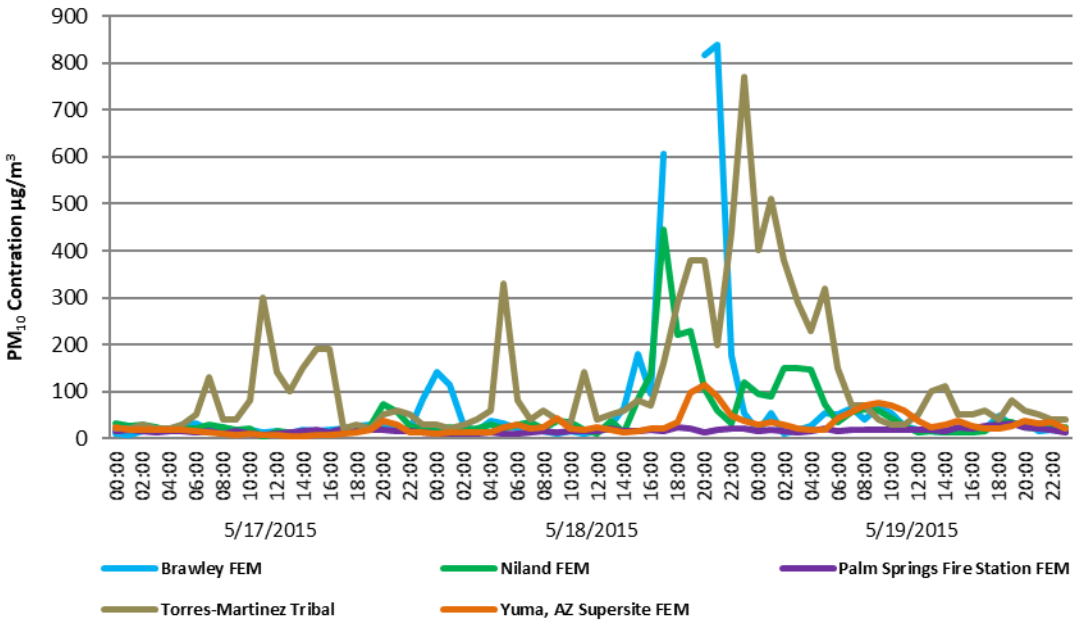

Fig 2-22: Is the graphical representation of the 72-hour relative PM_{10} concentrations at FEM monitoring sites throughout Riverside, Imperial and Yuma counties. Indio (Jackson St) did not record during this period. Air quality data from the EPA's AQS data bank

[8] 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.

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 Brawley monitor on May 18, 2015, compared to non-event and event days demonstrates the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the May 18, 2015 high wind event and the exceedance measured at the Brawley monitor.

Figures 3-1 and 3-2 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley monitor for the five-year six-month period of January 1, 2010 to May 18, 2015, for 1,964 sampling days. Note that prior to 2013, the BAM data was not FEM compliant thus not reported into AQS.[9] In order to properly establish the variability of the event, as it occurred on May 18, 2015, 24 hour averaged PM_{10} concentrations were compiled and plotted as a time series, January 1, 2010 to May 18, 2015 to provide a historical perspective of PM_{10} concentrations at the Brawley monitor. Both figures illustrate that the exceedance, which occurred on May 18, 2015, was outside the normal historical concentrations when compared to event and non-event days.

[9] Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM_{10} concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM_{10} concentrations to PM_{10} concentrations with in this demonstration.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 18, 2015

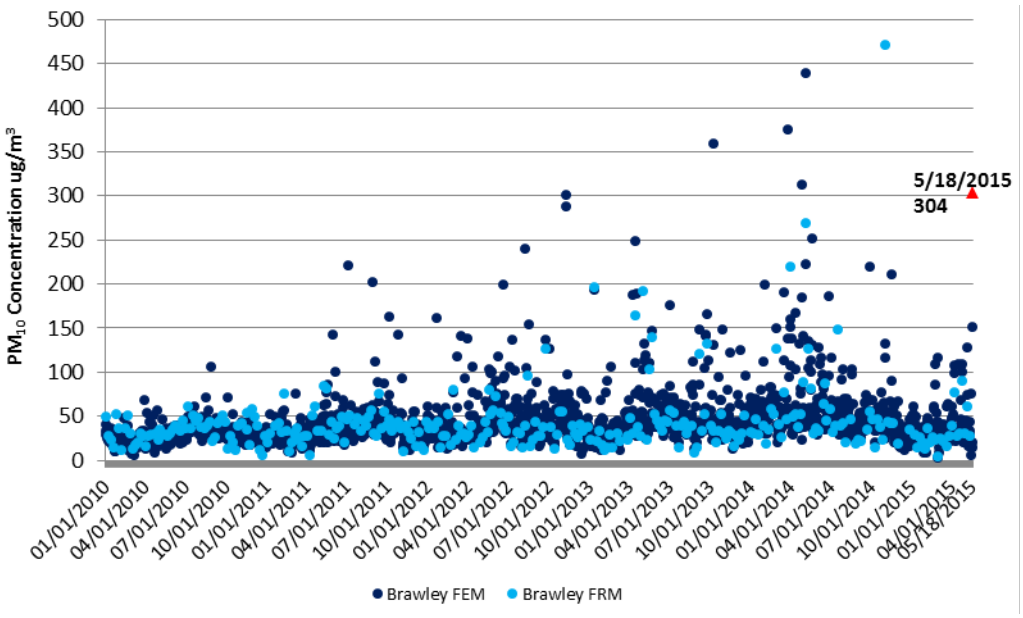

Fig 3-1: A historical comparison of PM_{10} concentrations to concentration at the Brawley monitor demonstrates that the measured 304 µg/m^3 on May 18, 2015, was outside the normal historical concentrations when compared to similar days and non-event days

The time series, **Figure 3-1**, for Brawley includes 2,276 credible samples, measured by FRM or FEM monitors between January 1, 2010 and May 18, 2015. Overall, the time series illustrates that of the 1,964 sampling days 32 exceedances occurred, which is less than a 2% occurrence rate. Of the total 32 exceedance days, second quarter (Apr thru Jun) measured 14 exceedance days (503 total sampling days) which equates to less than a 3% occurrence rate. Overall, the May 18, 2015 concentration is outside the normal historical measurement for the second quarter. The remaining 18 measured exceedance days occurred during the first, third, and fourth quarters spanning January 1, 2010 through May 18, 2015. No exceedances of the standard occurred during 2010.

FIGURE 3-2
BRAWLEY SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
APRIL 1, 2010 TO JUNE 30, 2015

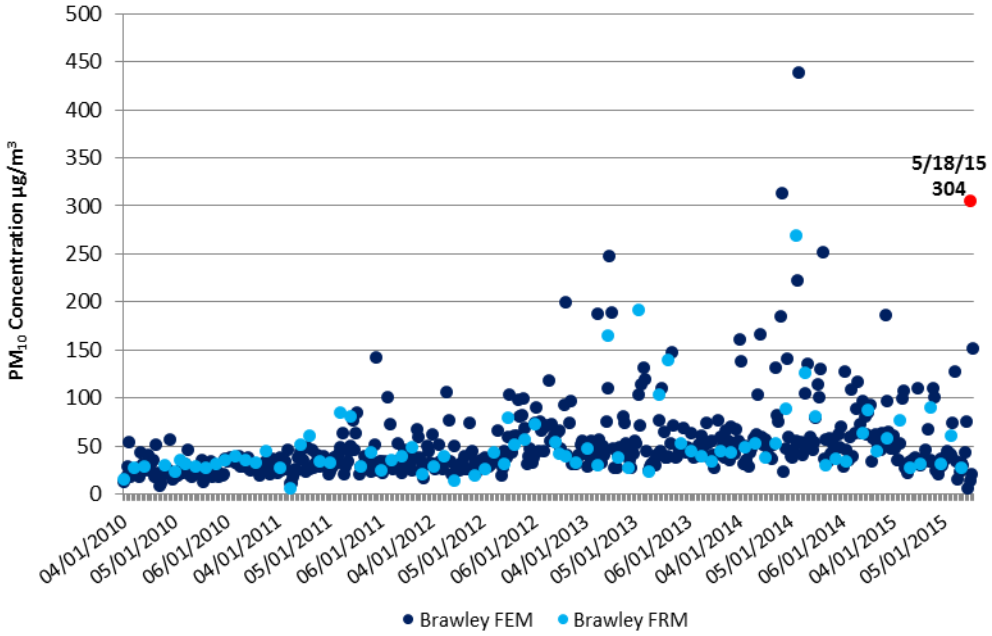

Fig 3-2: The seasonal historical comparison using the months of April through June for the years 2010 through 2015 supports that the measured exceedance at the Brawley monitor on May 18, 2015 was outside the normal historical norm

Figure 3-2, for Brawley illustrates the seasonal pattern between April and June for the years 2010 through 2015. Of the 586 credible samples measured among 503 sampling days, 14 exceedances occurred (April to June time between 2010 and 2015). This equates to less than a 3% occurrence rate. The May 18, 2015 measured concentration at the Brawley monitor was outside the normal historical and seasonal concentration when compared to both event days and non-event days.

FIGURE 3-3
BRAWLEY HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 TO MAY 18, 2015

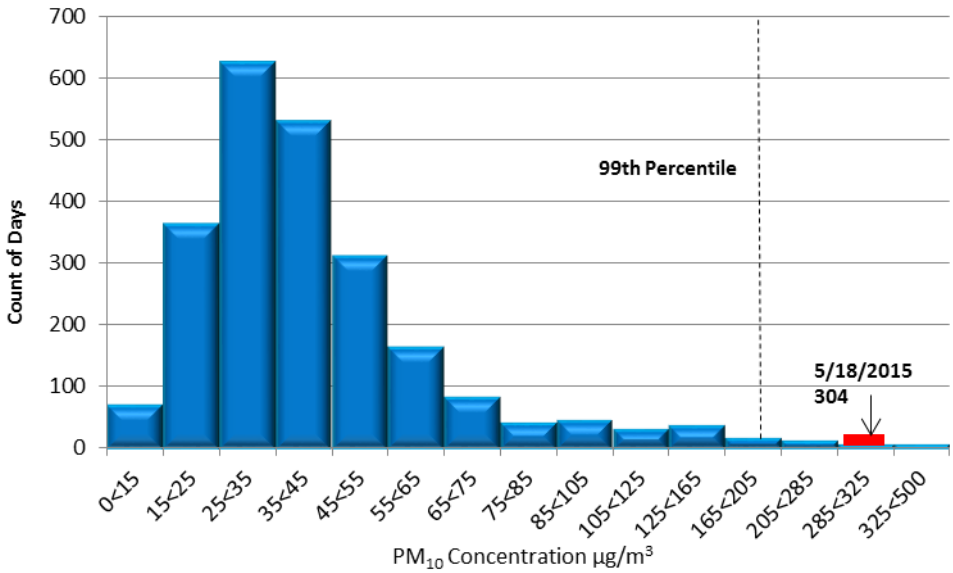

Fig 3-3: The 24-hr average PM_{10} concentrations measured at Brawley monitoring site demonstrates that the May 18, 2015 event was in excess of the 99th percentile

FIGURE 3-4
BRAWLEY SEASONAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
APRIL 1, 2010 TO JUNE 30, 2015

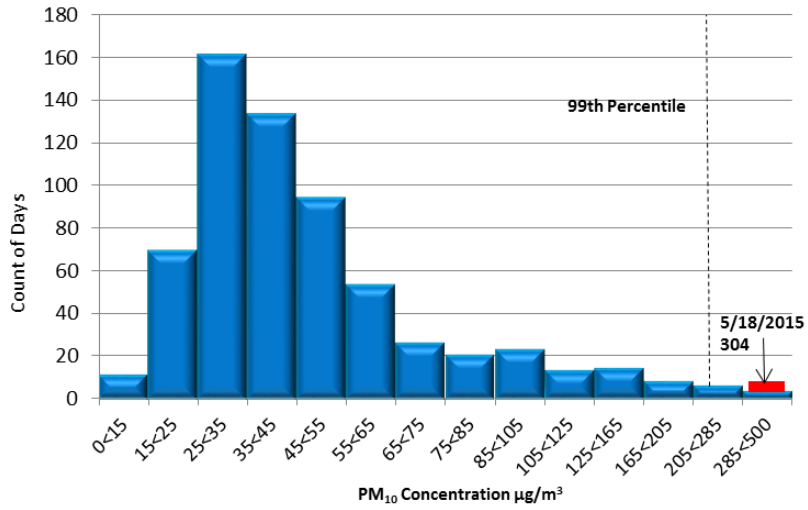

Fig 3-4: The 24-hr average PM_{10} concentration at the Brawley monitoring site demonstrates that the May 18, 2015 event was in excess of the 99th percentile

For the combined FRM and FEM data sets for the Brawley monitor, including **Figures 3-3 and 3-4**, the annual historical and the seasonal historical PM_{10} concentration of 304µg/m^3 is well at the 99th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns the May 18, 2015 measured exceedance of 304µg/m^3 for the Brawley monitor 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 May 18, 2015 occurs infrequently. When comparing the measured PM_{10} levels on May 18, 2015 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedance measured at the Brawley site was outside the normal historical and seasonal concentration levels.

This historical concentration analysis provided here supports the determination that the May 18, 2015 natural event affected the concentration levels at the Brawley 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 exceedances on May 18, 2015 and the natural event, qualifying the natural event as an Exceptional Event.

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. In order to properly 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 in order to properly 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 are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered 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 considered 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 May 18, 2015. In addition, this May 18, 2015 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley monitor on May 18, 2015. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the May 18, 2015 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 ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

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

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

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

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

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

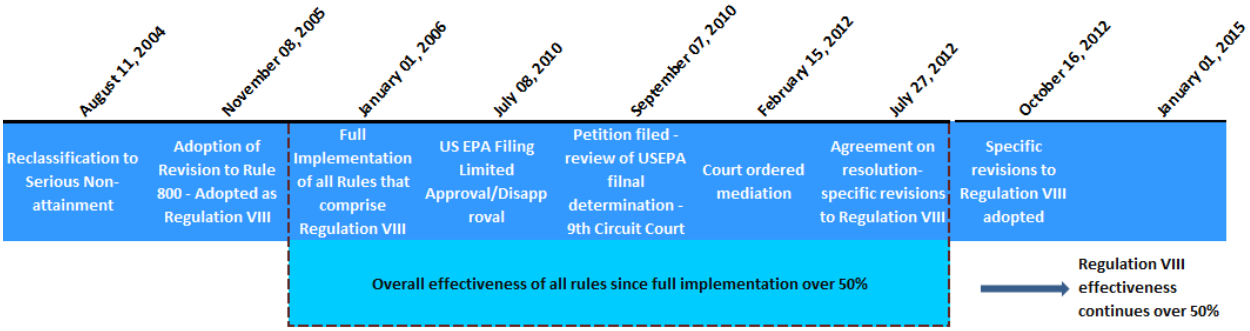

Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII, which is comprised of seven fugitive dust rules, is found below. **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, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

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

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

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

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

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

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

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

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

Smoke Management Plan (SMP) Summary

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

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews hourly surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four-quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On May 18, 2015, the ICAPCD declared a No Burn day **(Appendix A).** There were no complaints filed for agricultural burning on May 18, 2015.

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 Niland during the time of the May 18, 2015 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 May 18, 2015 officially declared as No Burn day related to agricultural or waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

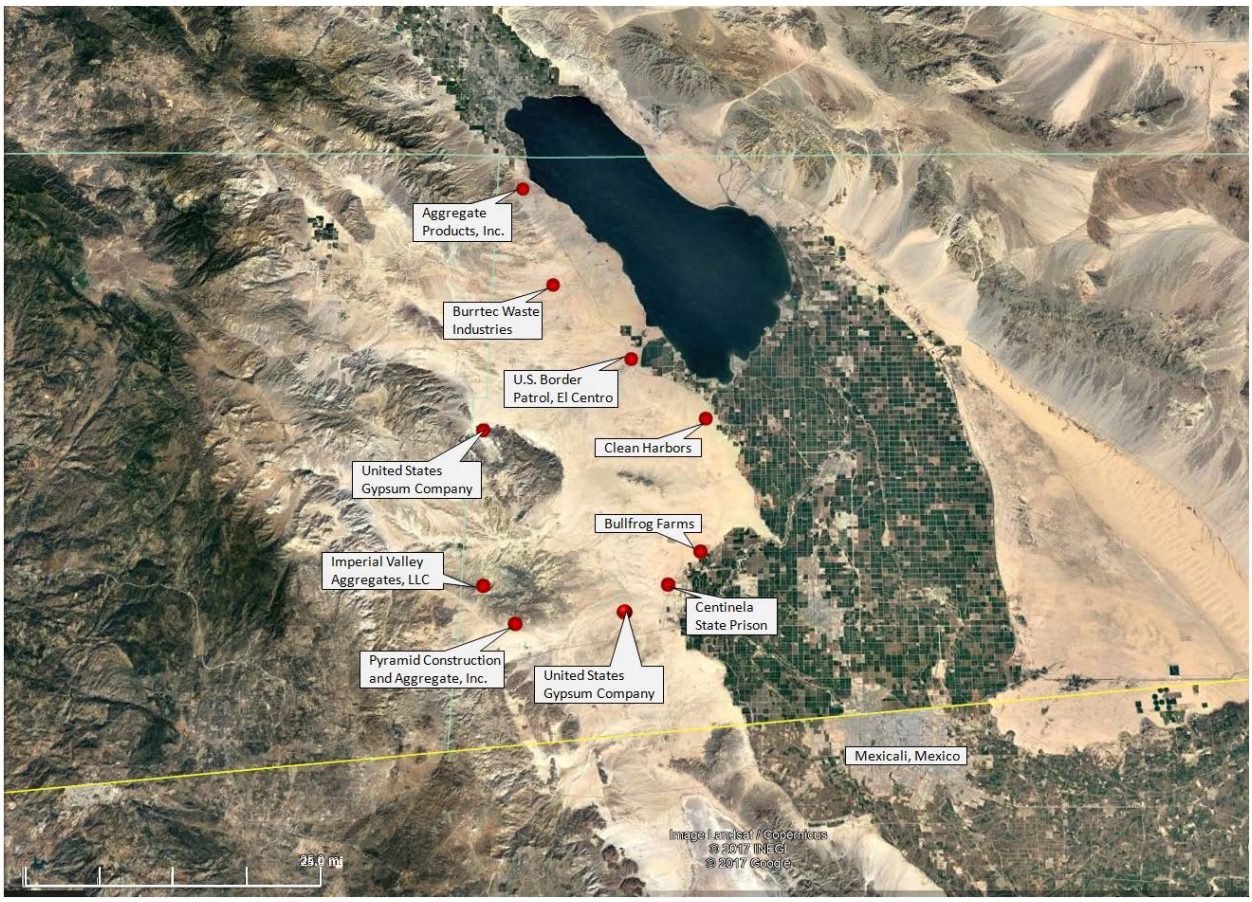

Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley monitor. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States 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

FIGURE 4-3
NON-PERMITTED SOURCES

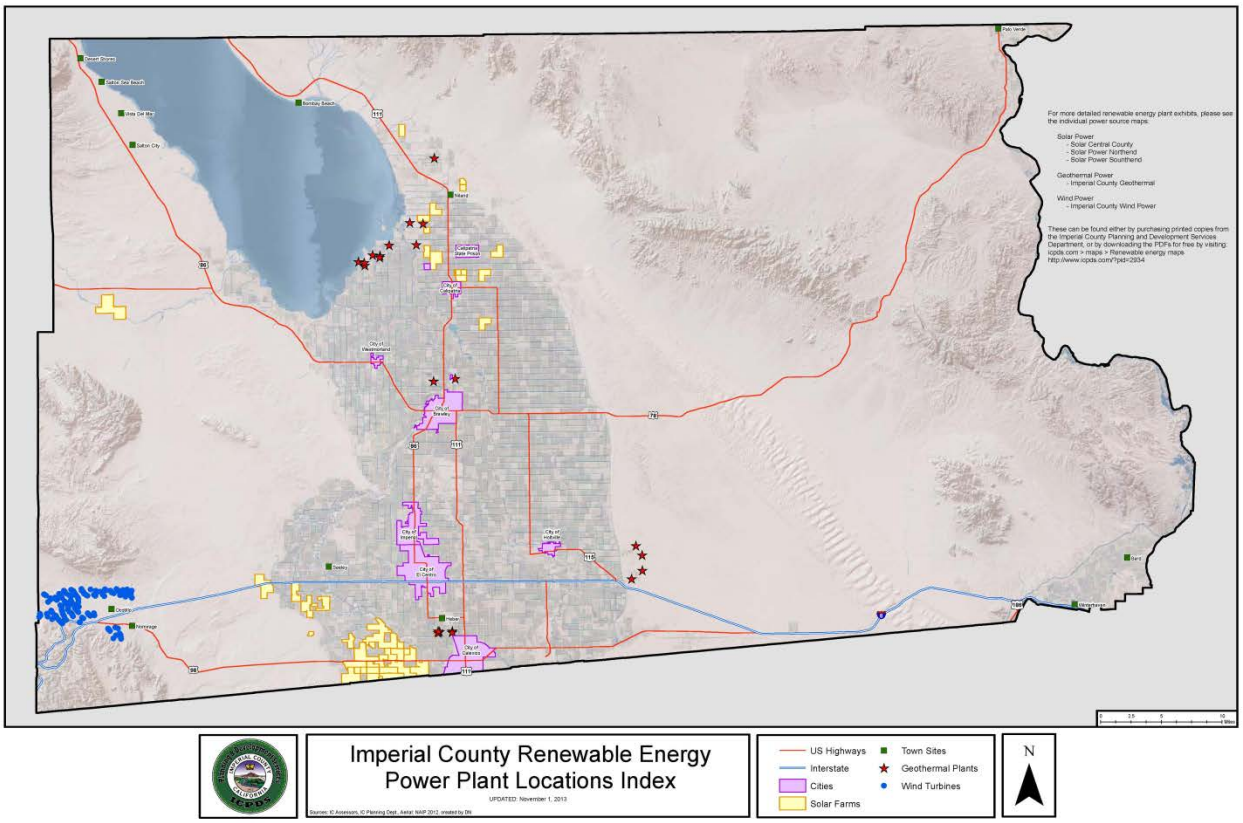

Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

Both the San Diego and Phoenix NWS offices began issuing zone forecast advising of the movement of a series of low pressure systems that would bring cloud coverage, a slight chance for rain, and gusty winds, primarily for the mountains and deserts. The San Diego NWS office issued an Urgent Weather Message May 18, 2015 at 12:10pm PST which included a wind advisory for the lower deserts and adjacent desert mountain slopes. With west winds 20 to 30 mph and with local gusts 50 to 55 mph the wind advisory was in effect from 10:00pm PST (11:00pm PDT) Monday, May 18, 2015 through 8:00am PST (9:00am PDT) Tuesday, May 19, 2015. Similarly, the NWS Phoenix office forecast winds 20 mph and gusts up to 30 mph during the afternoon and evening hours of May 18, 2015.

Finally, the ICAPCD web-based Air Quality Index (AQI) for May 18, 2015 confirms the affect upon air quality. The AQI reached moderate or yellow levels by 6:00pm PST (7:00pm PDT) reaching unhealthy levels by 11:00pm PST or 12:00am (PDT). The index level cautions those with

respiratory sensitivities to be cautious as the levels increase the U.S. EPA cautions that people with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion."[10] **Appendix A** contains copies of notices pertinent to the May 18, 2015 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2)**. Five hours of winds speeds above 25 mph were measured at the El Centro NAF (KNJK) between the hours of 1:56pm PST (2:56 PDT) and 6:56pm PST (7:56 PDT). KNJK measured wind gusts between 18mph and 38mph during afternoon and evening hours. Imperial County Airport (KIPL), located within an urban setting, measured two consecutive hours (1:53pm and 2:53pm PST) of 25 mph winds along with measured gusts between 21 mph and 37 mph. Wind speeds over 25 mph are normally sufficient to overcome most PM_{10} control measures. During the May 18, 2015 event, wind speeds were above the 25 mph threshold overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that gusty west winds associated a low-pressure system that was enhanced by the presence of both a fairly stationary surface trough and an upper level low-pressure trough which moved over California caused uncontrollable PM_{10} emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements within the surrounding areas to the north and south of Brawley during the event were consistent and gusty enough (above 25 mph, with wind gusts over 30 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 May 18, 2015 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 May

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

18, 2015 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 May 18, 2015 identified a series of weak low-pressure systems off the California coast that moved inland producing strong onshore flow with gusty winds in the mountains and deserts. The first low-pressure system off the California coast that moved inland through California brought gusty west winds across the mountains and deserts of southeastern California. While Imperial County airports measured winds predominantly from the west and southwest northern airports in Riverside measured winds predominantly from the north, northwest (**Figures 5-1 and 5-2**). In any event, gusty westerly winds entrained windblown dust from natural areas, particularly from the mountain and desert areas west and southwest of Brawley.

Meteorological and air quality observations affirm the entrained windblown dust from natural areas, west and southwest of Brawley on May 17, 2015, May 18, 2015 and May 19, 2015. Moderate west winds measured in Imperial County occurred as the low-pressure system moved southeast during the evening hours of May 17, 2015 and the morning hours of May 18, 2015. By afternoon and evening hours of May 18, 2015 Imperial County airports measured elevated winds and gusts. Similarly, northwest airports in Riverside County measured consecutive hours of gusts above 20 mph reaching 36 mph primarily during the afternoon and evening hours. As gusty west winds continued, a wind advisory issued for the San Diego deserts adjacent to Imperial County advised of 30 mph winds and gusts 55 mph (**Appendix A**). **Figure 5-1** is a satellite image that captured the incoming clouds associated with the weather system that brought gusty west winds that affected air quality in Imperial County.

FIGURE 5-1
MODIS TERRA SATELLITE IMAGE MAY 18, 2015

Fig 5-1: A MODIS Terra satellite image 9:30am PST (10:30 PDT) captured the clouds as the weather system moves into Imperial County. Arrows placed as a general illustration of QCLCD data. Image: AirNow Tech Navigator

The low-pressure system enhanced by the presence of both a fairly stationary surface trough and an upper level low pressure trough moving over California brought gusty west winds to southeastern California before moving east into Arizona. **Figure 5-2** confirms a moderately thick layer of aerosols suspended over portions of southeastern California and northern Mexico.[11] Note the increase in the thickness of the aerosols within the mountain and desert slopes to the west and south of Brawley. Finally, NOAA's Satellite Services Division released a descriptive text narrative for smoke/dust observed in satellite imagery through 6:15pm PST (7:15pm PDT) May 18, 2015 that calls out light blowing dust over southern California originating from the desert

[11] 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

areas west of the Salton Sea moving east. In addition, the text describes a small plume of blowing dust to the northwest of the Salton Sea moving south (**Appendix A**).

FIGURE 5-2
AEROSOLS OVER IMPERIAL COUNTY MAY 18, 2015

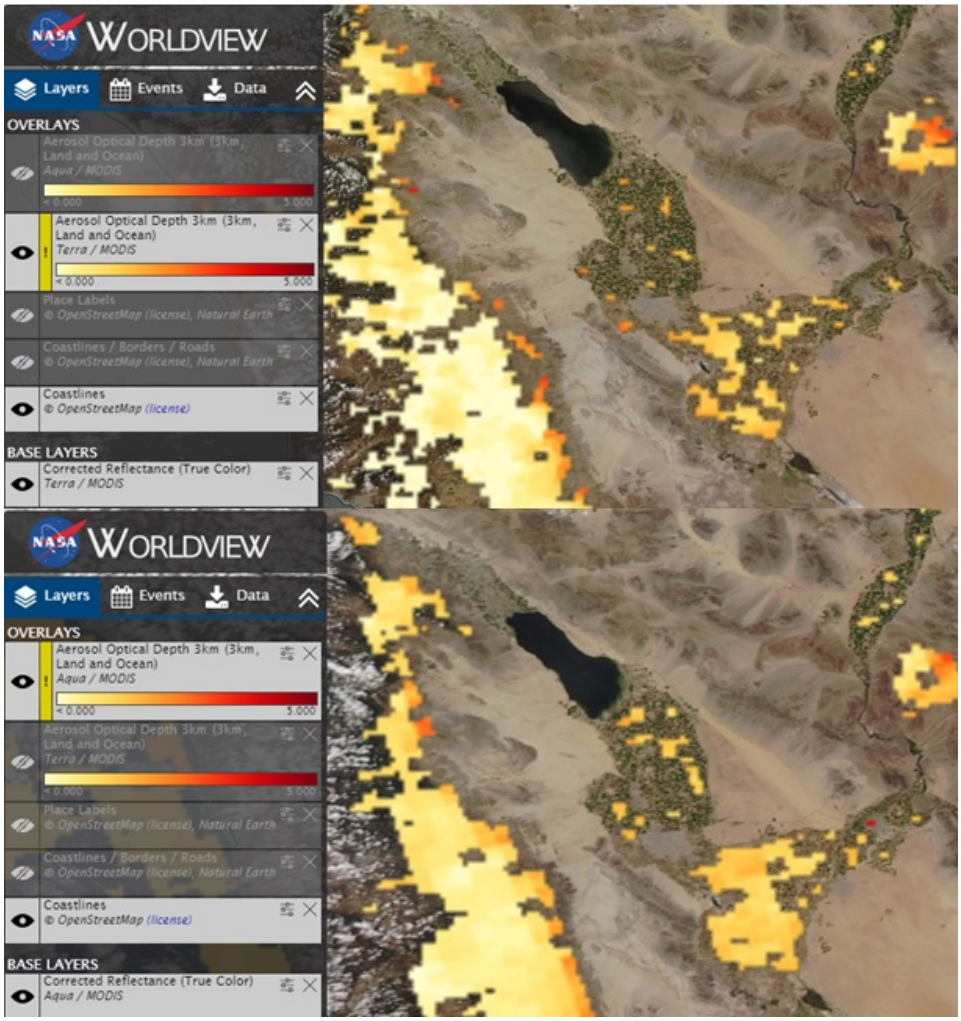

Fig 5-2: Terra and Aqua MODIS satellite images showing the AOD along the edges of the mountains of San Diego County and over Imperial County. The top image was captured shortly after 9:30am PST (10:30 PDT). The bottom image was captured shortly after 12:30pm PST (1:30 PDT). Warmer colors indicate thicker AOD. Source: https://worldview.earthdata.nasa.gov

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[12] **Tables 5-1 through 5-3** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding station.[13] The Brawley monitor shows peak hourly concentrations following or during the period of high upstream wind

[12] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016
[13] Please refer to **Appendix B** for a brief explanation regarding the meteorological differences between stations.

speeds. The Brawley station does not have its own meteorological instruments, as does Niland. The measured strong west winds blew across and through the mountain passes of San Diego County, down the canyon/desert slopes and into the desert floor of Imperial County. The strong west winds transported windblown dust toward Brawley, and Niland, elevating concentrations sufficiently to cause an exceedance at the Brawley monitor.

TABLE 5-1
BRAWLEY AND NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS MAY 17, 2016

OCOTILLO WELLS				FISH CREEK MOUNTAINS				SUNRISE-OCOTILLO				EL CENTRO NAF				IMPERIAL COUNTY AIRPORT					NILAND BAM	BRAWLEY BAM
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0:00	7	10	328	0:00	1	13	297	0:00	5	8	248	0:56	3		300	0:53	5		130	0	31	10
1:00	5	8	335	1:00	3	9	187	1:00	8	11	229	1:56	0		0	1:53	0		0	100	26	8
2:00	2	7	321	2:00	11	17	207	2:00	5	8	252	2:56	0		0	2:53	0		0	200	28	15
3:00	4	7	329	3:00	8	17	194	3:00	4	8	268	3:56	0		0	3:53	0		0	300	23	17
4:00	4	8	323	4:00	9	12	196	4:00	7	12	242	4:56	6		250	4:53	6		270	400	15	17
5:00	4	6	329	5:00	2	11	87	5:00	5	11	248	5:56	3		240	5:53	0		0	500	22	28
6:00	8	12	323	6:00	4	7	175	6:00	7	11	241	6:56	0		0	6:53	3		280	600	20	31
7:00	2	5	6	7:00	3	10	186	7:00	8	12	235	7:56	5		310	7:53	3		340	700	29	19
8:00	3	5	246	8:00	1	7	275	8:00	4	8	326	8:56	0		0	8:53	3		320	800	24	24
9:00	6	10	242	9:00	5	12	85	9:00	7	12	100	9:56	5		100	9:53	5		VR	900	17	11
10:00	8	11	174	10:00	7	12	33	10:00	9	14	103	10:56	6		VR	10:53			M	1000	22	17
11:00	7	13	156	11:00	3	19	359	11:00	7	11	121	11:56	11		150	11:53	7		100	1100	2	13
12:00	8	12	159	12:00	6	14	116	12:00	8	15	99	12:56	9		100	12:53	7		140	1200	16	15
13:00	9	15	190	13:00	8	18	110	13:00	9	13	101	13:56	M		M	13:53	7		VR	1300	13	9
14:00	9	18	166	14:00	6	18	136	14:00	9	15	85	14:56	6		180	14:53	3		120	1400	9	18
15:00	6	10	108	15:00	8	16	107	15:00	7	12	246	15:56	6		140	15:53	6		260	1500	8	15
16:00	13	22	314	16:00	7	13	110	16:00	12	18	241	16:56	8		100	16:53	5		90	1600	9	17
17:00	13	25	301	17:00				17:00	13	19	246	17:56	0		0	17:53	7		80	1700	20	22
18:00	14	27	298	18:00	13	24	204	18:00	15	23	243	18:56	16		240	18:53	11		250	1800	18	26
19:00	14	22	321	19:00	15	22	201	19:00	20	29	219	19:56	11		260	19:53	8		250	1900	27	29
20:00	13	25	25	20:00	14	21	204	20:00	19	28	216	20:56	13		260	20:53	7		270	2000	72	26
21:00	16	25	305	21:00	13	20	200	21:00	20	29	230	21:56	11		270	21:53	10		270	2100	56	17
22:00	16	27	293	22:00	13	20	202	22:00	17	26	243	22:56	21		260	22:53	11		270	2200	27	20
23:00	17	26	298	23:00	15	22	208	23:00	16	24	236	23:56	17		260	23:53	9		280	2300	20	83

Table data original measurements - Wind data for Airports and Campo from NCEI's QCLCD system. All measurements in PST. Wind speed in mph; Direction in degrees.

TABLE 5-2
BRAWLEY AND NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS MAY 18, 2016

OCOTILLO WELLS				FISH CREEK MOUNTAINS				SUNRISE-OCOTILLO				EL CENTRO NAF				IMPERIAL COUNTY AIRPORT					NILAND BAM	BRAWLEY BAM
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0:00	17	26	298	0:00	15	24	209	0:00	12	23	227	0:56	8		250	0:53	8		270	0	20	140
1:00	14	25	323	1:00	11	24	218	1:00	13	23	229	1:56	5		280	1:53	9		280	100	24	114
2:00	10	15	329	2:00	11	16	204	2:00	12	23	251	2:56	10		270	2:53	7		290	200	17	26
3:00	14	23	301	3:00	9	18	203	3:00	10	21	239	3:56	13		260	3:53	9		290	300	22	16
4:00	12	20	323	4:00	12	17	214	4:00	17	28	231	4:56	11		260	4:53	7		290	400	30	38
5:00	12	20	326	5:00	12	18	200	5:00	16	28	230	5:56	13		250	5:53	8		270	500	21	31
6:00	12	22	307	6:00	8	21	204	6:00	12	21	236	6:56	16		250	6:53	13		270	600	28	20
7:00	13	21	328	7:00	11	17	203	7:00	16	23	236	7:56	16		280	7:53	7		320	700	34	32
8:00	14	26	309	8:00	10	17	194	8:00	15	24	231	8:56	10		250	8:53	7		300	800	21	15
9:00	14	25	326	9:00	7	16	197	9:00	12	24	247	9:56	10		250	9:53	9		270	900	38	10
10:00	11	22	319	10:00	7	19	179	10:00	14	22	245	10:56	14	18	270	10:53	7		270	1000	34	16
11:00	10	19	314	11:00	5	18	266	11:00	13	24	256	11:56	14	30	270	11:53	15	24	270	1100	17	10
12:00	12	25	314	12:00	5	18	317	12:00	17	28	250	12:56	21	26	240	12:53	13	21	280	1200	10	16
13:00	14	30	311	13:00	9	22	282	13:00	20	29	247	13:56	23		230	13:53	18	25	250	1300	36	29
14:00	14	32	315	14:00	14	24	228	14:00	16	27	253	14:56	29		240	14:53	20	32	250	1400	13	65
15:00	14	29	311	15:00	16	28	267	15:00	19	28	243	15:56	26	37	240	15:53	29	37	250	1500	83	181
16:00	20	37	298	16:00	10	27	263	16:00	17	27	251	16:56	29	38	240	16:53	25	36	250	1600	135	96
17:00	17	36	302	17:00	20	33	247	17:00	12	24	258	17:56	23		250	17:53	24	31	260	1700	446	606
18:00	17	32	291	18:00	17	32	238	18:00	11	19	269	18:56	30		250	18:53	21		260	1800	221	
19:00	19	31	304	19:00	17	30	230	19:00	13	24	259	19:56	31	38	260	19:53	21		250	1900	228	
20:00	20	32	312	20:00	12	31	240	20:00	11	20	259	20:56	23	32	260	20:53	16		260	2000	105	816
21:00	20	38	288	21:00	17	29	216	21:00	13	23	255	21:56	13		250	21:53	15		270	2100	58	838
22:00	19	36	298	22:00	8	27	192	22:00	13	22	251	22:56	13		230	22:53	11		240	2200	33	178
23:00	18	35	287	23:00	5	13	192	23:00	15	24	249	23:56	17		250	23:53	11		260	2300	119	53

Table data original measurements - Wind data for Airports and Campo from NCEI's QCLCD system. All measurements in PST. Wind speed in mph; Direction in degrees.

TABLE 5-3
BRAWLEY AND NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS MAY 19, 2016

OCOTILLO WELLS				FISH CREEK MOUNTAINS				SUNRISE-OCOTILLO				EL CENTRO NAF				IMPERIAL COUNTY AIRPORT					NILAND	BRAWLEY
																					BAM	BAM
HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	W/S	W/G	W/D	HOUR	PM_{10} ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0:00	20	39	307	0:00	5	13	192	0:00	15	24	249	0:56	10		250	0:53	10		260	0	94	16
1:00	18	30	300	1:00	8	12	191	1:00	17	26	241	1:56	14		260	1:53	9		260	100	89	53
2:00	18	31	311	2:00	9	14	196	2:00	19	28	243	2:56	16		250	2:53	11		260	200	149	9
3:00	18	30	293	3:00	11	17	202	3:00	19	29	240	3:56	11		250	3:53	7		250	300	150	17
4:00	17	30	308	4:00	9	16	200	4:00	19	25	239	4:56	9		270	4:53	7		270	400	148	26
5:00	14	28	316	5:00	9	15	195	5:00	17	26	242	5:56	7		270	5:53	5		290	500	73	53
6:00	12	19	308	6:00	5	13	206	6:00	18	24	237	6:56	11		270	6:53	7		290	600	35	50
7:00	15	26	322	7:00	7	14	175	7:00	16	23	239	7:56	8		270	7:53	10		270	700	57	64
8:00	10	19	319	8:00	9	16	209	8:00	15	21	240	8:56	10		250	8:53	8		320	800	63	41
9:00	12	20	305	9:00				9:00	16	23	227	9:56	7		330	9:53	6		VR	900	60	68
10:00	10	24	330	10:00	6	12	4	10:00	16	23	215	10:56	8		250	10:53	5		100	1000	43	55
11:00	5	10	315	11:00	6	12	16	11:00	7	14	275	11:56	10		100	11:53	6		300	1100	27	27
12:00	7	14	309	12:00	3	13	17	12:00	4	11	330	12:56	8		120	12:53	3		VR	1200	13	17
13:00	8	15	302	13:00	3	14	35	13:00	12	21	240	13:56	0		0	13:53	6		240	1300	16	15
14:00	8	18	307	14:00	3	17	18	14:00	13	18	221	14:56	0		0	14:53	5		VR	1400	14	14
15:00	15	26	318	15:00	8	18	202	15:00	13	20	230	15:56	11	20	210	15:53	5		260	1500	12	17
16:00	11	25	316	16:00	12	24	256	16:00	13	20	247	16:56	18		230	16:53	13		240	1600	14	24
17:00	14	25	312	17:00	14	25	254	17:00	14	20	243	17:56	17		240	17:53	16		260	1700	16	22
18:00	15	28	301	18:00	13	23	255	18:00	9	16	247	18:56	20		250	18:53	15		260	1800	36	49
19:00	12	24	312	19:00	8	21	258	19:00	15	24	244	19:56	22		260	19:53	17		270	1900	34	30
20:00	14	26	312	20:00	13	22	234	20:00	13	20	251	20:56	18		250	20:53	15		260	2000	24	35
21:00	13	25	319	21:00	16	22	201	21:00	14	22	247	21:56	20		260	21:53	16	24	260	2100	20	15
22:00	14	24	307	22:00	15	22	215	22:00	17	25	243	22:56	11		290	22:53	5		320	2200	25	18
23:00	13	21	329	23:00	15	23	198	23:00	10	18	259	23:56	11		280	23:53	8		290	2300	25	16

Table data original measurements - Wind data for Airports and Campo from NCEI's QCLCD system. All measurements in PST. Wind speed in mph; Direction in degrees.

The analysis of the meteorological setting, including weather reports and NWS satellite imagery, indicates that a low-pressure system brought gusty west winds across the San Diego county mountains and desert slopes into Imperial County as early as May 17, 2015 through May 19, 2015. The weather system caused the NWS to issue a wind advisory (**Appendix A)** for a wide area covering the mountain and desert slopes of San Diego County, Riverside County, and the whole of Imperial County. The advisory included a forecast of strong westerly winds of 20 to 30 mph, with possible gusts up to 40 mph. As the weather system moved through San Diego and into Imperial County, strong winds and concurrent gusts did in fact occur.

FIGURE 5-3
BRAWLEY EXCEEDANCE FACTORS MAY 18, 2015

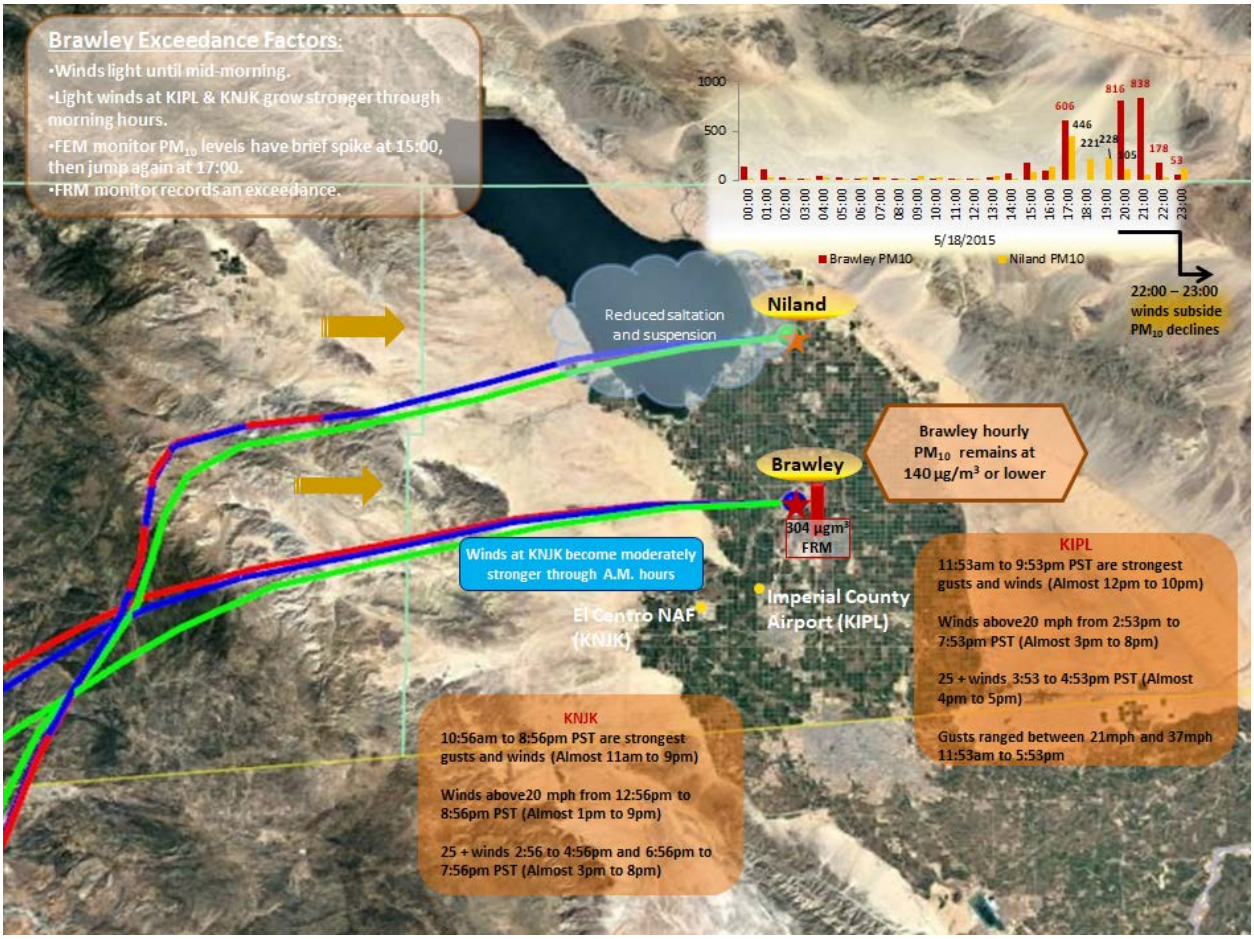

Fig 5-3: High winds measured at upwind sites played a key role in the exceedance of the Brawley FRM monitor. Entrained windblown dust from the mountain and desert slopes west-to-west-southwest of Brawley within Imperial County. The HYSPLIT back trajectory shows the general path of air ending at Brawley at 17:00 on May 18, 2015. See also **Figures 2-13** and **2-14**. Google Earth base map

Figure 5-3 provides a timeline of wind speeds during the time when the monitoring stations measured elevated concentrations of PM_{10}. The NWS San Diego office issued a wind advisory for the desert areas at 1:10 p.m. on May 18, 2015. The wind advisory forecast 30 mph wind speeds and gusts potentially reaching 55 mph along desert slopes and the desert floor. Likewise, diminished visibility was expected below two miles because of blowing dust and sand. **Figure 5-3** is a visual illustration of the chain of events.

As shown in **Figure 5-3,** high westerly winds within the mountains and deserts located west of Brawley entrained windblown dust affecting air quality and local air monitoring stations in Imperial County. Wind direction, wind speed and gust combined with local topography provided the factors that enabled approaching westerly winds to affect the Brawley monitor, which

resulted in an exceedance of the NAAQS, while other local regulatory sites did not measure a similar exceedance. The entrained windblown dust resulted in (midnight to midnight) 24-hr average concentration of 304 µg/m^3 at the FRM monitor in Brawley. Brawley hourly measurements by the FEM PM_{10} monitor did not exceed 140 µg/m^3 during the morning hours. However, as winds increase, PM_{10} concentrations similarly begin to increase, the PM_{10} levels rose to 181 µg/m^3 by 15:00. For example, upwind sites located west of Brawley measured multiple hours of gusts exceeding 30 mph. Sites such as Sunrise-Ocotillo, Ocotillo Wells and both local airports all measured strong wind speeds and powerful gusts.

As such, elevated PM_{10} concentrations continued, 606 µg/m^3 to 838 µg/m^3 soon after wind speeds increased (**Figure 5-4**). As wind speeds diminished during the late evening hours so did concentrations. Ultimately, the Brawley FRM monitor measured an exceedance of 304 µg/m^3. Best Available Control Measures (BACM) was overwhelmed by the suddenness and intensity of the meteorological event. Although the Niland, El Centro, and Calexico sites saw elevated PM_{10} concentrations on May 18, 2015, it was not enough to cause an exceedance.

The wind event was regional in nature as evidenced by the wind advisory issued for the San Diego deserts west of Imperial County and the forecasted high winds by the Phoenix NWS office.[14] Several stations in Riverside County, including the Blythe Airport (KBLH), Palm Springs International Airport (KPSP), and Jacqueline Cochran Regional (aka Desert Resorts) Airport (KTRM) measured wind gusts between 24 and 36 mph. Winds finally decrease during the late evening hours.

Figure 5-4 is an illustration of the wind speeds throughout Imperial County beginning with May 17 and ending May 19, 2015.[15] The consistency for all stations is evident. A summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, Riverside County, Yuma County in Arizona, and Mexicali, Mexico, is shown in **Table 2-2**. For detailed meteorological station graphs see **Appendix B**.

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

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

FIGURE 5-4
72 HOUR WIND SPEEDS NEIGHBORING SITES

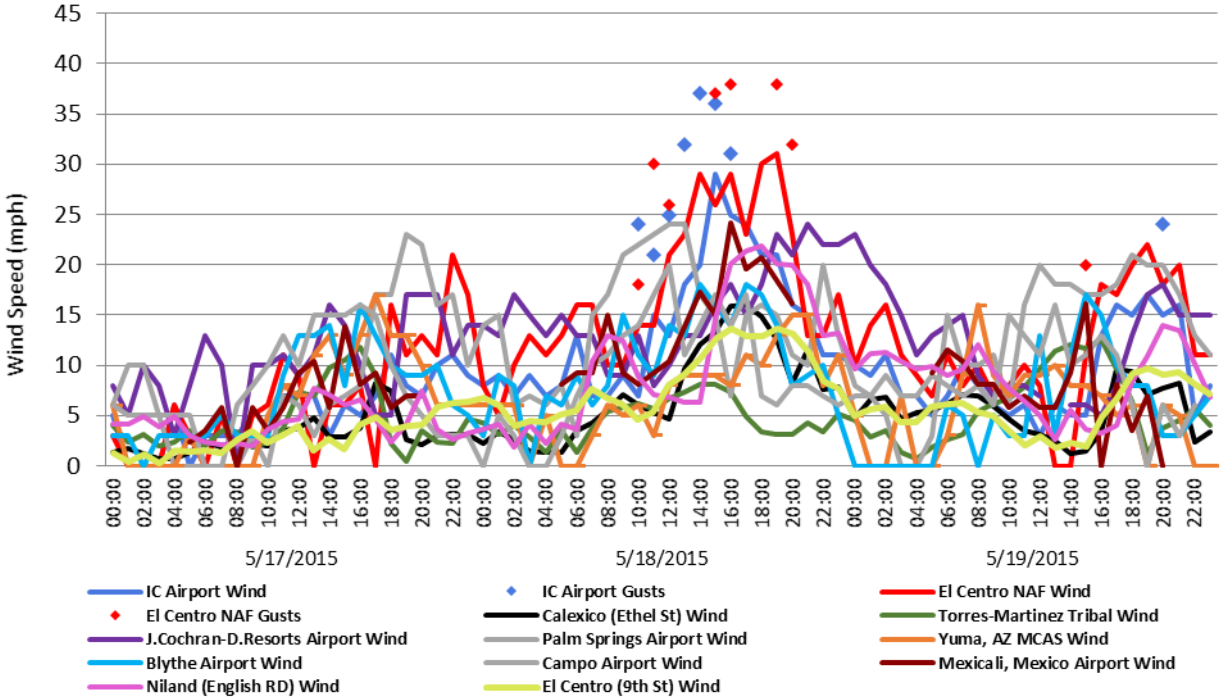

Fig 5-4: Wind data collected from sites in Imperial, Riverside, and Yuma counties, along with Mexicali, Mexico, shows a uniform spike in wind speed during May 18, 2015

Figure 5-5 demonstrates the temporal relationship between the high winds and the transported entrained windblown dust affecting the Brawley monitor. The correlation of hourly BAM 1020 data from the Brawley air monitoring station and the elevated wind speeds on May 18, 2015 indicate that as wind speeds increase so do concentrations of PM_{10}. The peak hourly PM_{10} concentration occurred throughout the late afternoon and early evening hours which are associated with the high peak winds and gusts measured at the different stations in Imperial County. **Appendix C** contains additional graphs illustrating the relationship between the high PM_{10} concentrations and increased wind speeds from other monitoring sites within Imperial, Riverside, and Yuma Counties on May 18, 2015**.**

Figures 5-6 and 5-7 show a three-day depiction of the PM_{10} concentrations for the Brawley FEM monitor. For May 17, 2015, the Brawley monitor measured lower concentrations, which correlates with the light winds. However, as winds increased during the early afternoon hours of May 18, 2015 concentrations showed a similar increase. As winds continued throughout the evening on May 18, 2015, PM_{10} concentration stayed elevated. As winds subsided back to relatively light conditions during the late evening hours on May 18, 2015 so did concentrations.

FIGURE 5-5
BRAWLEY PM_{10} CONCENTRATION & WIND SPEED CORRELATION

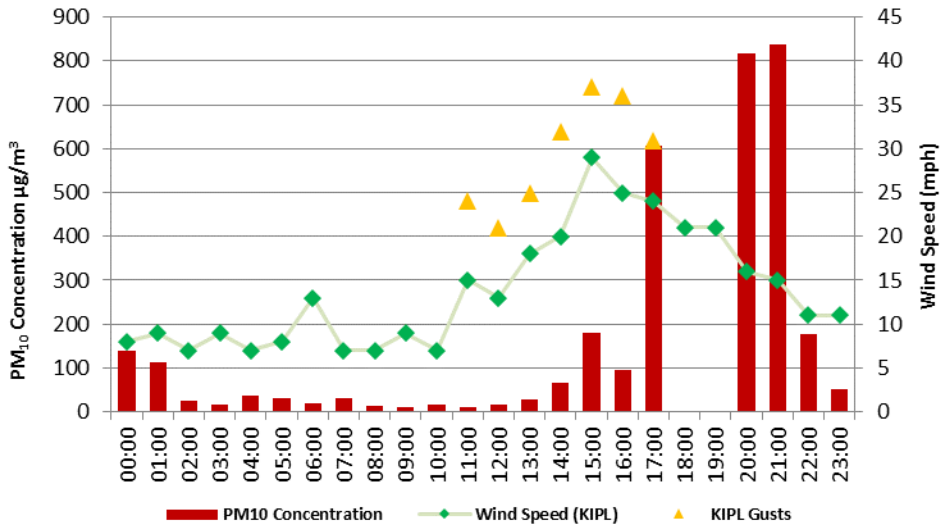

Fig 5-5: Brawley FEM PM_{10} concentrations show a positive correlation as high winds affected the area. Imperial County Airport wind data utilized

FIGURE 5-6
BRAWLEY PM_{10} 72 HOUR CONCENTRATION & WIND SPEED CORRELATION

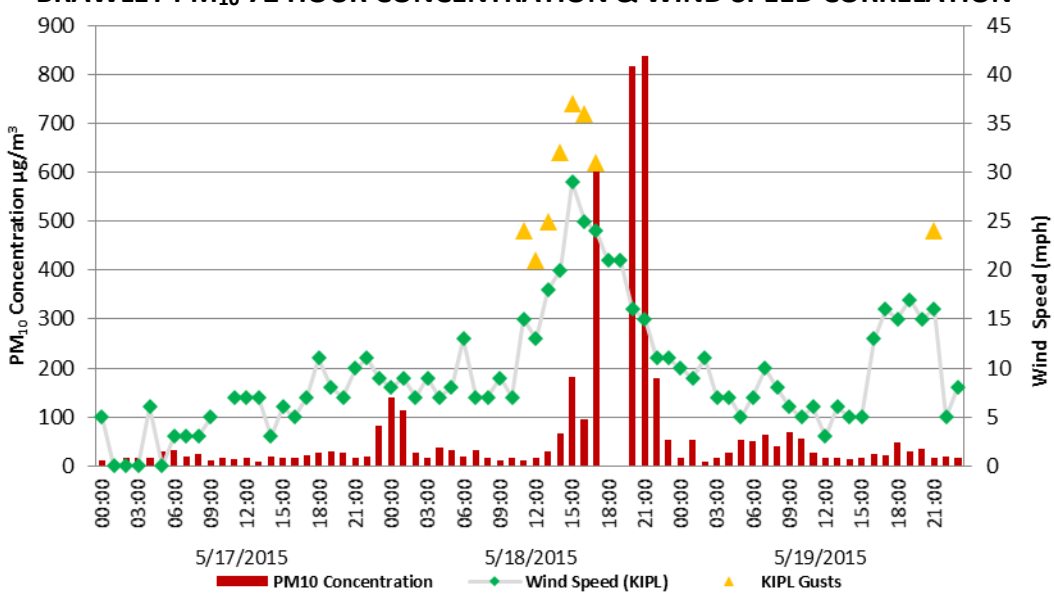

Fig 5-6: This graph illustrates the concentration levels and wind speeds for the day before, day after and May 18, 2015 for the Brawley monitor. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

The NWS defines gusts as a rapid fluctuation of wind speed with variations of 11.5 mph or more between peaks and lulls. **Figure 5-7** is a 72-hour graph of hourly concentrations at

the Brawley station and upstream wind sites depicted in **Figure 2-19.** An increase in winds late May 17, 2015 is coincident with a slight increase in PM_{10} concentrations. Concentrations of PM_{10} remain nominal as wind speeds decrease slightly during the morning hours of May 18, 2015. Although wind speeds increase slightly, gusts begin to become more consistent and stronger by mid-day May 18, 2015. As gusts become more frequent and stronger, so do concentrations of PM_{10}. The graph illustrates that gusts remained above 20 mph for several hours at most sites.

FIGURE 5-7
BRAWLEY PM_{10} FLUCTUATIONS & UPSTREAM WIND SPEEDS

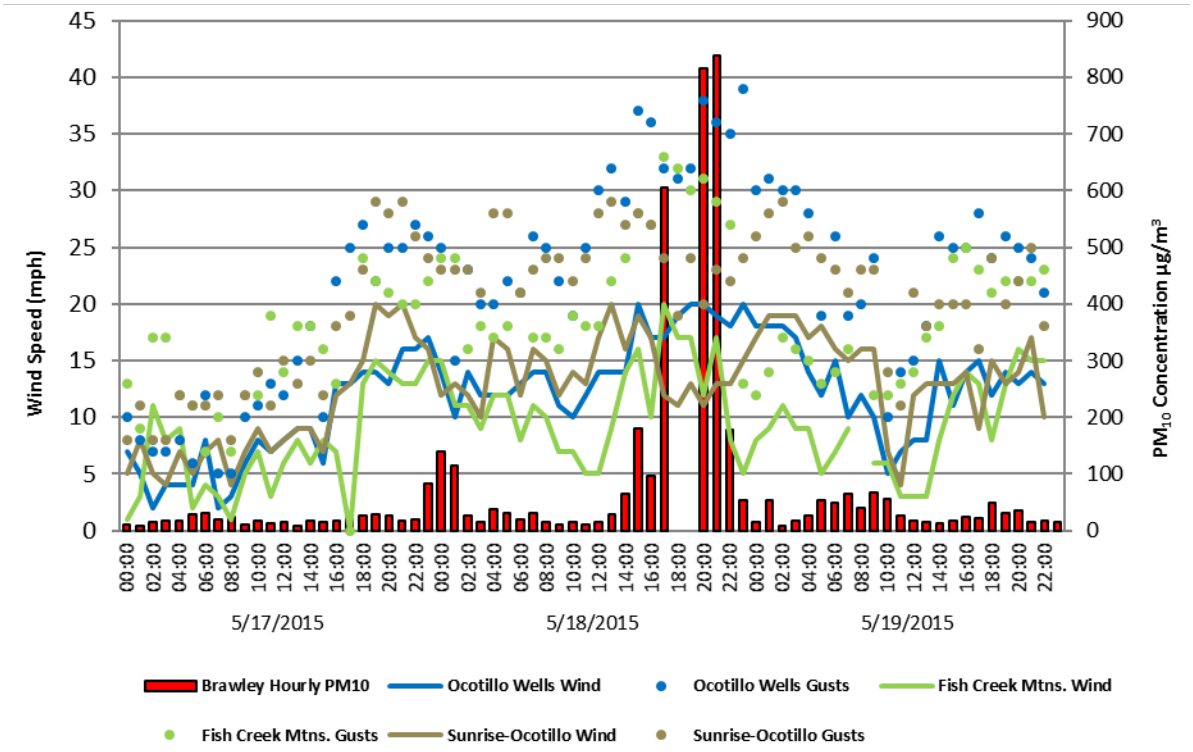

Fig 5-7: A three-day time series of Brawley hourly FEM PM_{10} fluctuations correlated to upstream wind speeds. As upstream wind speeds increased on May 18, hourly PM_{10} levels likewise increased

Figure 5-8 is a three-day depiction of the associated PM_{10} concentrations at neighboring stations. All stations except Palm Springs Fire Station showed a corresponding increase in concentrations as wind speeds increased.

FIGURE 5-8
72 HOUR PM_{10} FLUCTUATIONS AND LOCAL WIND SPEEDS

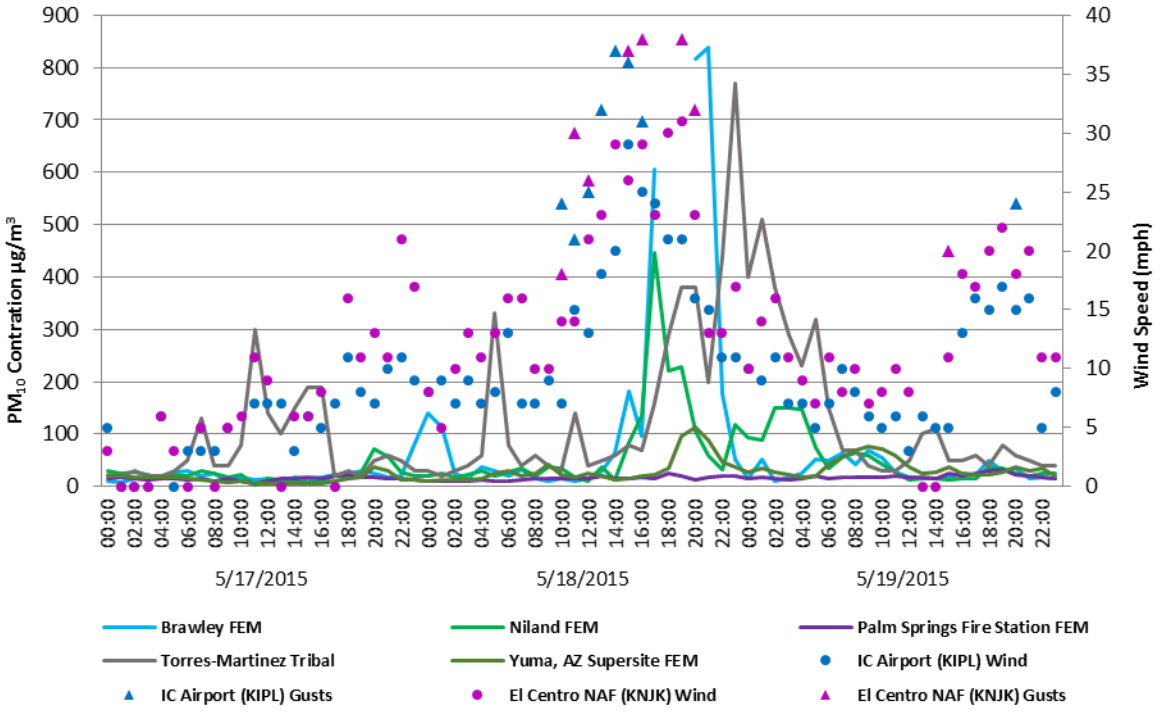

Fig 5-8: All stations/monitors except Palm Springs Fire Station show a comparable pattern between the elevated wind speeds and concentrations

The NWS San Diego office issued an Urgent Weather Message at 12:10 PST (1:10 PDT) May 18, 2015 for the slopes and desert floor of the San Diego county deserts immediately upstream of Imperial County. Winds were expected to reach 30 mph and gusts potentially 55 mph. Visibility was expected to be reduced from blowing dust and sand. The winds entrained windblown dust near the San Diego-Imperial County border and transported it downstream into Imperial County.

Figure 5-9 is the resultant Air Quality Index (AQI) for May 18, 2015.[16] The Air Quality Index for May 18, 2015 remained in the "Green" or Good category from 1 a.m. to 6 p.m. From 7 p.m. to 11 p.m. the AQI rose to the "Moderate" or "Yellow" category. At 12 a.m. the AQI entered the "Unhealthy for Sensitive Groups" or "Orange" category, confirming that the fugitive dust transported by high winds had impacted the quality of air in Imperial County.

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

FIGURE 5-9
IMPERIAL VALLEY AIR QUALITY INDEX FOR BRAWLEY MAY 18, 2015

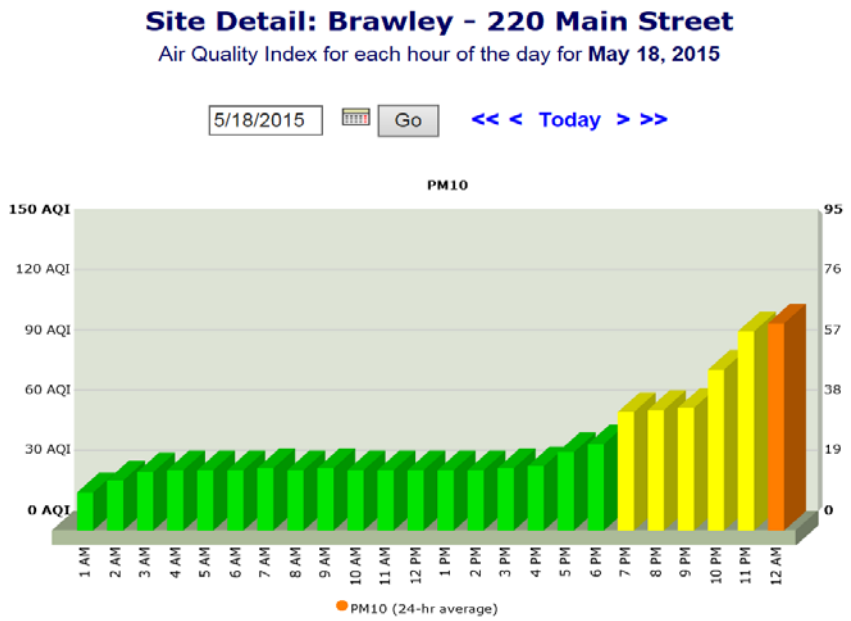

Fig 5-9: Demonstrates that air quality in Imperial County was effected when a low pressure system with high winds moved through southern California, impacting the Imperial County monitors on May 18, 2015

V.2 Clear Causal Summary

The preceding discussion, graphs, figures, and tables provide wind direction, wind speed, and concentration data illustrating the spatial and temporal representation of the dust entrained by high winds associated with a low-pressure system over the region. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley FRM monitor on May 18, 2015. Furthermore, the advisories and issued air quality index illustrate the affect upon air quality within the region extending from all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM_{10} were carried aloft by strong westerly winds into the lower atmosphere. The source regions for the PM_{10} are identified as open desert areas of the Sonoran Desert west to west-southwest of Imperial County. Combined, the information demonstrates that the elevated PM_{10} concentration measured May 18, 2015, coincided with high westerly winds of a regional nature over the southern portion of San Diego County, Riverside County, and Imperial County.

VI Conclusions

The PM_{10} exceedance that occurred on May 18, 2015, 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)	Pgs 21-34
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	Pgs 44-53
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	Pgs 30-34
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	Pgs 35-43
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	Pgs 21-53

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated 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. 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 May 18, 2015 event, which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played little or 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 Brawley FRM monitor and discussed within this report was caused by naturally occurring strong gusty winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert region to the west and southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedance on May 18, 2015, 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) is an event with its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. Anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions. As discussed within this demonstration, the PM_{10} exceedances that occurred at Brawley on May 18, 2015, were caused by the transport of windblown dust into Imperial County by strong westerly winds associated with the passage of low-pressure system and accompanying trough that moved through the region. At the time of the event, anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at different areas in Imperial and Riverside County monitors demonstrates a consistency of elevated gusty winds and concentrations of PM_{10} at the Brawley monitor on May 18, 2015 (Section IV). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty winds were an event that was widespread, regional and uncontrollable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty winds. Days immediately before and after the high wind event PM10 concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on May 18, 2015.

VI.5 Historical Concentrations

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

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

This section contains a wind advisory and forecasts issued by the NWS and carried by Imperial County on May 18, 2015. The data show a region-wide 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, and Yuma, Arizona. 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 in Imperial and Riverside Counties, and Yuma, Arizona. These graphs demonstrate the regional impact by the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule.

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

FIGURE 6-1
MAY 18, 2015 EXCEPTIONAL EVENT TAKEAWAY POINTS

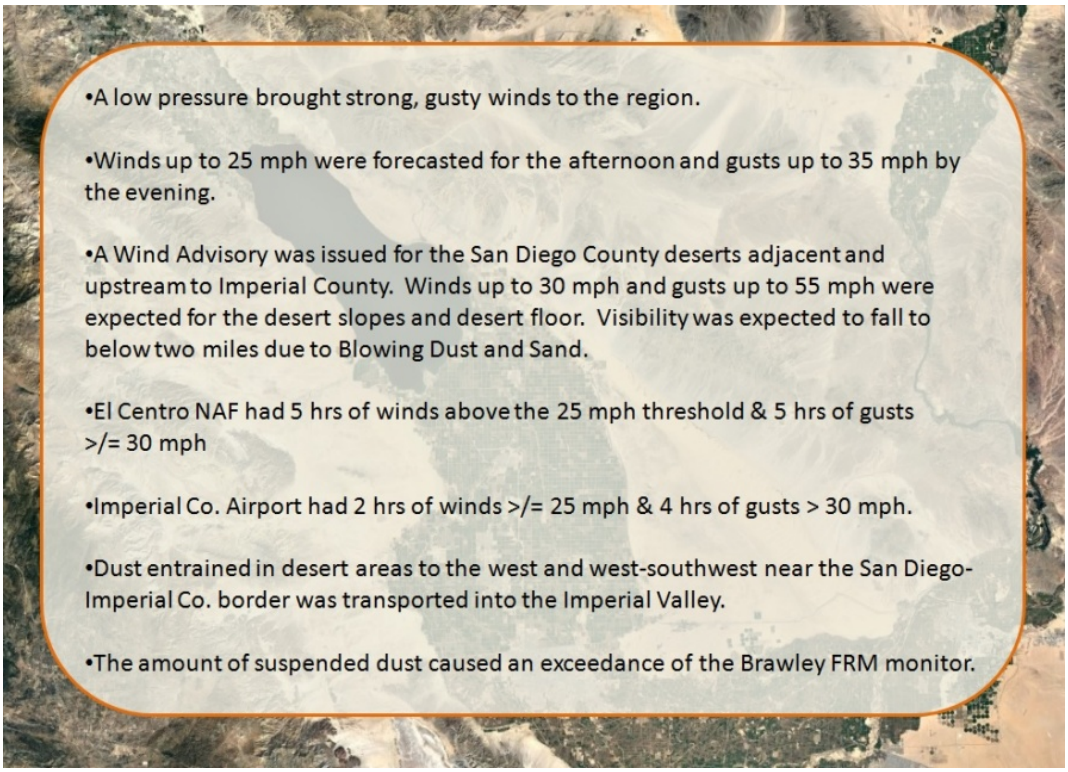

Fig 6-1: Illustrates the factors that qualify the January 31, 2016 natural event, which affected air quality as an Exceptional Event