IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

Banning Patch article by Deanne Goodman for May 21, 2015: https://patch.com/california/banning-beaumont/brace-yourself-gusty-winds-banning-0

May 21, 2015 and May 22, 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 21, 2015 and May 22, 2015, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 06-025-0007) and Niland (AQS Site Code 06-025-4004) California measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The exceedance occurred when the Federal Equivalent Method (FEM), Beta Attenuation Monitors Model 1020 (BAM 1020) measured a 24-hr average Particulate Matter less than 10 microns (PM_{10}) concentrations of 225 µg/m^3 and 171 µg/m^3 and 227 µg/m^3 (**Table 1-1**). PM_{10} 24-hr measurements measured above the 150µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley and Niland were the only monitors in Imperial County to measure an exceedance of the PM_{10} NAAQS on May 21, 2015 and May 22, 2015.

TABLE 1-1
***CONCENTRATIONS OF PM_{10} ON MAY 21, 2015 AND MAY 22, 2015**

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
5/21/2015	**Brawley**	**06-025-0007**	**3**	**24**	**225**	**150**
5/21/2015	**Niland**	**06-025-4004**	**3**	**24**	**171**	**150**
5/22/2015	**Brawley**	**06-025-0007**	**3**	**24**	**227**	**150**
5/20/2015	Brawley	06-025-0007	3	24	41	150
5/20/2015	Niland	06-025-4004	3	24	60	150
5/22/2015	Niland	06-025-4004	3	24	122	150
5/23/2015	Brawley	06-025-0007	3	24	17.7	150
5/23/2015	Niland	06-025-4004	3	24	40.5	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]
May 21, 2015 and May 22, 2015 were not scheduled run days

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Inlet (SSI) High-Volume Gravimetric 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 21, 2015 and May 22, 2015 the Brawley and Niland monitors were impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds generated by a low pressure system that moved through southern California and into Imperial County.

[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

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 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 PM_{10} 24-hour NAAQS measured exceedances of 225 µg/m^3, 171 µg/m^3, and 227 µg/m^3, as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the May 21, 2015 and May 22, 2015 event as it occurred in California and in Imperial County, providing background information on the exceptional event and explaining how the wind driven emissions from the event led to the exceedances at the Brawley and Niland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley and Niland stations this section discusses and establishes how the May 21, 2015 and May 22, 2015 event affected air quality such that a clear causal relationship is demonstrated 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 local conditions and standard conditions. PM_{10} continuous data prior to 2013 is in local condition measurements, 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 21, 2015 and May 22, 215 event and its resulting emissions defining the event as a “natural event”.[3]

Section IV - Provides evidence that the event of May 21, 2015 and May 22, 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.

[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 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.

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 the potential for gusty west winds 20 to 30 mph and gusts up to 45 miles per hour (mph) suspending particulate matter in the air and affecting the region. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory in Imperial County for May 21, 2015 and May 22, 2015. **Appendix A** contains copies of notices pertinent to the May 21, 2015 and May 22, 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 and Niland monitors 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 21, 2015 and May 22, 2015. The submitted request included a brief description of the meteorological conditions for May 21, 2015 and May 22, 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 concentrations of 225 $\mu g/m^3$ and 171 $\mu g/m^3$ and 227 $\mu g/m^3$, measured on May 21, 2015 and May 22, 2015 in Brawley and Niland. 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)). 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 21, 2015 and May 22, 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 21, 2015 and May 22, 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 21, 2015 and May 22, 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 concentration in Niland and 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 21, 2015 and May 22, 2015 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the May 21, 2015 and May 22, 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)**. The Colorado Desert not only includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

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

A notable feature in Imperial County is the Salton Sea, which is at 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 at the South

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

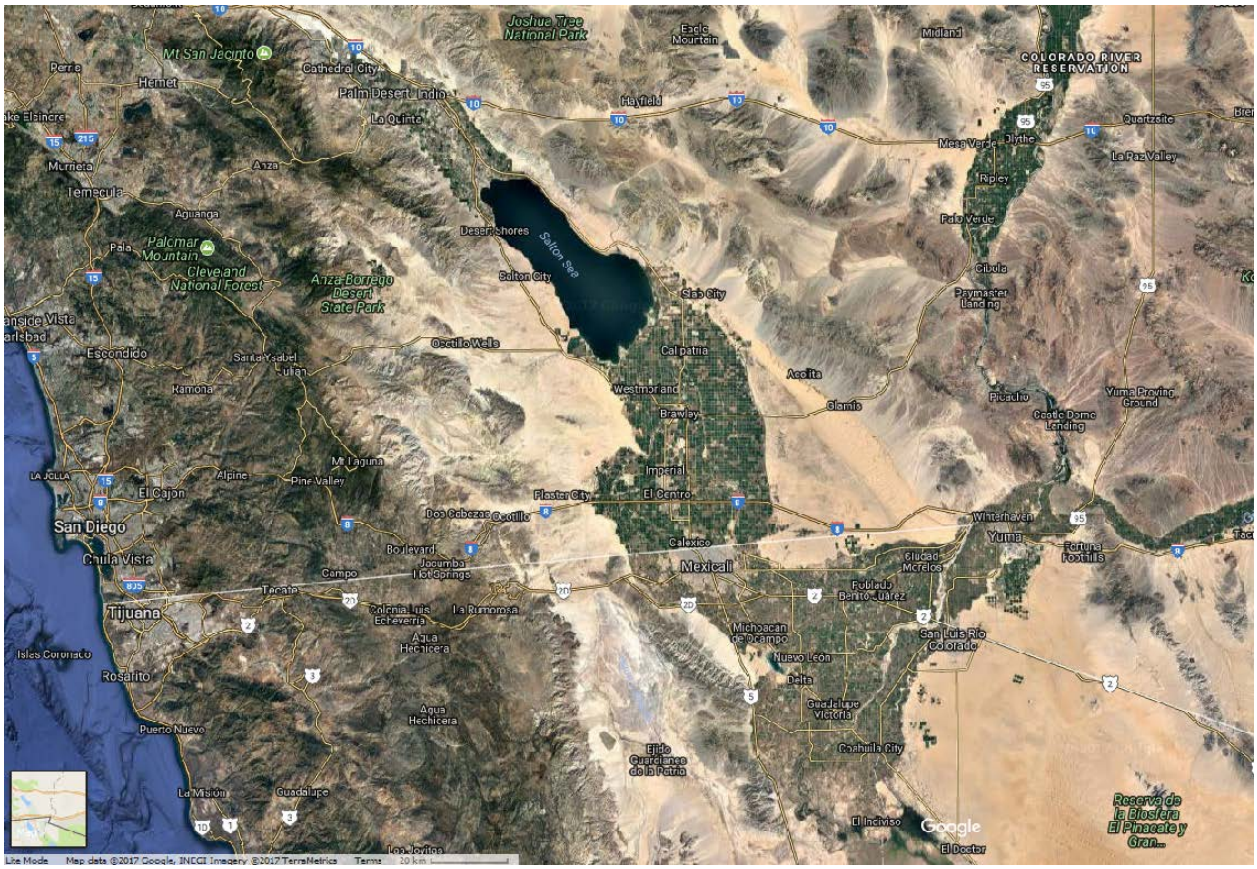

Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Google Earth base map

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 for May 21, 2015 and May 22, 2015, occurred at the Niland and Brawley stations. The Niland and Brawley stations are regarded as the "northern" monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions of meteorological conditions occurring on May 21, 2015 and May 22, 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 (**Figure 2-8)**.

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

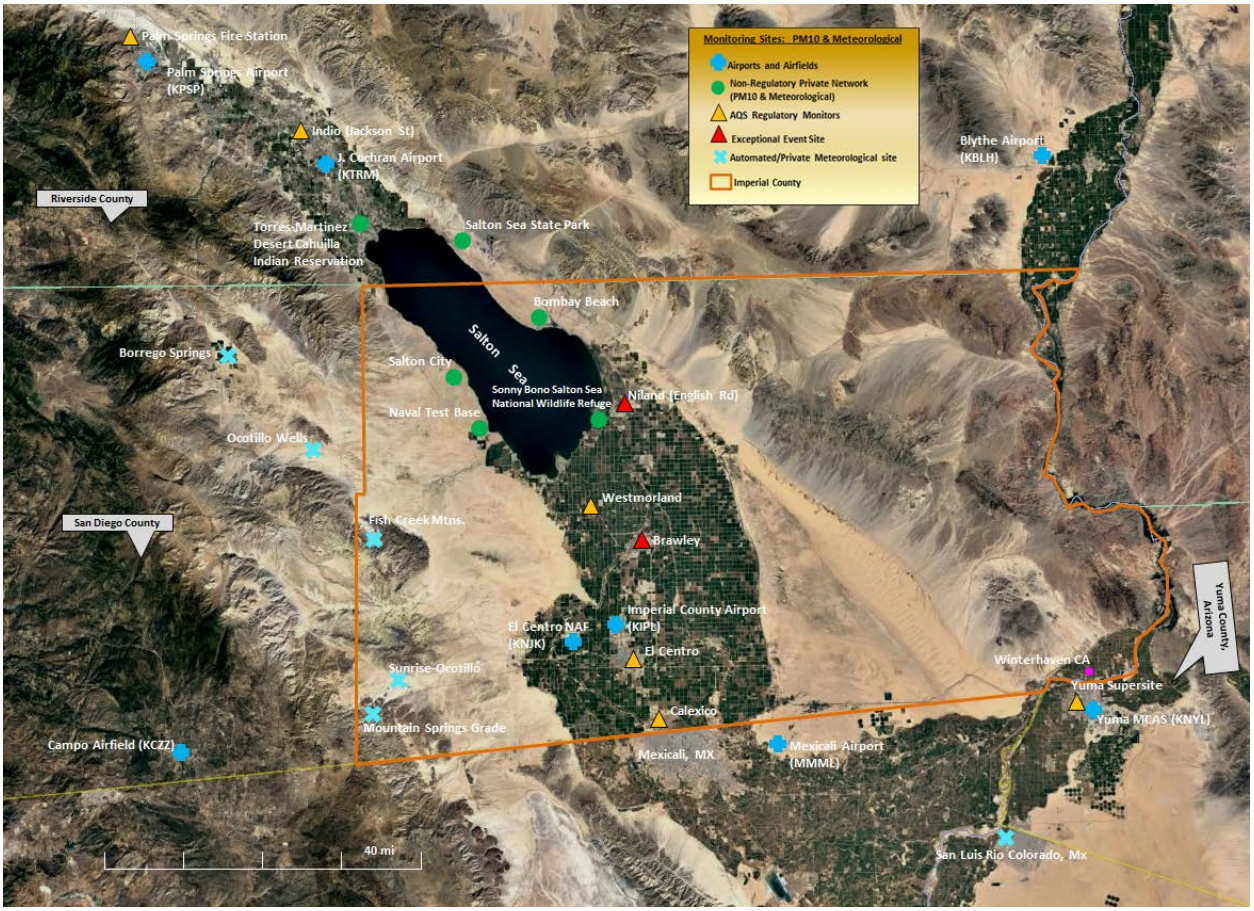

Fig 2-8: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support of an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

In addition to meteorological sites, there are non-regulatory PM_{10} sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and 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

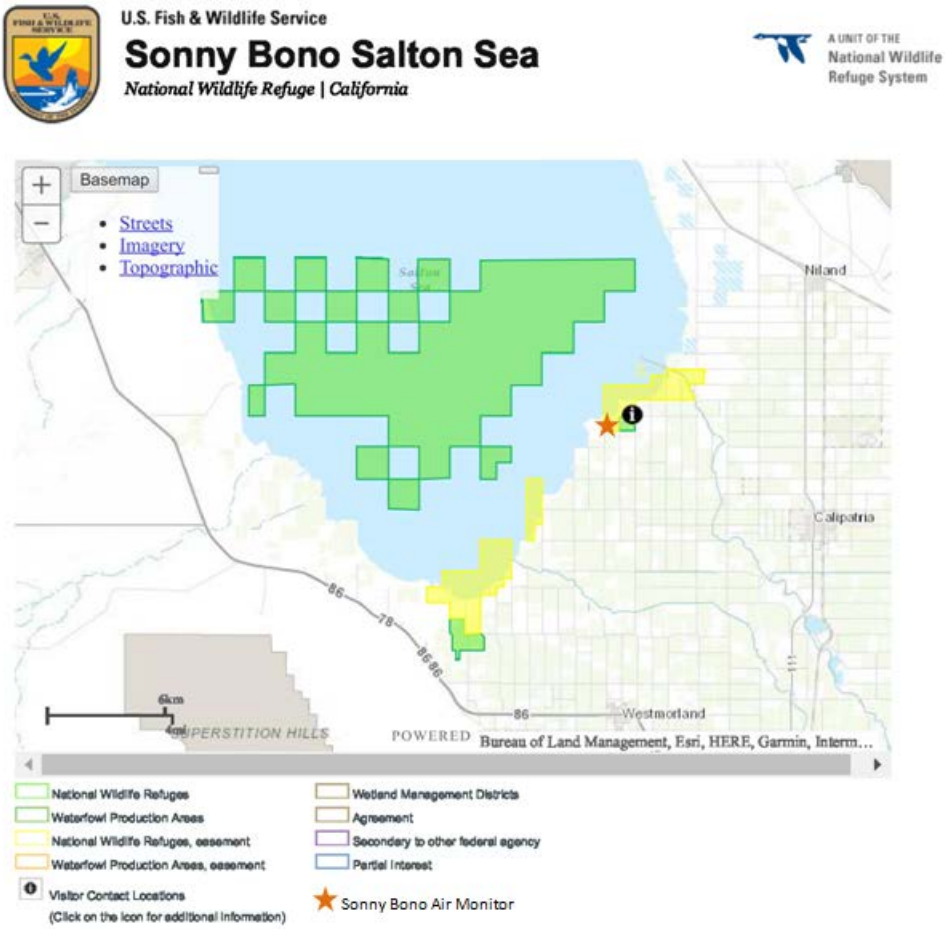

Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to 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 21, 2015 AND MAY 22, 2015

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	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	21	-	-	-	-	-
		BAM 1020						225.1	855	15:00		
		Hi-Vol Gravimetric					22	-	-	-	-	-
		BAM 1020						227.0	769	18:00		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	81102	13698	3	21	-	-	-	17.4	13:00
							22	-	-	-	17.3	16:00
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	81102	13694	9	21	-	-	-	14.7	14:00
							22	-	-	-	14.0	15:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	81102	13997	-54	21	-	-	-	25.9	20:00
		BAM 1020						171.0	564	19:00		
		Hi-Vol Gravimetric					22	-	-	-	25.6	16:00
		BAM 1020						122.0	631	14:00		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	81102	13697	-43	21	-	-	-	-	-
							22	-	-	-	-	-
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	81102	33137	174	21	15.7	21	17:00	-	-
							22	11	19	15:00		
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	81102	33157	1	21	124	271	21:00		
							22	59.3	253	16:00	-	-
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	81102	N/A	60	21	62.7	162	07:00	-	-
							22	62.9	166	7:00	-	-

*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)
***Not a sampling day

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

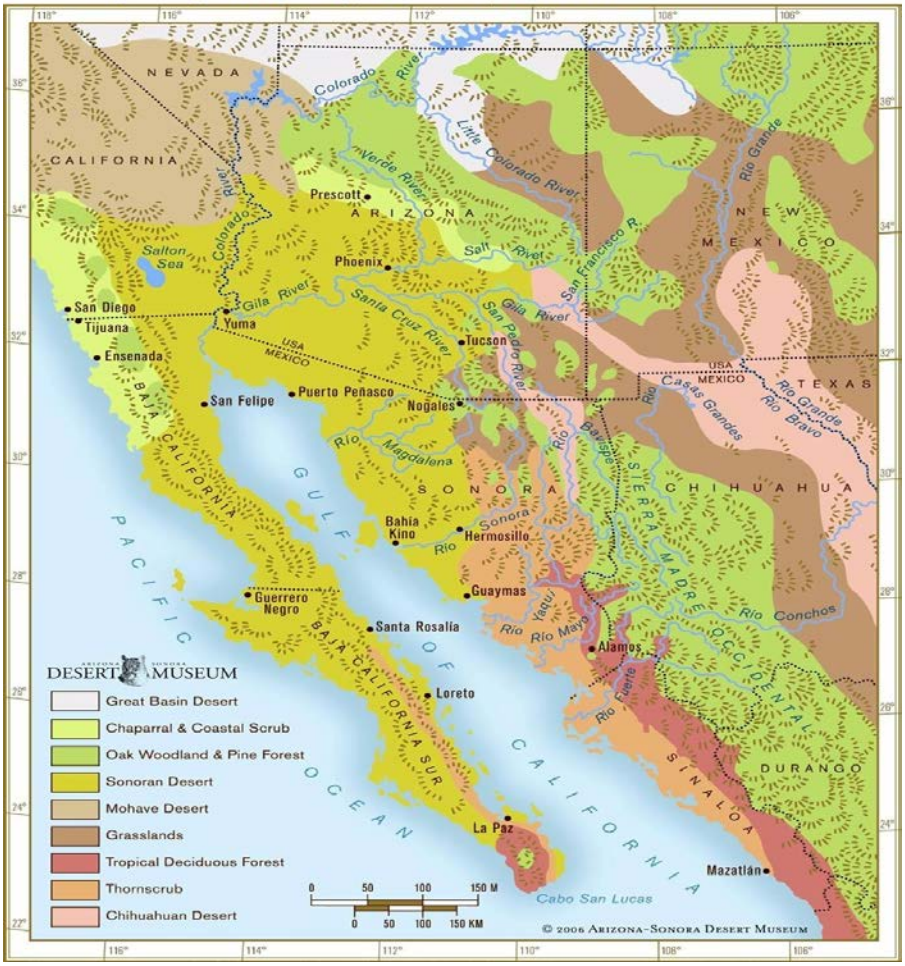

Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

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 May 21, 2015 and May 22, 2015, Imperial County recorded 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

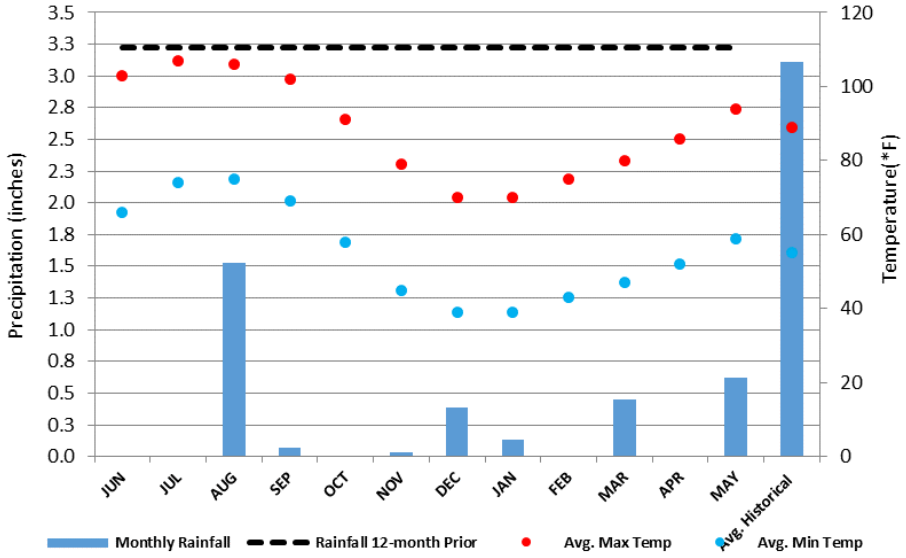

Fig 2-16: The total annual precipitation prior to May 21, 2015 and May 22, 2015 event measured 3.22 inches, which was slightly above the average annual precipitation of 3.11 inches, was insufficient to relieve the arid conditions existing in Imperial County. Meteorological data courtesy of Weather Underground, 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 21, 2015 and May 22, 2015, caused by a strong upper level low-pressure system that moved over southern California, created a strong onshore flow at the surface that brought strong and gusty westerly winds across the mountains and deserts of southeastern California. On May 21, 2015 and May 22, 2015, strong gusty westerly winds transported windblown dust from the mountain passes and deserts within San Diego County into Imperial County affecting air quality and causing an exceedance at the Brawley and Niland monitors. **Figures 2-17 to 2-20** illustrate the conditions across the region responsible for the gusty westerly winds including the presence of the upper level low-pressure system that affected air quality and caused an exceedance at the Brawley and Niland monitors.

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

FIGURE 2-17
UPPER LEVEL 500MB CHARTS MAY 21, 2015 & MAY 22, 2015

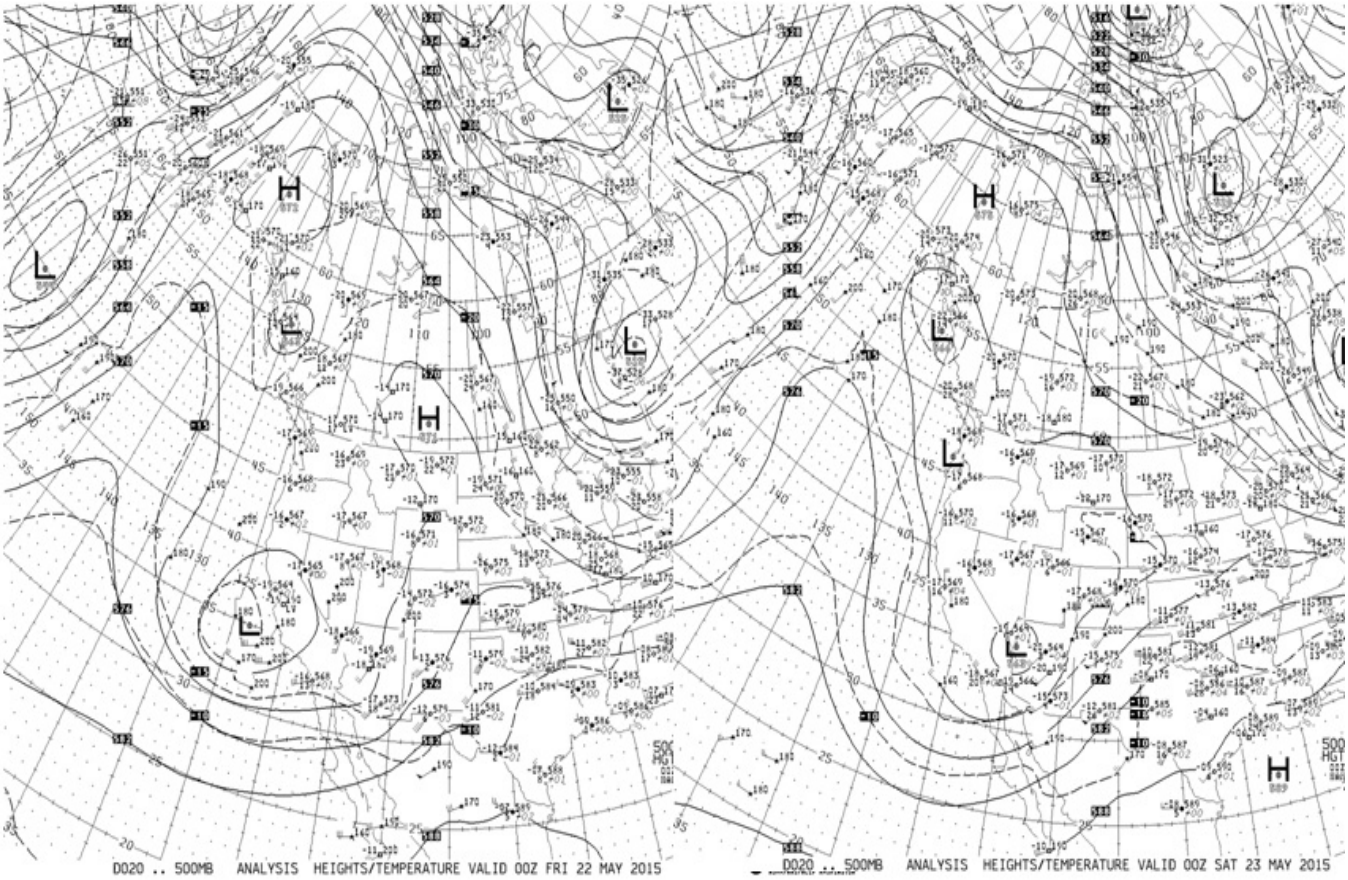

Fig 2-17: A pair of 500mb charts captured at 4:00pm PST May 21, 2015 and May 22, 2015 illustrate the movement of the upper level low over California from the Pacific. Strong westerly winds at the surface accompanied the upper level low as it moved into California. Source: Colorado State University Department of Atmospheric Sciences; http://archive.atmos.colostate.edu/data/misc/QHTA11/150

FIGURE 2-18
DAILY WEATHER MAPS MAY 21, 2015 & MAY 22, 2015

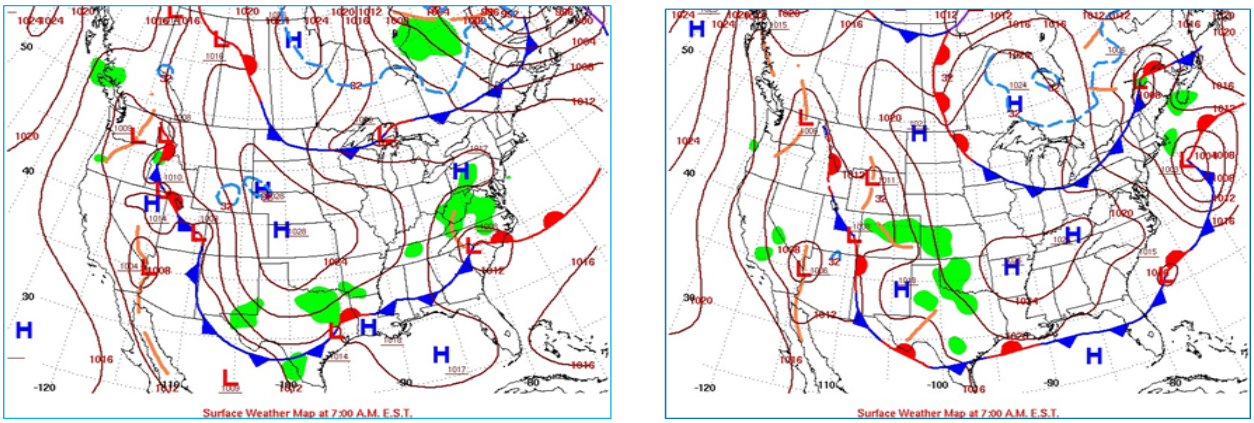

Fig 2-18: A pair of daily weather maps captured at 4:00am PST on May 21, 2015 and May 22, 2015 illustrate the anchored low pressure over the California-Nevada-Arizona borders and trough over the area, extending southward into Mexico. Images courtesy of National Centers for Environmental Prediction, Weather Prediction Center

FIGURE 2-19
CONUS INFRARED SATELLITE IMAGES MAY 21, 2015 & MAY 22, 2015

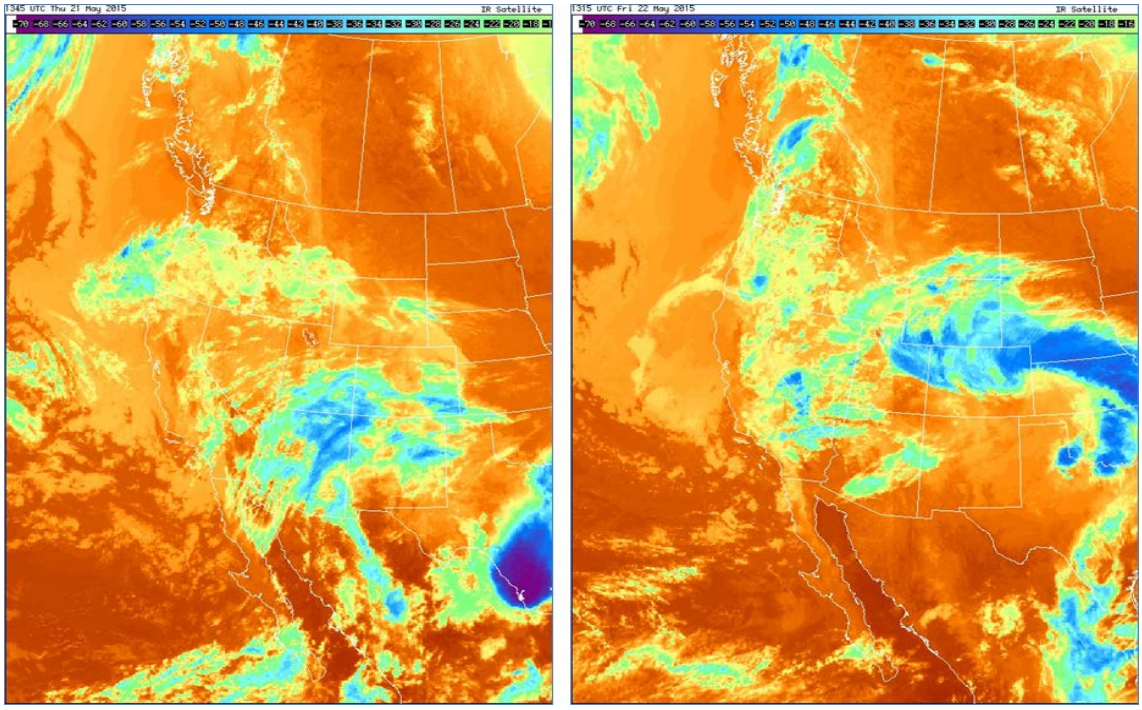

Fig 2-19: CONUS infrared satellite images captured at 5:45am and 5:15am PST May 21, 2015 and May 22, 2015, respectively. Images courtesy of https://aviationweather.gov/

FIGURE 2-20
GOES-W VISIBLE-INFRARED IMAGES MAY 21, 2015 & MAY 22, 2015

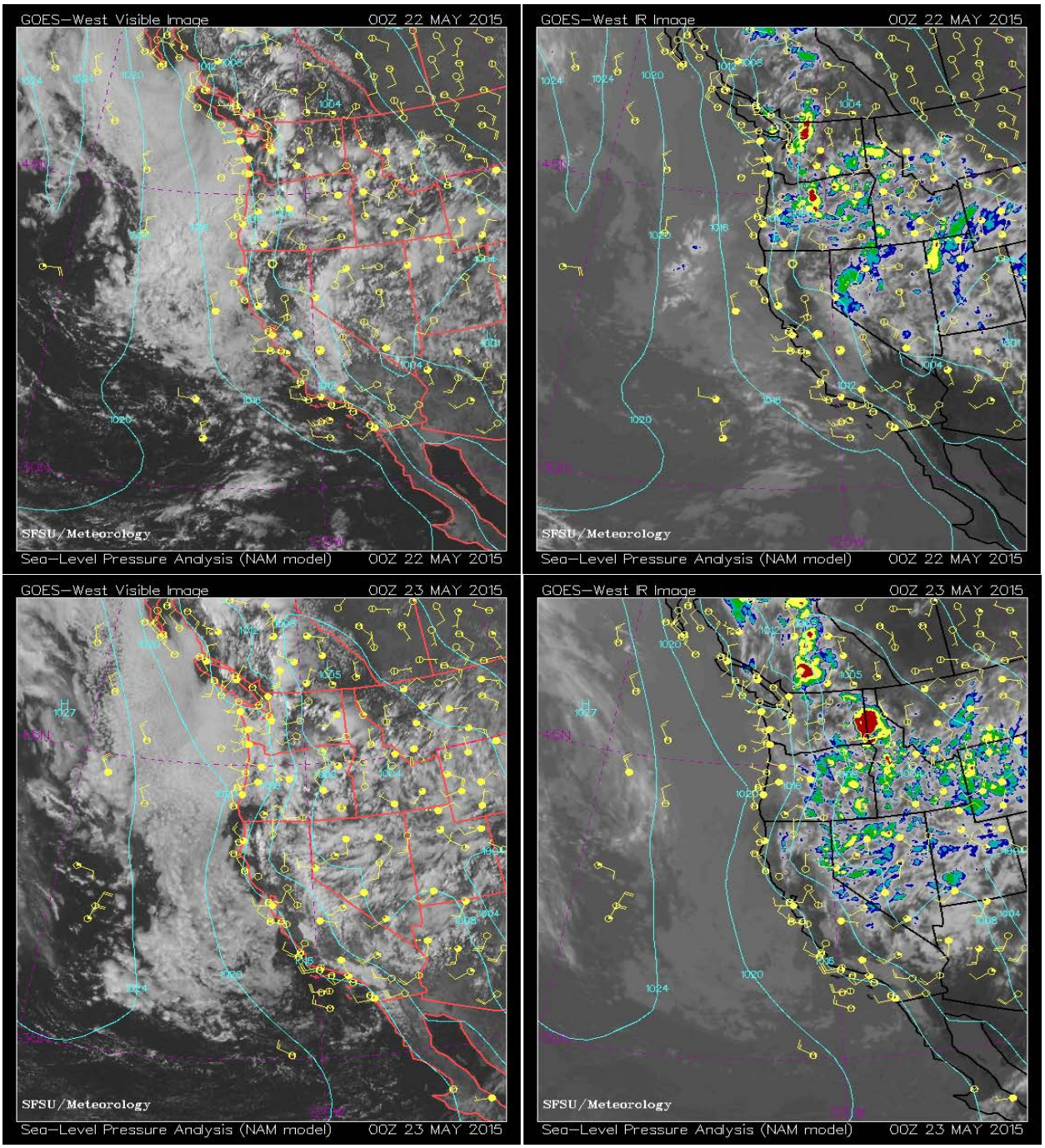

Fig 2-20: Visible and infrared sea-level pressure analysis composite images captured at 4:00pm PST by a GOES-W satellite on May 21, 2015 (top) and May 22, 2015 (bottom). The GOES-w visible (left) and infrared (right) are overlaid with wind barbs indicating wind speeds 26-31 mph for May 21, 2015 and slightly slower wind speeds for May 22, 2015 at 21-25 mph. Images are courtesy of SFSU Department of Earth and Climate Sciences and the California Regional Weather Server

Discussions of the weather system that moved through southern California, with associated gusty westerly winds came about as early as May 20, 2015. The area forecast issued at 8:45pm PST by the San Diego NWS office reported on a low-pressure aloft expected to bring, among other weather impacts, locally gusty winds to the desert areas. Soon after, during the early morning hours of May 21, 2015 both the NWS office in Phoenix and San Diego issued Urgent Weather Messages containing wind advisories. Both advisories, issued originally at 1:47am and 2:01am PST May 21, 2015, warned of high winds 25 mph and above with gusts 40 to 50 mph potentially affecting visibility due to blowing dust and sand. While the Phoenix wind advisory only encompassed a single day the San Diego wind advisory extended the high wind speeds to 8:00pm PST Friday, May 22, 2015 (**Appendix A**).[5] As the weather system moved into Imperial County, strong winds did in fact occur.

Figures 2-21 and 2-22 are visual illustrations of the sequence of resulting meteorological events that caused an impact upon air quality on May 21, 2015 and May 22, 2015 in Imperial County. According to meteorological data from several stations such as the Palm Springs Regional Airport (KPSP), the Desert Resorts Regional Airport (Thermal: KTRM), the Imperial County Airport (KIPL), the El Centro NAF (KNJK), and Niland (English Road), westerly winds began increasing late May 20, 2015. Both KPSP and KTRM measured predominately northwest winds and began measuring continuous gusts as early as 12:53pm PST on May 20, 2015. Stations to the west and southwest of the Brawley and Niland monitors measured gusts at or above 22 mph for the last several hours of May 20, 2015 (Fish Creek Mountains-MesoWest Station ID:FHCC and Sunrise-Ocotillo – MesoWest Station ID:IMPSD).

By May 21, 2015, all four airports were measuring elevated wind speeds with the strongest wind speeds measured during the late afternoon and evening hours of May 21, 2015. KPSP, KTRM, KIPL and KNJK measured continuous wind gusts peaking locally at KNJK at 45 mph. Like the day before, the strongest wind speeds and wind gusts, at or greater than 30 mph, were measured during the late afternoon to evening hours of May 21, 2015.

Elevated wind speeds continued into May 22, 2015 until mid-morning when all airports measured reduced winds, including the Niland station. Measured wind speeds slightly decreased as early as 8:00am PST (Niland Station) through 12:00pm PST when winds and gusts resumed elevated levels. Other surrounding meteorological sites similarly measured elevated wind speeds and gusts May 22, 2015, Fish Creek Mountains measured winds of 20 mph with gusts of 33 mph. However, unlike the previous two days, measured wind speeds and gusts were strongest during the early morning hours of May 22, 2015 and not during the evening hours.

Airports in Imperial County and Riverside County all measured elevated wind speeds for several hours at or above 25 mph. Winds 25 mph or above are normally sufficient to overcome most PM_{10} control measures. **Table 2-2** is a summary of maximum winds, peak wind gusts, and wind

[5] The Phoenix NWS office issued Urgent Weather Messages at 1:47am and 1:44pm PST, and a Hazardous Weather Outlook at 3:09am PST. The San Diego NWS office issued Urgent Weather Messages for May 21, 2015 at 2:01am and 10:10am PST and May 22, 2015 at 9:58am PST.

direction at monitors in Imperial County, Riverside County, Yuma County (Arizona), and Mexicali, Mexico. For detailed meteorological data, such as QCLCD reports and graphs, see **Appendix B**.

FIGURE 2-21
RAMP-UP ANALYSIS MAY 21, 2015

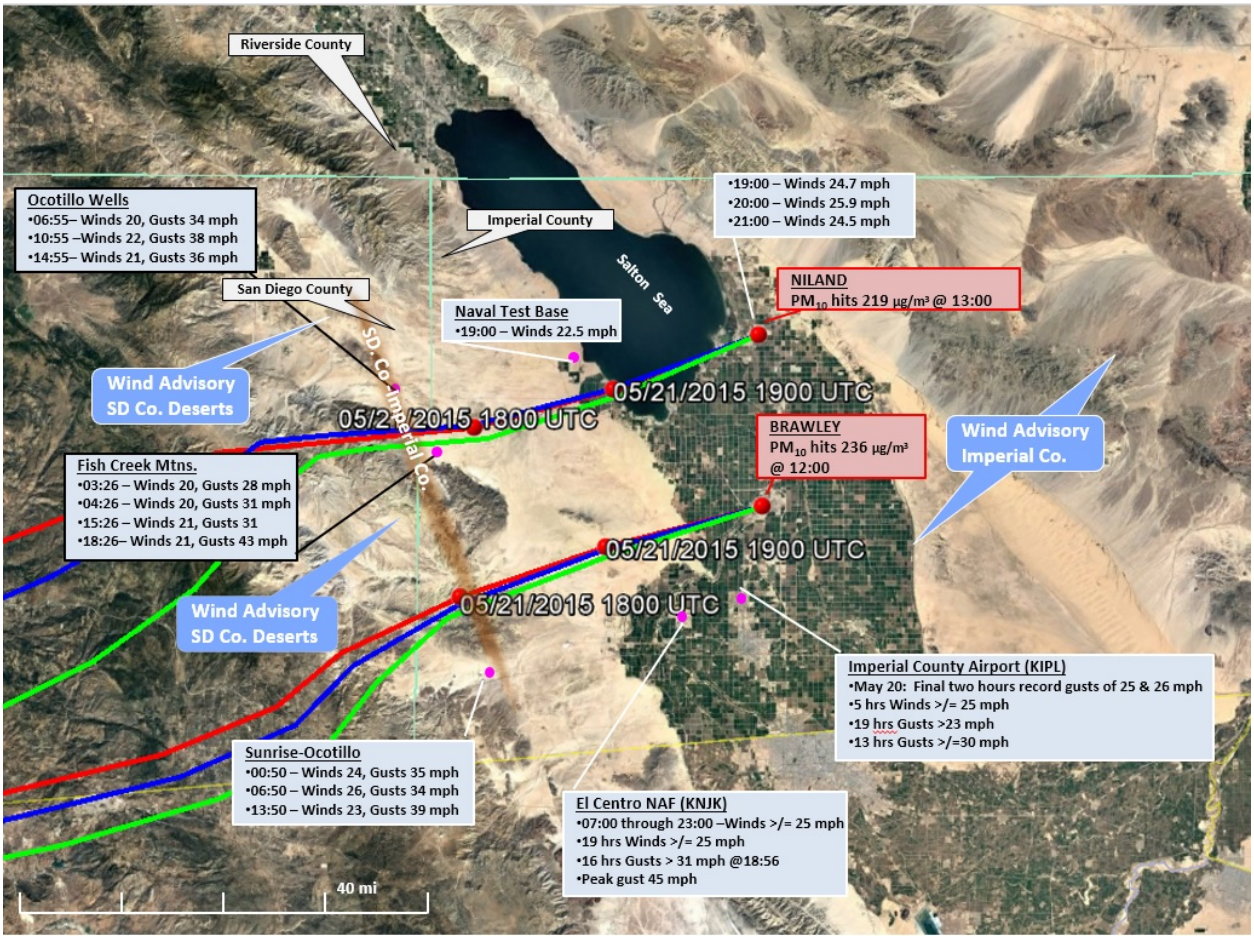

Fig 2-21: A ramp-up analysis for the Brawley and Niland stations identifying the increases in wind speed and associated increase in PM_{10} levels on May 21, 2015. The times given encompass wind speeds through the given hour. Google Earth base map

FIGURE 2-22
RAMP-UP ANALYSIS MAY 22, 2015

Fig 2-22: A ramp-up analysis for the Brawley station identifying the increases in wind speed and associated increase in PM_{10} levels on May 22, 2015. The times given encompass wind speeds through the given hour. Google Earth base map

TABLE 2-2
WIND SPEEDS ON MAY 21, 2015 & MAY 22, 2015

Station Monitor Airport Meteorological Data	Day	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	
							Brly	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	21	28	260	15:53	39	23:53	855	259
	22	26	250	12:53	36	12:53	116	50
Naval Air Facility (KNJK)	21	37	250	18:56	45	18:56	663	392
	22	29	240	4:56	37	4:56	15	34
Calexico (Ethel St)	21	17.4	282	13:00	-	-	549	219
	22	17.3	294	16:00	-	-	368	468
El Centro (9th Street)	21	14.7	280	14:00	-	-	713	200
	22	14	266	15:00	-	-	348	487
Niland (English Rd)	21	25.9	250	20:00	-	-	153	444
	22	25.6	255	16:00	-	-	368	468
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	21	22	230	19:52	26	16:52	371	564
	22	21	240	15:52	29	16:52	348	487
Palm Springs Airport (KPSP)	21	26	320	11:53	34	14:53	99	93
	22	20	330	14:53	30	16:53	451	631
Jacqueline Cochran Regional Airport (KTRM) - Thermal	21	21	330	21:52	29	20:52	44	220
	22	23	340	17:52	28	17:52	650	356
ARIZONA - YUMA								
Yuma MCAS (KNYL)*MST	21	16	300	21:57	22	15:57	44	220
	22	24	270	9:57	31	10:57	324	26
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	21	20.7	290	21:00	-	-	44	220
	22	25.3	300	17:00	-	-	650	356

The back trajectory National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT model,[6] **Figures 2-23, and 2-24,** indicates the path of the airflow 12 hours leading up to elevated concentrations at the Brawley and Niland monitors for Thursday, May 21, 2015 and Friday, May 22, 2015.

Both trajectories show a westerly direction**.** **Figure 2-23** indicates a more predominate west direction while **Figure 2-24** indicates a slightly northwest direction, accounting to some degree why the Niland monitor, while measuring elevated concentrations of PM_{10} did not exceed. Both trajectories indicate airflow over the mountains and deserts within both San Diego County and Imperial County.

The May 21, 2015 trajectory ends at 12:00pm PST when the Brawley monitor consistently began measuring elevated concentrations of PM_{10}, which is coincident with the continuously measured

[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.

winds speeds above 20mph at KIPL and KNJK. As mentioned above, KIPL and KNJK began measured elevated wind speeds during the early morning hours, followed by a short lull in winds only to elevate during the late afternoon to evening hours of May 21, 2015.

The May 22, 2015 trajectory ends at 7:00am PST the hour prior to the Brawley monitor measuring continuous elevated concentrations of PM_{10} and the hour when the Niland monitor measured a slight increase in PM_{10}. Like May 21, 2015, the Niland monitor measured concentrations were elevated however because of topography and the slightly more northerly direction on May 22, 2015, a greater amount of the entrained dust would have crossed the over the surface of the Salton Sea, effectively reducing the amount of dust affecting the Niland monitor.

Combined, both trajectories provide evidence that the path of the airflow, high winds, which took winds over and through the mountain and deserts slopes of San Diego bordering Imperial County, across largely barren soils and over agricultural farmland affecting PM_{10} monitors. The dust particles entrained by these strong westerly winds elevated levels of PM_{10} concentrations in Riverside, Imperial and Yuma counties illustrating the regional nature of the event (**Tables 2-1 and 2-2**).

FIGURES 2-23
HYSPLIT TRAJECTORY MODELS MAY 21, 2015

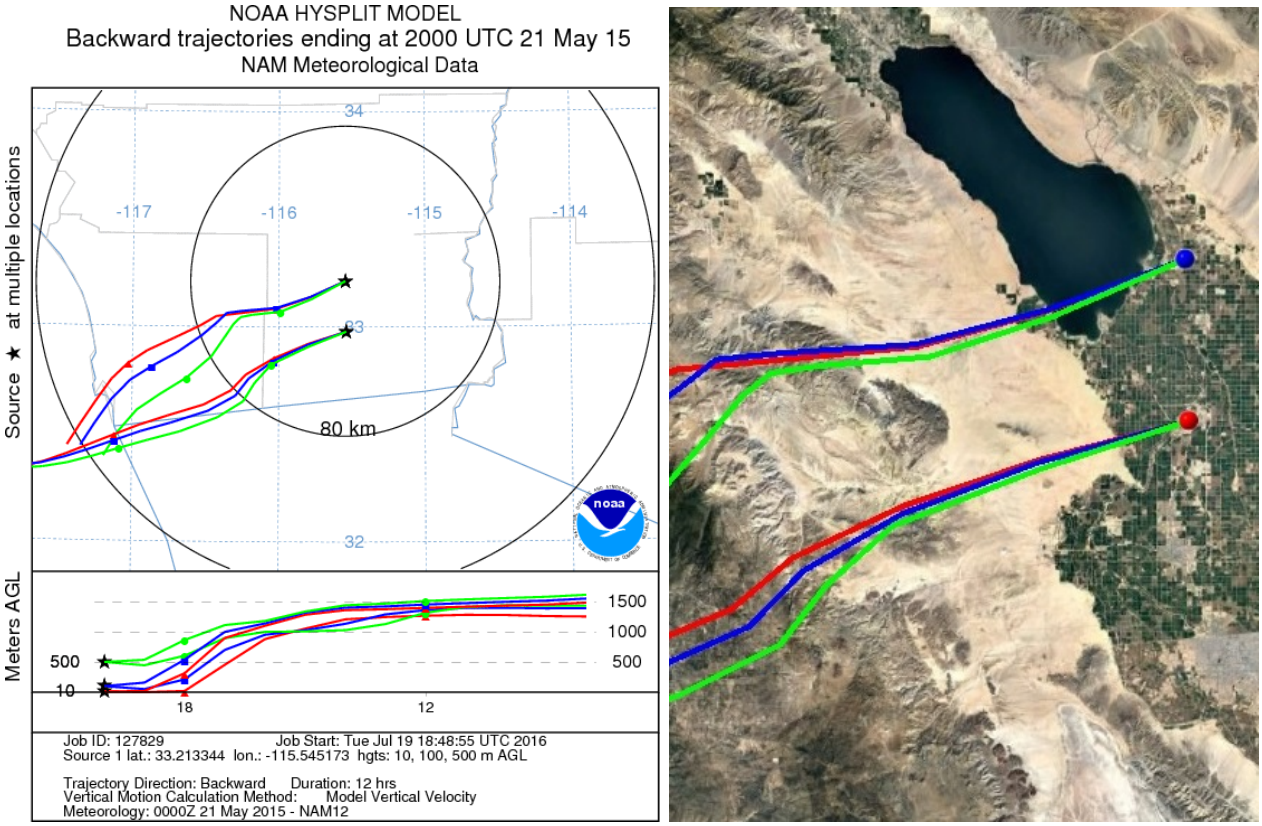

Fig 2-23: A 12-hour HYSPLIT back trajectory ending at Niland (blue icon) and Brawley (red icon) at 12:00 PST on May 21, 2015. 12:00 PST was the first hours of continuous elevated concentrations of PM_{10} at the Brawley monitor. Niland begins measuring elevated concentrations of PM_{10} the following hour. Red line indicates airflow at 10 meters AGL (above ground level); blue line represents 100 meters AGL; green line represents 500 meters AGL. Image dynamically generated through NOAA's Air Resources Laboratory

FIGURES 2-24
HYSPLIT TRAJECTORY MODELS MAY 22, 2015

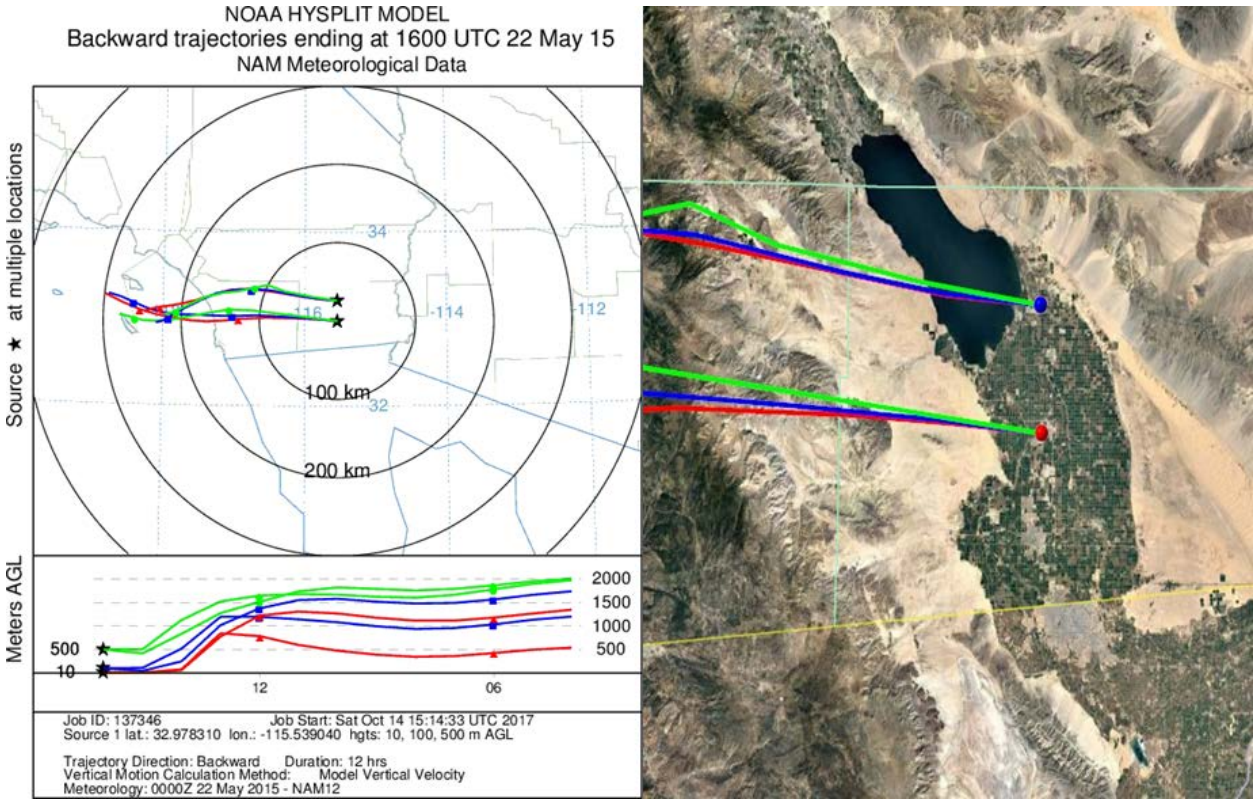

Fig 2-24: A 12-hour back-trajectory ending at 07:00 PST at Brawley on May 22, 2015. Airflow shifted slightly May 22, 2015 to a slightly northwest direction. However, the May 22, 2015 airflow was still predominantly west. Red line indicates airflow at 10 meters AGL (above ground level); blue line represents 100 meters AGL; green line represents 500 meters AGL. Image dynamically generated through NOAA's Air Resources Laboratory

Figures 2-25 and 2-26 illustrate the elevated levels of hourly PM_{10} concentrations and winds speeds measured in Riverside, Imperial and Yuma Counties for a period of four days. Elevated emissions were entrained into Imperial County affecting the Brawley and Niland monitors when the passing of an upper level low-pressure system moving over southern California, created strong onshore flow at the surface creating strong and gusty westerly winds across the mountains and deserts of southeastern California.

Wind driven entrained dust particles resulted in elevated concentrations of PM_{10} within the northern section of Imperial County (**Table 1-1**). Although the Niland monitor measured elevated concentrations of PM_{10} on May 22, 2015, it was not enough to cause an exceedance. The highest elevated measurements of PM_{10} on May 21, 2015 and May 22, 2015 occurred during late afternoon to evening hours, with peak measurements of 855 µg/m^3 and 769 µg/m^3 in Brawley (3:00pm PST) and Niland (6:00pm PST) on May 21, 2015 and 564 µg/m^3 in Brawley (7:00pm PST) on May 22, 2015

The resulting entrained dust and accompanying high winds from the system qualify this event as a "high wind dust event".[7] High wind dust events are considered natural events where 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 21, 2015 and May 22, 2015 high wind event qualifies as a natural event and that BACM was overwhelmed by the intensity of the meteorological event.

FIGURE 2-25
96 HOUR WINDS SPEEDS VARIOUS SITES

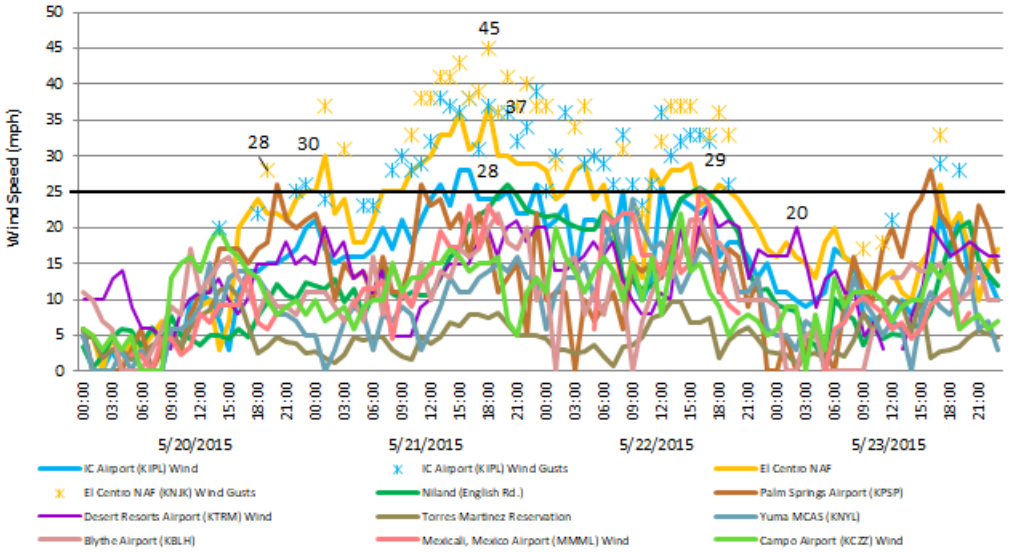

Fig 2-25: Is the graphical representation of the 96-hour wind speeds and wind gusts at various locations within Riverside, Imperial and Yuma counties. The high gusty westerly winds began as early as May 20, 2015 with moderate to variable wind speeds. Measured wind gust in Imperial County began as early as 14:53 PST May 20, 2015 however northern sites in Riverside County began measuring continuous wind gust as early as 12:53pm PST. Winds decreased temporarily early May 21, 2015 only to elevated through May 22, 2015. By late afternoon early evening hours winds decrease. The graph helps correlate the airflow of the trajectories and the high wind speeds and gusts May 21, 2015 through May 22, 2015. The strong gusty westerly winds entrained dust particles into Imperial County affecting air quality. Air quality data from the EPA's AQS data bank

[7] 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.

FIGURE 2-26
96 HOUR PM_{10} FLUCTUATIONS & WIND SPEEDS VARIOUS SITES

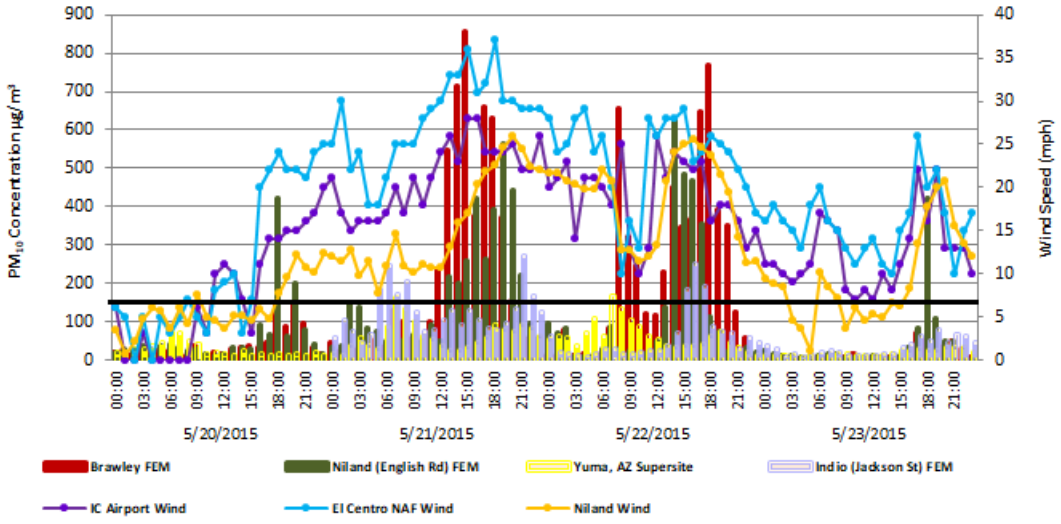

Fig 2-26: Is the graphical representation of the 96-hour PM_{10} concentrations at various monitoring locations within Riverside, Imperial and Yuma counties. The elevated PM_{10} concentrations measured on May 21, 2015 and May 22, 2015 support affect upon monitoring sites in Riverside, Imperial and Yuma counties. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley and Niland monitors May 21, 2015 and May 22, 2105, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the May 21, 2015 and May 22, 2015 high wind event and the exceedance measured at the Brawley and Niland monitors.

Figures 3-1 to 3-3 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley and Niland monitors for five and half years from January 1, 2010 to May 22, 2015, for a combined total of 1,968 sampling days. Note that prior to 2013, measured BAM data, in Imperial County was non-regulatory or non-FEM and was not reported into AQS.[8] In order to properly establish the variability of the event, as it occurred on May 21, 2015 and May 22, 2015, 24-hour averaged PM_{10} concentrations were compiled and plotted as time series, January 01, 2010 to May 22, 2015 to provide a historical perspective of PM_{10} concentrations at the Brawley and Niland monitors. The figures illustrate that the exceedances, which occurred on May 21, 2015 and May 22, 2015, were outside the normal historical concentrations when compared to event and non-event days.

[8] 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} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 22, 2015

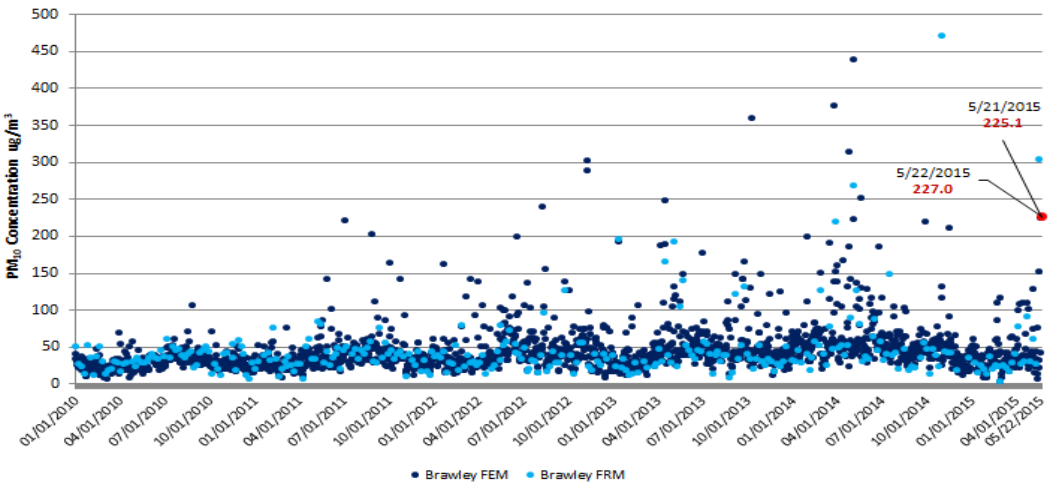

Fig 3-1: A historical comparison of PM_{10} concentrations to concentrations at the Brawley monitor demonstrates that the measured concentration of 225.1 µg/m^3 and 227 µg/m^3 on May 21, 2015 and May 22, 2015, respectively, were outside the normal historical concentrations when compared to similar days and non-event days

FIGURE 3-2
NILAND HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 21, 2015

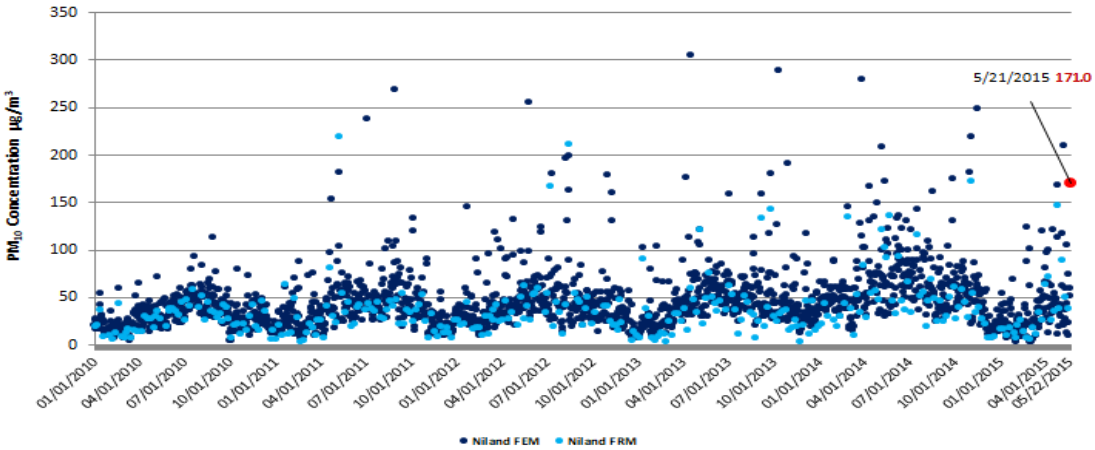

Fig 3-2: A historical comparison of PM_{10} concentrations to concentrations at the Niland monitor demonstrates that the measured concentration of 171 µg/m^3 measured on May 21, 2015 was outside the normal historical concentrations when compared to similar days and non-event days.

The time series, **Figures 3-1 to 3-2**, illustrate that of the 2,280 credible samples (1, 968 sampling days), for the Brawley monitor 34 exceedances occurred, which equates to an occurrence of less than 2%. Similarly, for the Niland monitor 32 exceedances occurred, which equates to an occurrence of less than 2%.

FIGURE 3-3
BRAWLEY AND NILAND HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO MAY 22, 2015

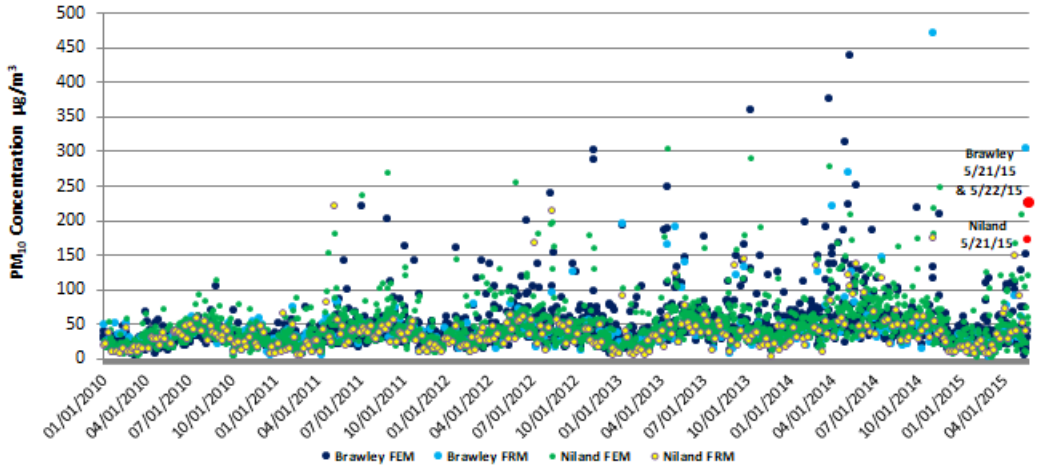

Fig 3-3: The combined historical comparison of PM_{10} concentrations to concentrations at the Brawley and Niland monitors demonstrates that the measured concentrations of 225.1 µg/m^3, 227 µg/m^3 and 171 µg/m^3 measured on May 21, 2015 and May 22, 2015 were outside the normal historical concentrations when compared to similar days and non-event days

The time series, **Figures 3-1 to 3-3**, illustrate that of the 4,555 credible samples (1,968 sampling days), for both the Brawley and Niland monitors, 66 exceedances occurred, which equates to an occurrence of less than 1.5%. However, when looking solely at days, of the 1,968 sampling days there were 50 exceedance days, which equates to an occurrence of less than 2.5%. For second quarter, there were 507 sampling days for which, Brawley measured 16 exceedances while Niland measured 12 during the same period, April 1 2010 to June 30, 2014 and April 1, 2015 to May 22, 2015. This equates to an occurrence less than 3.5%, for Brawley and less than 2.5% for Niland. Combined, there were 23 exceedance days during 2nd quarter, which equates to an occurrence less than 5%. The remaining 27 exceedance days occurred during the 1st quarter, 3rd quarter and 4th quarter. No exceedances of the standard occurred during 2010. As mentioned above, BAM data measured prior to 2013 is non-regulatory.

FIGURE 3-4
BRAWLEY SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
APRIL 1, 2010 TO MAY 22, 2015

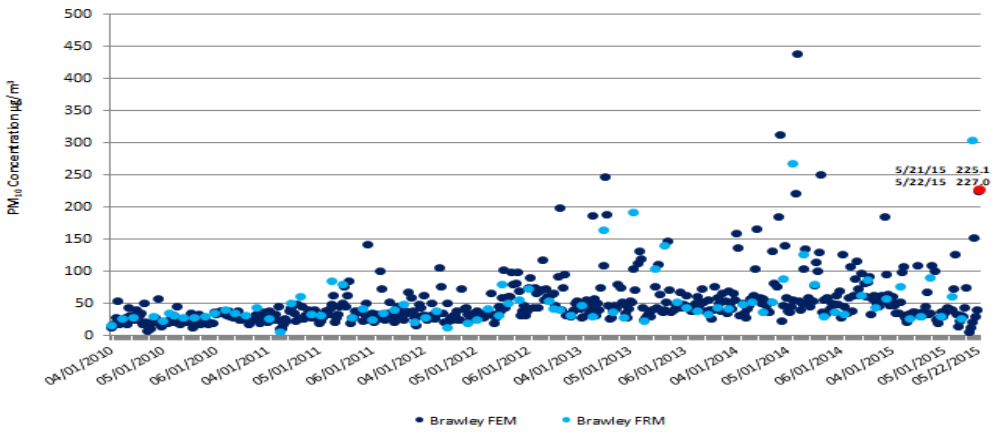

Fig 3-4: The seasonal historic comparison using the months of April thru June for the years 2010 thru 2015 supports that the measured exceedance at the Brawley monitor on May 21, 2015 and May 22, 2015 were outside the normal historical concentrations when compared to similar days and non-event days. Air Quality data from the EPA's AQS data bank

FIGURE 3-5
NILAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
APRIL 1, 2010 TO MAY 21, 2015

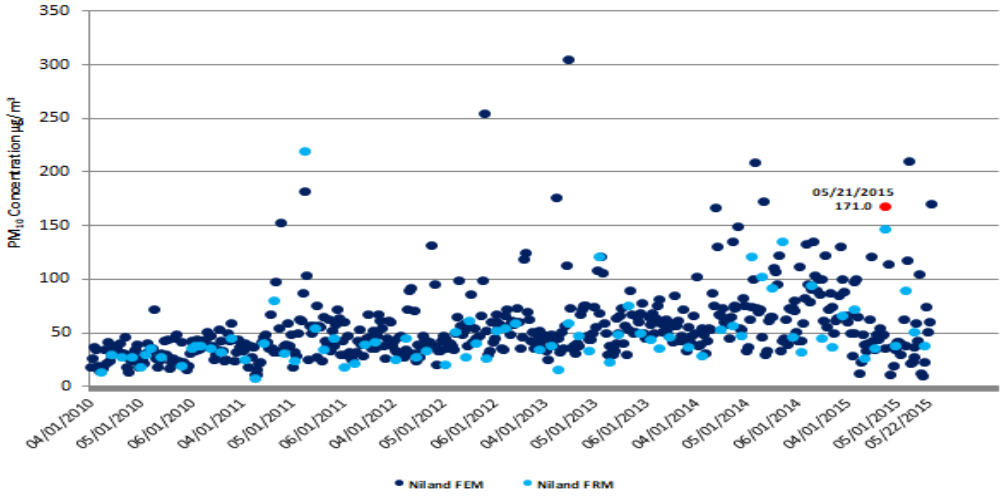

Fig 3-5: The seasonal historic comparison using the months of April thru June for the years 2010 thru 2015 supports that the measured exceedance at the Niland monitor on May 21, 2015 was outside the normal historical concentrations when compared to similar days and non-event days. Air Quality data from the EPA's AQS data bank

The time series, **Figures 3-4 to 3-5**, illustrate that of the 590 credible samples (507 sampling days), for the Brawley monitor a total of 16 exceedances occurred, which equates to an occurrence of less than 3%. Similarly, for the Niland monitor out of 585 credible samples a total of 12 exceedances occurred, which equates to an occurrence of less than 2.5%.

FIGURE 3-6
BRAWLEY AND NILAND SEASONAL COMPARISON
PM_{10} 24 HR AVG CONCENTRATIONS
APRIL 1, 2010 TO JUNE 30, 2015

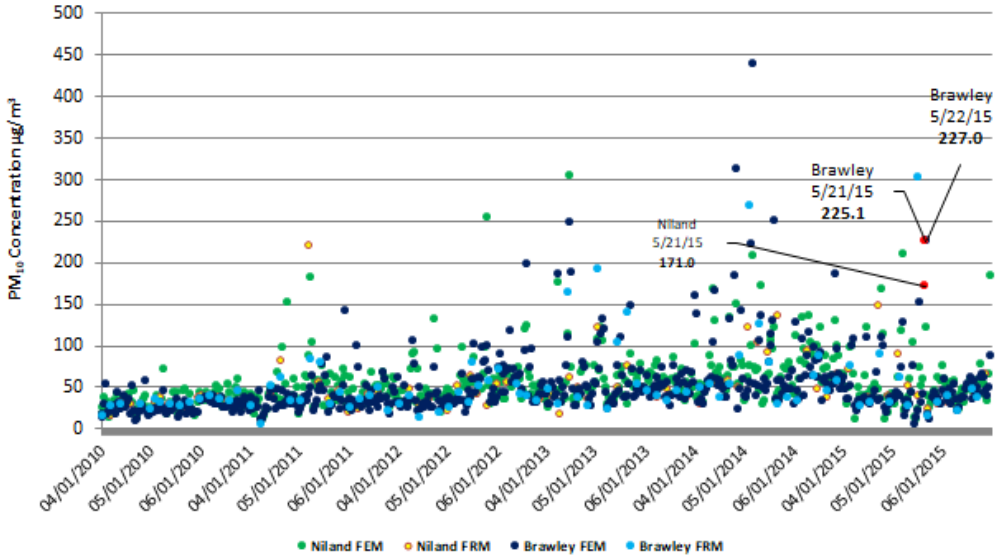

Fig 3-6: The combined seasonal comparison using the months of April through June for years 2010 through 2015 supports that the measured exceedances at both the Brawley and Niland monitors on May 21, 2015 and May 22, 2015 was outside the normal historical concentrations when compared to similar days and non-event days. Air Quality data from the EPA's AQS data bank

The time series, **Figures 3-4 to 3-6**, illustrate that of the combined seasonal historical 1,175 credible samples (507 sampling days), for both the Brawley and Niland monitors a total of a combined 28 exceedances occurred, which equates to an occurrence of less than 2.5%. However, when looking solely at days, of the 507 sampling days there were a total of 23 exceedance days which equates to an occurrence of less than 5%. No exceedances of the standard occurred during 2010. As mentioned above, BAM data measured prior to 2013 is non-regulatory.

FIGURE 3-7
BRAWLEY HISTORICAL PERCENTILE
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 TO MAY 22, 2015

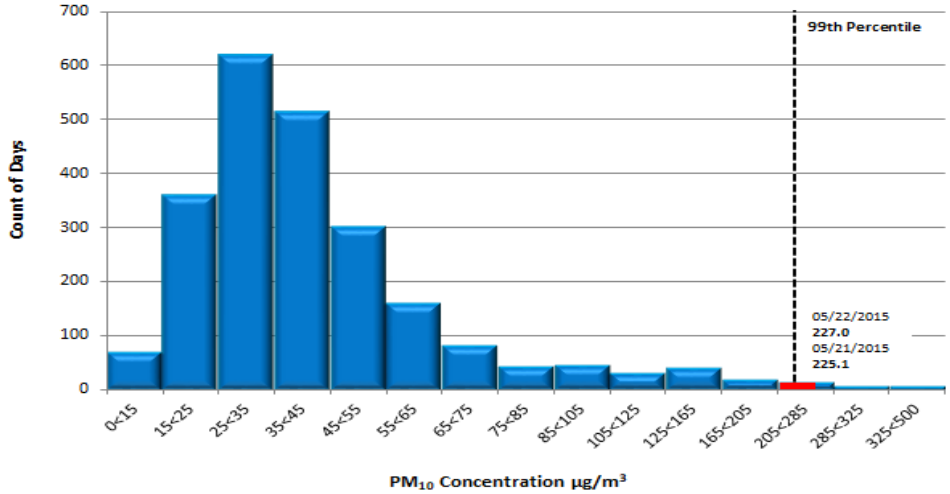

Fig 3-7: The 24-hr average PM_{10} concentrations measured at the Brawley monitoring site demonstrates that the May 21, 2015 and May 22, 2015 event was in excess of the 99th percentile. Air Quality data from the EPA's AQS data bank

FIGURE 3-8
NILAND HISTORICAL PERCENTILE
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 TO MAY 21, 2015

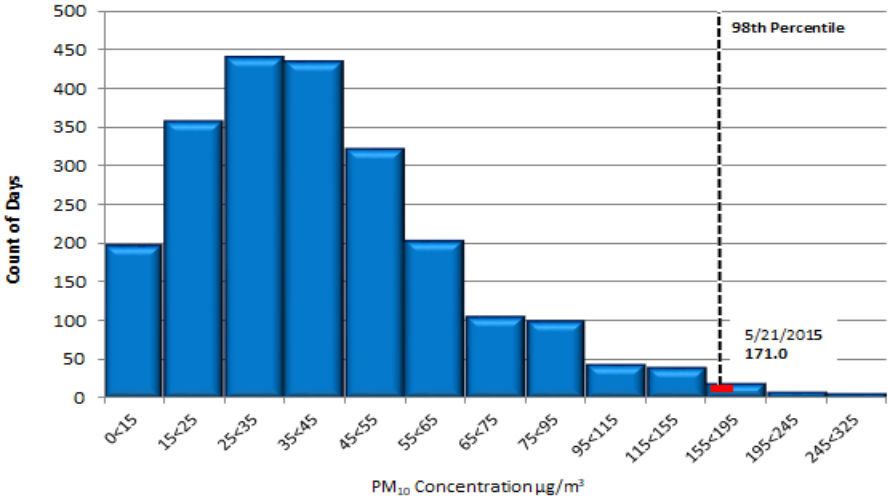

Fig 3-8: The 24-hr average PM_{10} concentrations measured at the Niland monitoring site demonstrates that the May 21, 2015 and May 22, 2015 event was in excess of the 98th percentile. Air Quality data from the EPA's AQS data bank

FIGURE 3-9
BRAWLEY SEASONAL PERCENTILE
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
APRIL 1, 2010 TO MAY 22, 2015

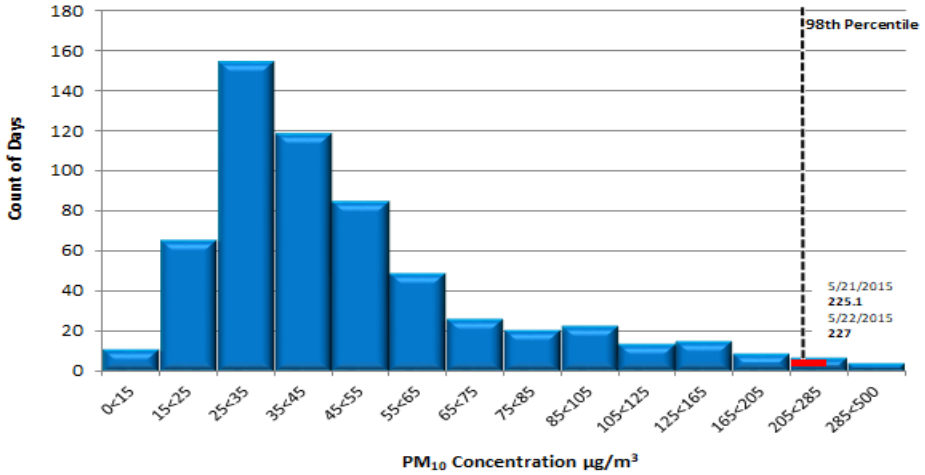

Fig 3-9: The 24-hr average PM_{10} concentrations measured at the Brawley monitoring site demonstrates that the May 21, 2015 and May 22, 2015 event was in excess of the 98th percentile. Air Quality data from the EPA's AQS data bank

FIGURE 3-10
NILAND SEASONAL PERCENTILE
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
APRIL 1, 2010 TO MAY 21, 2015

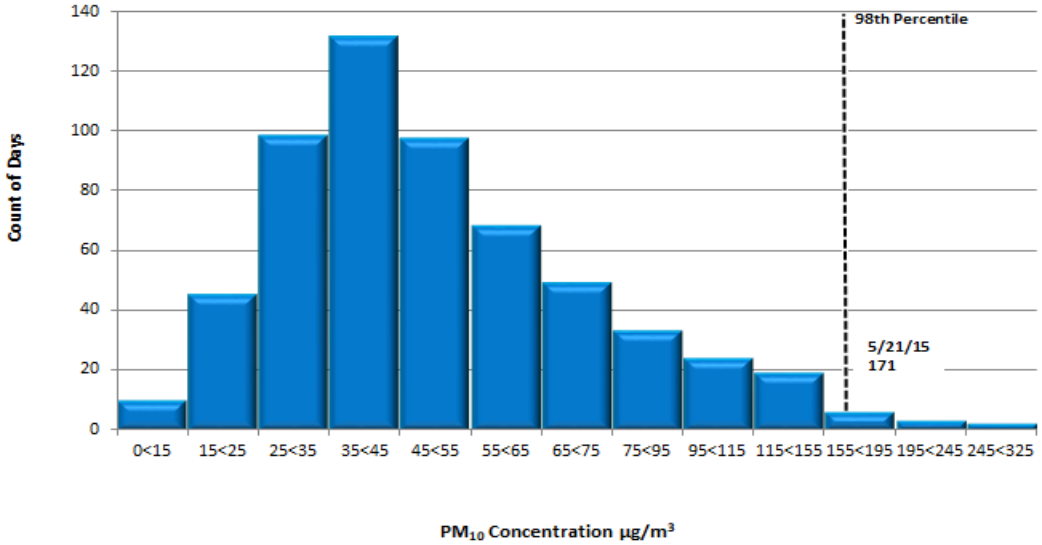

Fig 3-10: The 24-hr average PM_{10} concentrations measured at the Niland monitoring site demonstrates that the May 21, 2015 and May 22, 2015 event was in excess of the 98th percentile. Air Quality data from the EPA's AQS data bank

For the combined FRM and FEM data sets for the Brawley and Niland monitors, the annual historical and the seasonal historical PM_{10} concentrations of 225.1 µg/m^3 and 227 µg/m^3 for Brawley, and the 171 µg/m^3 for Niland the percentile ranking is at the 98th percentile ranking or the 99th percentile. Looking at the annual time series concentrations, the seasonal time series concentrations and the percentile rankings for both the historical and seasonal patterns for May 21, 2015 and May 22, 2015, the measured exceedances of 225 µg/m^3, 227 µg/m^3 and 171 µg/m^3 for Brawley and Niland are clearly outside the normal concentration levels when compared 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} concentrations observed on May 21, 2015 and May 22, 2015 occur infrequently. When comparing the measured PM_{10} levels on May 21, 2015 and May 22, 2015 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances at the Brawley and Niland sites were outside the normal historical and seasonal concentration levels.

This historical concentration analysis provided here supports the determination that the May 21, 2015 and May 22, 2015 natural event affected the concentration levels at the Brawley and Niland monitors 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 21, 2015 and May 22, 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 My 21, 2015 and May 22, 2015. In addition, this May 21, 2015 and May 22, 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 and Niland monitor on May 21, 2015 and May 22, 2015. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during May 21, 2015 and May 22, 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

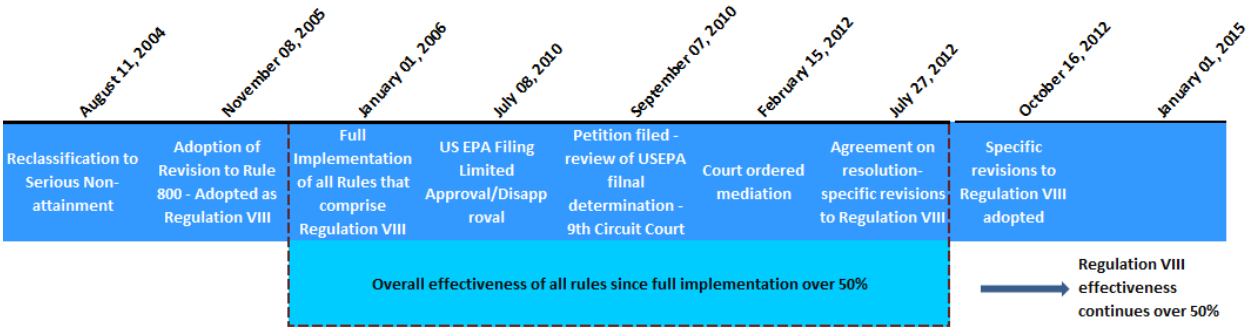

Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

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

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

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B of 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 21, 2015 and May 22, 2015 the ICAPCD declared a No Burn day **(Appendix A).** No complaints were filed for agricultural burning on May 21, 2015 and May 22, 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 Brawley and Niland during the time of the May 21, 2015 and May 22, 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. While no complaints were filed May 21, 2015 and May 22, 2015, officially designated as a NO burn day, for agricultural or waste burning, two dust complaints were investigated.

On May 21, 2015, the ICAPCD received a construction related dust complaint in Heber California, located southeast of the Brawley monitor and south of the Niland monitor. The complainant asserted that the construction site operating without a water truck, created dust. Upon investigation by certified ICAPCD personnel, an opacity violation, excess visible dust emissions, triggered the issuance of a Notice of Violation to the site operators. Immediate remedial measures included the increased frequency of water application to disturbed surface areas sufficient to reduce visible dust emissions. The second complaint filed May 22, 2015 asserted that a street sweeper illegally dumped dust behind an apartment complex in Brawley. The follow up investigation by certified iCAPCD personnel found no evidence of dust plumes at the site. Staff referred the complaint to the Environmental Health Department for a follow up investigation.

FIGURE 4-2
PERMITTED SOURCES

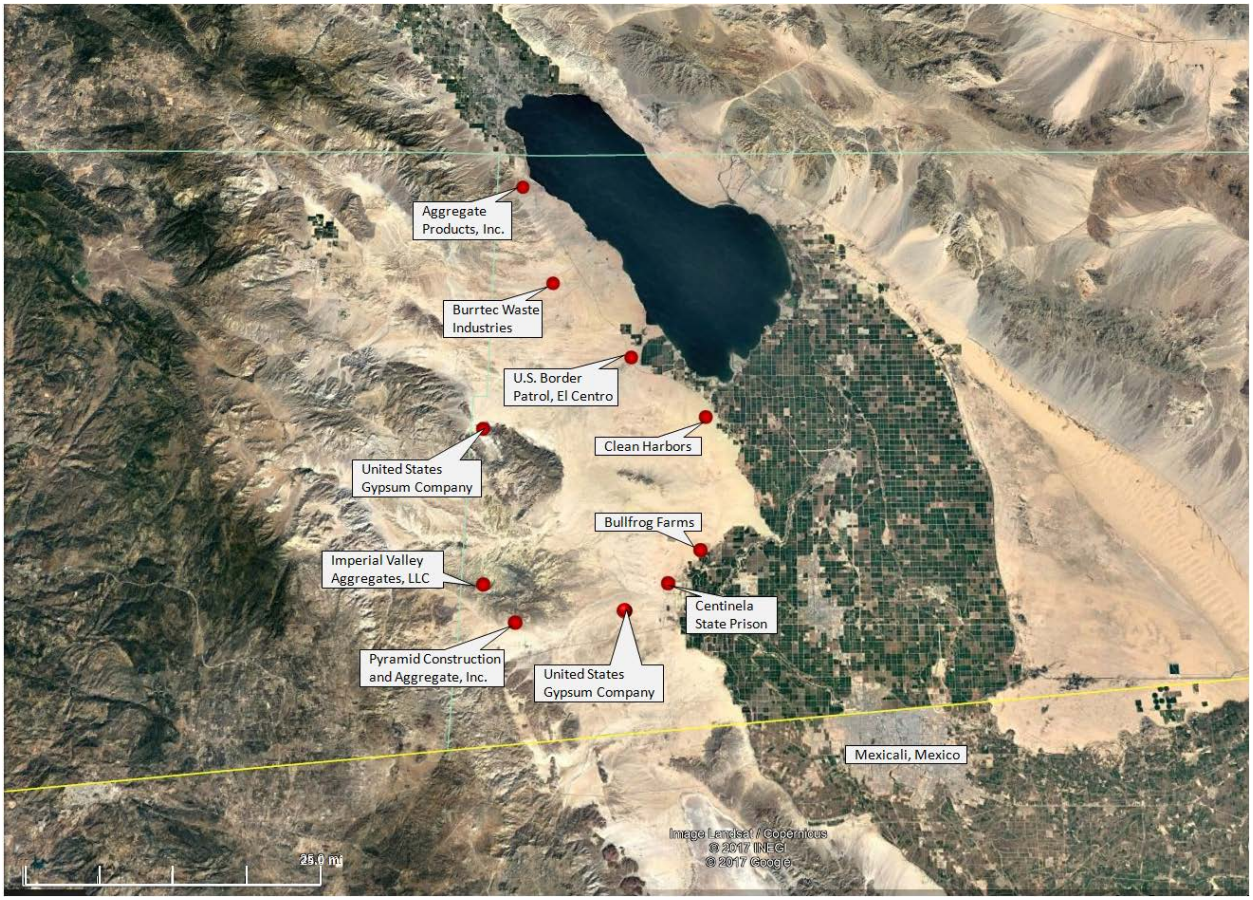

Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest of the Brawley and Niland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United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

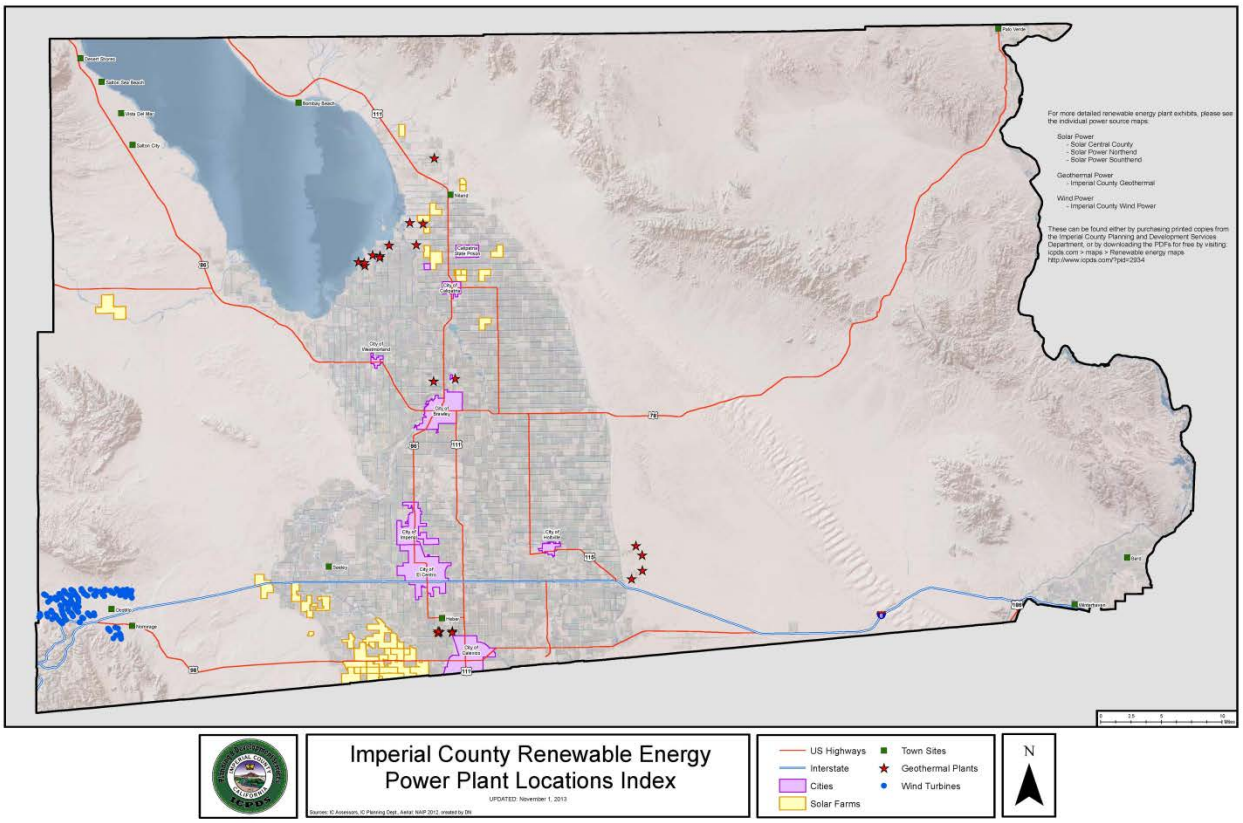

Fig 4-3: The above map identifies those power sources located west, northwest and southwest of the Brawley and Niland monitor. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

IV.2 Forecasts and Warnings

The San Diego NWS office began discussions of a weather system moving through southern California, with associated gusty westerly as early as May 20, 2015. The area forecast issued at 8:45pm PST by the San Diego NWS office reported on a low-pressure aloft that expected to bring, among other weather impacts, locally gusty winds to the desert areas. Soon after, during the early morning hours of May 21, 2015 both the NWS office in Phoenix and San Diego issued Urgent Weather Messages containing wind advisories. Both advisories, issued originally at 1:47am and 2:01am PST May 21, 2015, warned of high winds 25 mph and above with gusts 40 to 50 mph potentially affecting visibility due to blowing dust and sand. At 3:09am PST, the NWS Phoenix office issued a Hazardous Weather Outlook for the extreme southeast California, which included a wind advisory effective through 10pm May 21, 2015. While the Phoenix wind advisory only encompassed a single day the San Diego wind advisory extended the high wind speeds to 8:00pm

PST Friday, May 22, 2015 (**Appendix A**).[9] Visibility was forecast to reduce due to blowing dust and sand.

The ICAPCD issued Air Quality Index[10] alerts for Brawley on May 21, 2015 and May 22, 2015. The most severe alert was issued at 12:00pm PST on Friday, May 22, 2015. At that time air quality around Brawley entered the "Red" or the "Unhealthy" level (PM_{10} 151-200 µg/m^3). The web-based alert carried a warning for people with respiratory or heart disease, the elderly, and children of an increased likelihood of respiratory symptoms and to reduce prolonged or heavy exertion. **Appendix A** contains copies of the weather and air quality notices issued on May 21, 2015 and May 22, 2015.

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)**. The Palm Springs Regional Airport (KPSP), the Desert Resorts Regional Airport (Thermal: KTRM), the Imperial County Airport (KIPL), the El Centro NAF (KNJK) and the Niland station began measuring westerly winds as early the evening hours of May 20, 2015. The northern airports KSPS and KTRM measured predominately northwest winds with continuous gusts measured as early as 12:53pm PST on May 20, 2015. Winds and gusts continued through May 21, 2015 and May 22, 2015, with a temporary lull in wind speeds during the morning hours of May 22, 2015. The strongest measured winds occurred during the late afternoon and evening hours of May 21, 2015 and May 22, 2015.

Both the Imperial County Airport (KIPL) and the El Centro NAF (KNJK) measured winds speeds and gusts at or above 25 mph on May 21, 2015 and May 22, 2015 (**Figures 2-21 and 2-22**; **Table 2-2**). Wind speeds over 25 mph are normally sufficient to overcome most PM_{10} control measures. During the May 21, 2015 and May 22, 2015 event wind speeds were at or 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 strong gusty west winds associated with an upper level low pressure system that moved through southern California caused uncontrollable PM_{10} emissions. The BACM control measures in

[9] The Phoenix NWS office issued Urgent Weather Messages at 1:47am and 1:44pm PST, and a Hazardous Weather Outlook at 3:09am PST. The San Diego NWS office issued Urgent Weather Messages for May 21, 2015 at 2:01am and 10:10am PST and May 22, 2015 at 9:58am PST.

[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

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 at Brawley and Niland and surrounding areas to the north and west of Brawley and Niland during the event were high enough (at or above 25 mph, with wind gusts over 35 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on May 21, 2015 and May 22, 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 violations and the high wind event timeline and geographic location. The May 21, 2015 and May 22, 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 21, 2015 and May 22, 2015, identified a low-pressure system that brought strong gusty westerly winds to southeastern California. According to the NWS, a strong onshore flow associated with the low-pressure system brought strong and gusty westerly winds and gusts exceeding 25 mph across the mountains and deserts of southeastern California.

Entrained windblown dust from natural areas, particularly from the desert areas west and west-southwest of Brawley and Niland, along with anthropogenic sources controlled with BACM, is verified by the meteorological and air quality observations on May 21, 2015 and May 22, 2015.

As early as May 20, 2015 airports in Riverside County and Imperial County measured strong gusty westerly winds. The strong gusty westerly winds continued through May 21, 2015 and May 22, 2015 entraining PM_{10} into the atmosphere through the San Diego Mountains and deserts and over the deserts and agricultural lands in Imperial County. Both the Brawley and Niland monitors measured slight elevations of particulate matter as early as 2:00am PST with the highest concentrations measured during the late afternoon to evening hours of May 21, 2015 and May 22, 2015 coincident with the strongest measured wind speeds and gusts. The strong gusty westerly winds created blowing dust and sand over southern California causing the NWS to issued wind advisories.

Transported windblown dust affected both the Brawley and Niland monitors affecting air quality and causing and exceedance. **Figures 5-1 thru 5-3** provide images of the captured incoming clouds and haze associated with the low-pressure system and the tightening of the pressure gradient over southern California, May 21, 2015 and May 22, 2015. Two descriptive text narratives for smoke/dust observations help provide supporting evidence of blowing dust in southern California (**Appendix A**).

FIGURE 5-1
MODIS DUST IMAGE MAY 21, 2015

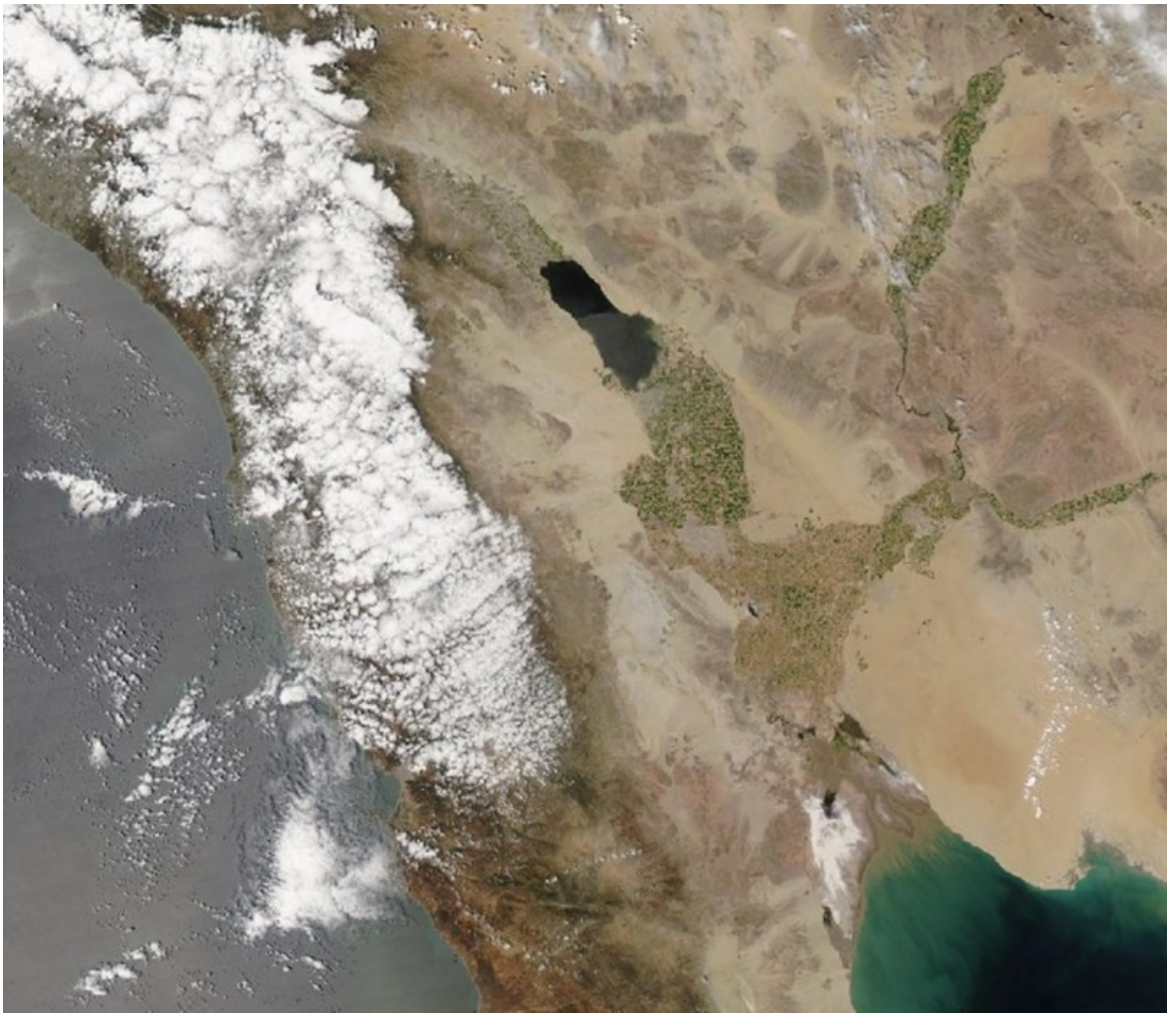

Fig 5-1: A MODIS Aqua satellite image May 21, 2015, captured a layer of dust over the region. The Brawley and Niland monitors began measuring continuous elevated concentrations at 12:00pm and 1:00pm PST. Source: MODIS Today

FIGURE 5-2
MODIS DUST IMAGE – MAY 22, 2015

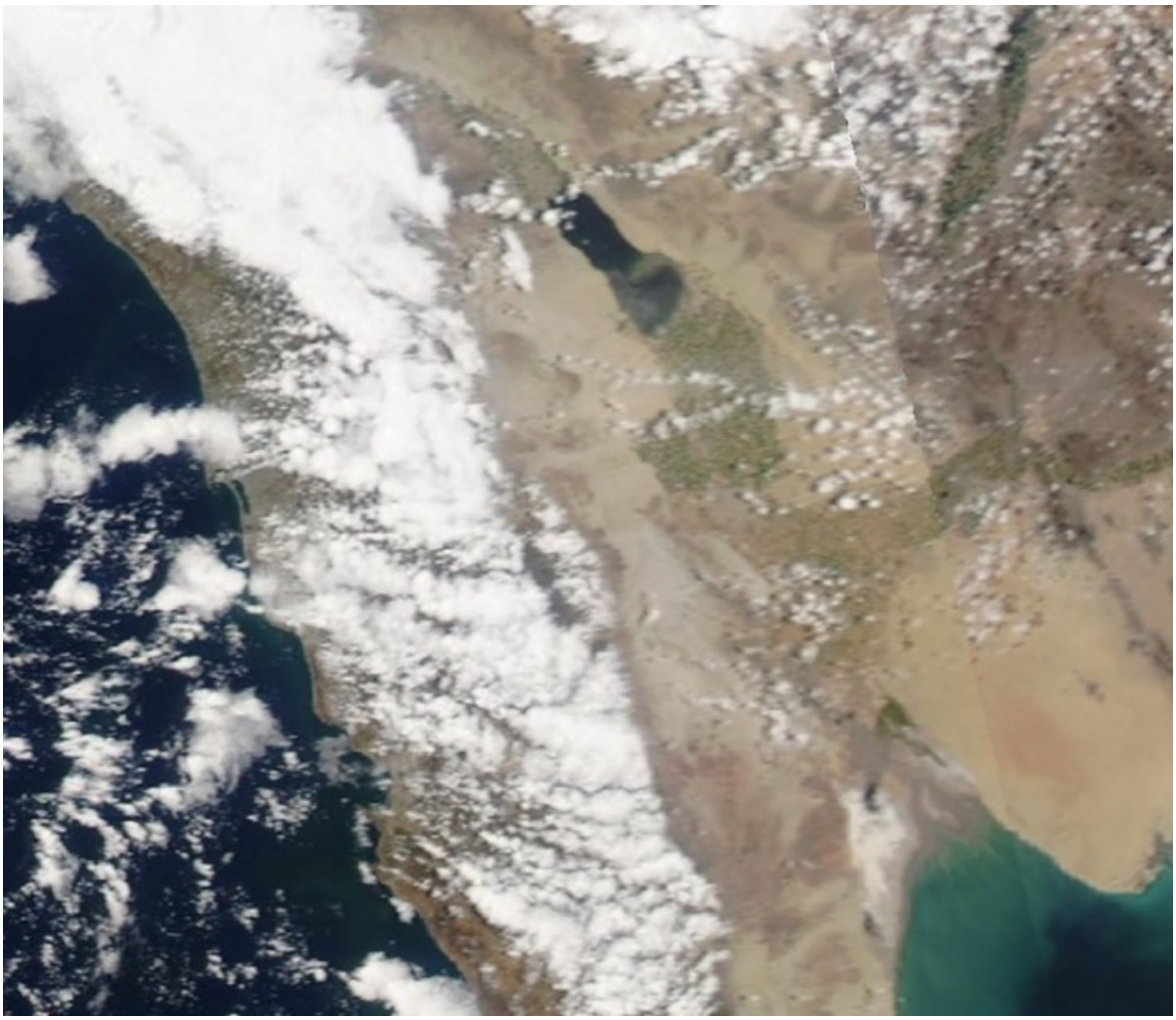

Fig 5-2: A MODIS Aqua satellite image May 22, 2015, captured a layer of dust over the region. Strong gusty winds began as early as May 20, 2015 and continued into May 22, 2015, entraining dust into the atmosphere affecting air quality and causing an exceedance at the Brawley monitor. Source: MODIS Today

FIGURE 5-3
GOES E-W SATELLITE IMAGES

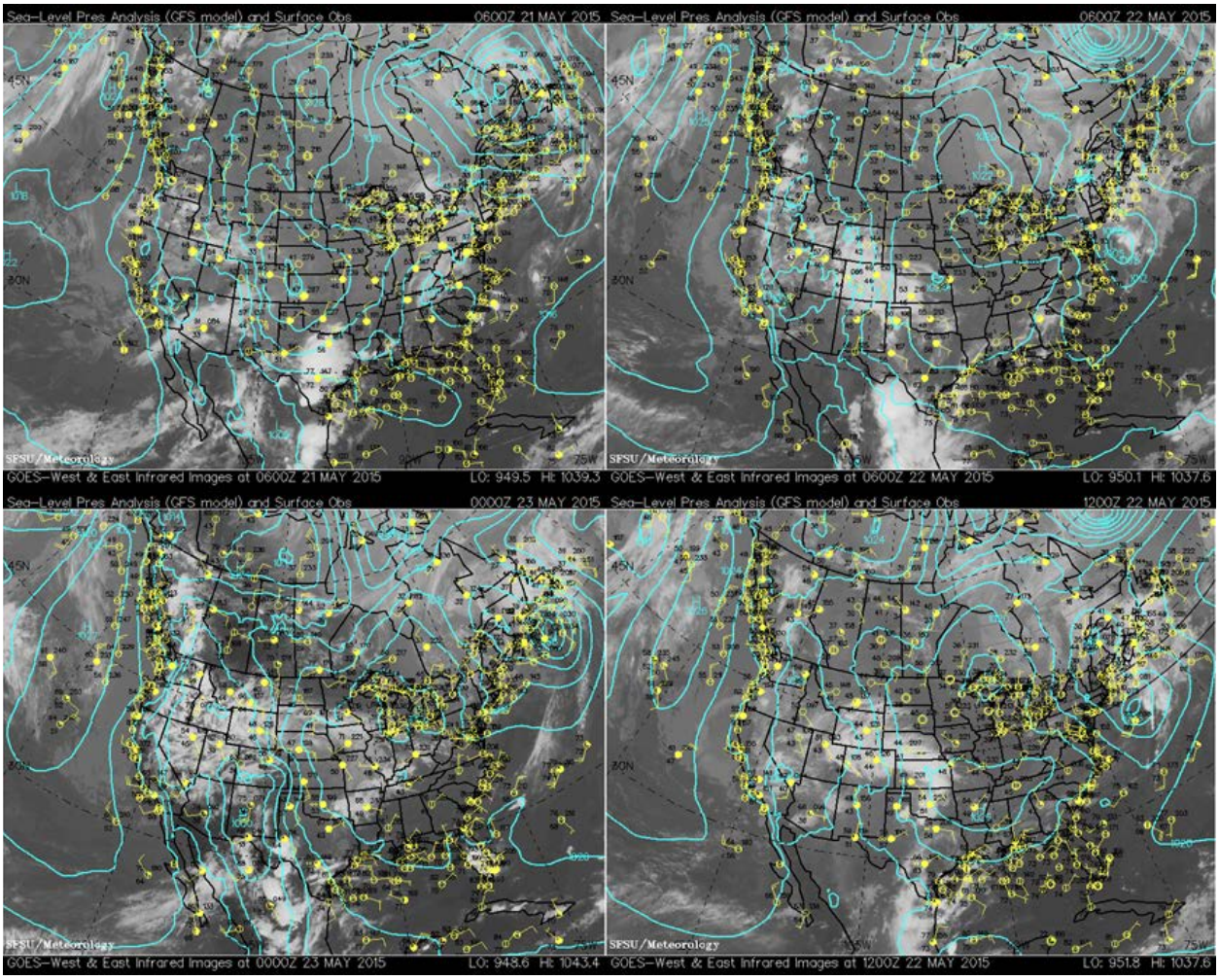

Fig 5-3: GOES E-W infrared satellite images show the pressure gradient remained moderately well-packed over southern California starting late May 20, 2015 and continuing through May 22, 2015. The tighter the gradient is the stronger the winds. The top two images at the top were captured at 10:00pm PST May 20, 2015 and May 21, 2015. The bottom two images were captured at 4:00pm PST May 22, 2015 (left) and 4:00am PST May 22, 2015 (right). Source: SFSU Department of Earth & Climate Sciences and the California Regional weather Server; http://virga.sfsu.edu/archive/composites/sathts_snd/1505/

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.[11] **Tables 5-1 and 5-2** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the exceeding stations.[12] The Brawley and Niland monitors shows peak hourly concentrations following or during the period of high upstream wind

[11] "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016
[12] 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. 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.

TABLE 5-1
BRAWLEY AND NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS MAY 21, 2015

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} (µg/m^3)	PM_{10} (µg/m^3)
0:00	12	27	305	0:00	14	22	209	0:00	23	36	235	0:56	25		270	0:53	21		270	0	34	45
1:00	19	33	318	1:00	17	26	203	1:00	24	35	242	1:56	30	37	250	1:53	17	24	270	100	38	25
2:00	17	35	304	2:00	19	27	205	2:00	15	24	308	2:56	22		260	2:53	15		270	200	150	94
3:00	17	30	308	3:00	18	31	221	3:00	12	23	286	3:56	24	31	250	3:53	16		270	300	140	30
4:00	18	35	311	4:00	20	28	205	4:00	12	28	246	4:56	18		260	4:53	16		280	400	85	38
5:00	19	36	307	5:00	20	31	217	5:00	15	29	245	5:56	18		270	5:53	16	23	280	500	76	54
6:00	18	29	321	6:00	15	23	208	6:00	18	32	233	6:56	21		260	6:53	17	23	270	600	51	37
7:00	20	34	300	7:00	16	29	211	7:00	26	34	234	7:56	25		260	7:53	20		280	700	78	130
8:00	20	34	295	8:00	18	28	217	8:00	24	34	235	8:56	25		260	8:53	17	28	280	800	56	102
9:00	19	32	304	9:00	10	24	201	9:00	20	28	240	9:56	25		250	9:53	21	30	270	900	66	58
10:00	18	35	312	10:00	4	20	333	10:00	19	28	240	10:56	28	33	250	10:53	18	28	260	1000	51	24
11:00	22	38	295	11:00	11	19	210	11:00	17	26	245	11:56	29	38	240	11:53	21	29	270	1100	93	99
12:00	18	35	302	12:00	11	20	230	12:00	20	32	246	12:56	30	38	250	12:53	24	32	270	1200	49	236
13:00	16	32	294	13:00	17	27	250	13:00	18	34	250	13:56	33	41	250	13:53	26	38	260	1300	219	549
14:00	17	32	318	14:00	16	32	269	14:00	23	39	243	14:56	33	41	260	14:53	23	37	270	1400	200	713
15:00	21	36	298	15:00	15	31	259	15:00	16	28	256	15:56	36	43	260	15:53	28	36	260	1500	259	855
16:00	21	37	311	16:00	21	31	248	16:00	19	34	253	16:56	31	38	250	16:53	28	38	260	1600	422	375
17:00	20	39	304	17:00	15	33	252	17:00	15	28	266	17:56	32	39	250	17:53	24	31	260	1700	264	661
18:00	18	37	308	18:00	19	33	255	18:00	18	35	255	18:56	37	45	250	18:53	24	37	260	1800	392	633
19:00	19	36	315	19:00	21	43	247	19:00	20	32	258	19:56	30	36	260	19:53	24	36	270	1900	564	371
20:00	21	41	300	20:00	19	32	222	20:00	16	30	260	20:56	30	41	260	20:53	25	36	270	2000	444	153
21:00	20	34	307	21:00	19	43	240	21:00	17	31	254	21:56	29	37	260	21:53	22	32	270	2100	220	44
22:00	15	28	309	22:00	17	32	231	22:00	15	26	256	22:56	29	40	260	22:53	22	34	270	2200	96	59
23:00	17	30	318	23:00	18	29	233	23:00	12	22	263	23:56	29	37	270	23:53	26	39	270	2300	57	17

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

TABLE 5-2
BRAWLEY AND NILAND WIND SPEEDS—PM_{10} CONCENTRATIONS MAY 22, 2015

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	17	33	314	0:00	20	33	250	0:00	13	24	263	0:56	28	37	250	0:53	20	25	260	0	97	12
1:00	18	29	300	1:00	16	31	254	1:00	12	21	277	1:56	24	29	250	1:53	21	30	260	100	73	11
2:00	15	27	314	2:00	23	46	261	2:00	19	32	275	2:56	25		250	2:53	23	36	270	200	82	78
3:00	15	25	305	3:00	17	38	252	3:00	17	26	259	3:56	28	34	250	3:53	14		270	300	13	13
4:00	16	31	312	4:00	7	28	269	4:00	17	26	261	4:56	29	37	240	4:53	21	29	250	400	12	15
5:00	16	26	326	5:00	11	27	268	5:00	12	22	268	5:56	24		240	5:53	21	30	250	500	13	8
6:00	19	32	297	6:00	13	24	265	6:00	16	26	273	6:56	26		250	6:53	20	29	250	600	28	16
7:00	20	33	297	7:00	12	23	262	7:00	15	22	283	7:56	20		270	7:53	18	26	280	700	88	82
8:00	19	33	319	8:00	14	29	256	8:00	14	26	266	8:56	10	31	280	8:53	25	33	250	800	33	657
9:00	20	35	319	9:00	11	32	309	9:00	15	27	265	9:56	16		280	9:53	13	26	280	900	26	324
10:00	22	34	322	10:00	12	24	265	10:00	16	25	253	10:56	13	22	250	10:53	10	23	300	1000	15	245
11:00	25	42	295	11:00	11	27	252	11:00	16	29	254	11:56	28		240	11:53	13	26	280	1100	22	120
12:00	17	30	300	12:00	18	33	260	12:00	16	28	257	12:56	26	32	230	12:53	26	36	250	1200	50	116
13:00	18	30	302	13:00	16	36	251	13:00	15	25	261	13:56	28	37	230	13:53	21	30	250	1300	140	232
14:00	15	26	300	14:00	19	36	263	14:00	15	29	265	14:56	28	37	260	14:53	24	32	260	1400	631	451
15:00	20	32	319	15:00	17	40	259	15:00	19	31	268	15:56	29	37	260	15:53	23	33	260	1500	487	348
16:00	17	27	305	16:00	20	37	263	16:00	13	23	263	16:56	23		260	16:53	22	33	250	1600	468	368
17:00	20	31	304	17:00	19	42	261	17:00	14	25	267	17:56	24	33	250	17:53	23	32	250	1700	356	650
18:00	19	31	308	18:00	22	38	260	18:00	14	23	270	18:56	26	36	250	18:53	16		260	1800	115	769
19:00	21	36	308	19:00	15	36	247	19:00	14	33	265	19:56	25	33	260	19:53	18	26	260	1900	74	392
20:00	16	26	294	20:00	15	30	244	20:00	15	26	263	20:56	24		250	20:53	18		260	2000	25	350
21:00	18	31	298	21:00	14	30	247	21:00	13	26	260	21:56	22		250	21:53	16		260	2100	23	127
22:00	18	33	293	22:00	17	30	236	22:00	12	24	262	22:56	20		250	22:53	13		260	2200	34	57
23:00	17	32	318	23:00	14	26	219	23:00	15	25	253	23:56	17		240	23:53	15		260	2300	23	7

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

The NWS defines gusts as a rapid fluctuation of wind speed with variations of 11.5 mph or more between peaks and lulls. The analysis of the meteorological setting, including weather reports and NWS satellite imagery, indicates that a low-pressure system brought strong and gusty west winds across the San Diego county mountains and desert slopes into Imperial County as early as May 20, 2015 through May 22, 2015. The weather system caused the NWS to issue wind advisories (**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 advisories included a forecast of strong westerly winds potentially as high as 30 mph and 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 5-4
BRAWLEY AND NILAND EXCEEDANCE FACTORS MAY 21, 2015

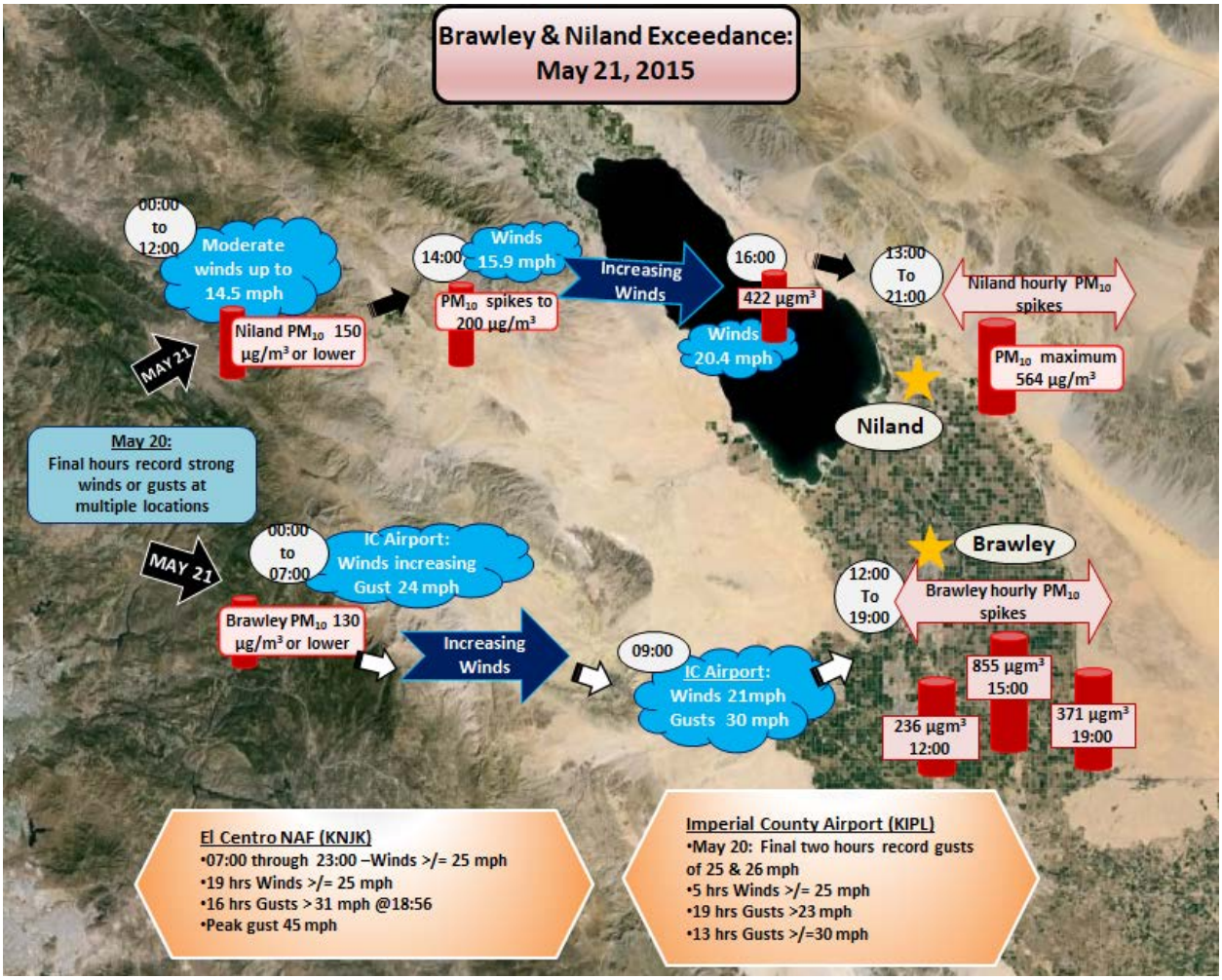

Fig 5-4: Time sequence analysis for the Brawley and Niland monitors identifying the increases in wind speed as the low-pressure system moved into the region May 21, 2015. The increases in wind speeds (gusts included) are coincident with elevated concentrations of PM_{10}

FIGURE 5-5
BRAWLEY EXCEEDANCE FACTORS MAY 22, 2015

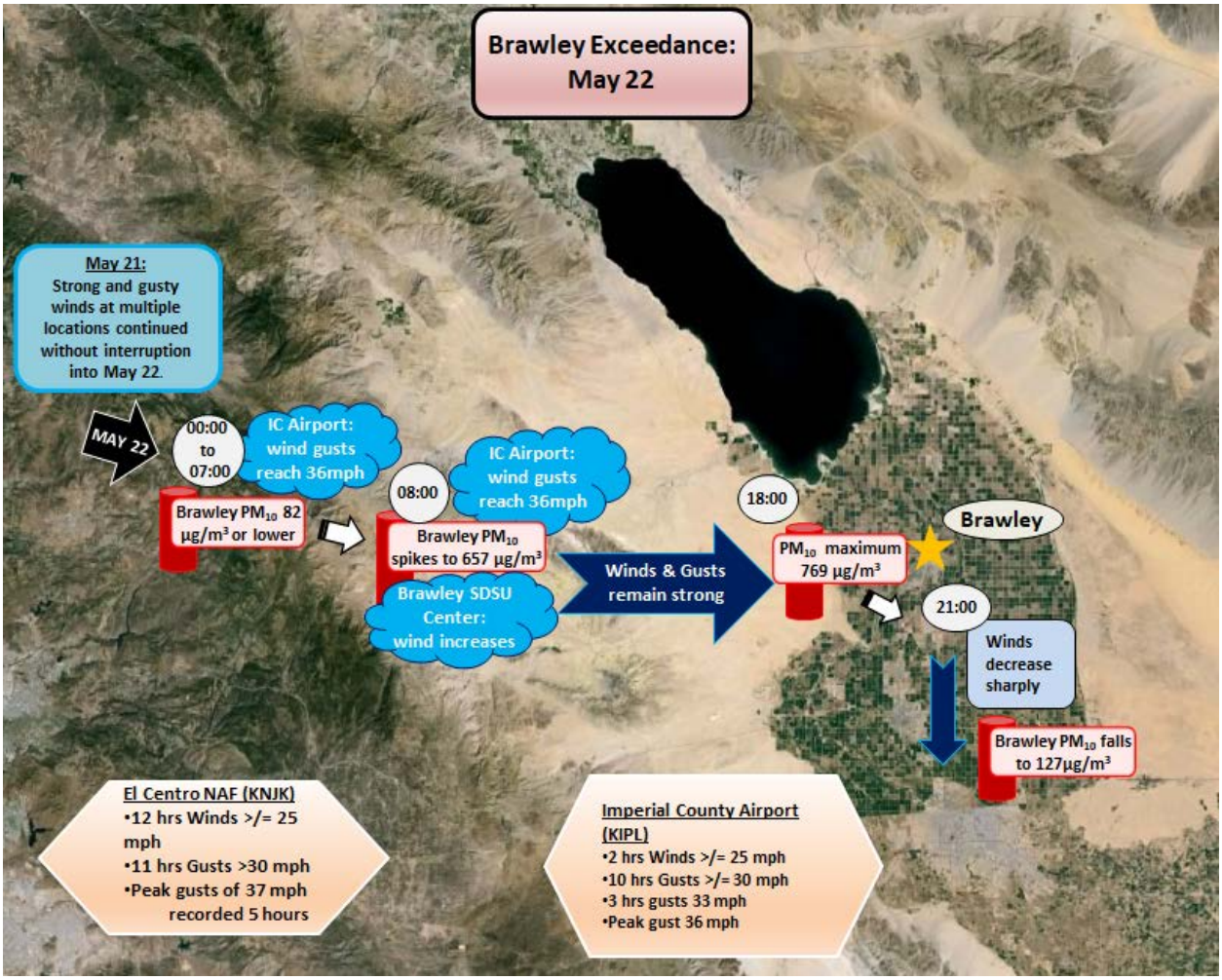

Fig 5-5: Time sequence analysis for the Brawley monitor identifies the increases in wind speed as the low-pressure system continued moving through the region May 22, 2015. The increases in wind speeds (gusts included) are coincident with elevated concentrations of PM_{10}

The chain of events for May 21, 2015 and May 22, 2015 visually demonstrated in **Figures 5-4 and 5-5**. As early as May 20, 2015 Riverside County and Imperial County measure elevated strong gusty westerly winds. Both the Brawley and Niland monitors begin to measure elevated concentrations of PM_{10} at 6:00pm PST May 20, 2015. Winds continue through May 21, 2015 with continuous elevated and strongest wind speeds and gusts measured during the afternoon and evening hours, coincident with the continuous and highest concentrations at the Brawley and Niland monitors (beginning at 12:00pm PST in Brawley and 1:00pm in Niland). Brawley measured peak concentrations at 5:00pm PST while Niland measured peak concentrations at 7:00pm, May 21, 2015, coincident with the strongest measured wind speeds and gusts for several continuous hours at KIPL and KNJK (QCLCD reports found in **Appendix B**).

By mid-morning May 22, 2015 both wind speeds and gusts decrease temporarily with an associated slight change in wind direction, northwest. The brief decrease in frequency of wind gusts and the slight change in wind direction on May 22, 2015 is coincident with the lower concentrations of PM_{10} at both Brawley and Niland. However, wind speeds and gusts elevate toward the later part of the day, which is similarly coincident with the elevated concentrations at the Brawley and Niland monitors. Although the Niland monitor measured elevated concentrations of PM_{10} it was not sufficient to cause an exceedance. Topography and the slight change in wind direction created the prefect airflow (path) that took entrained dust over a greater portion of the Salton Sea, thus capturing or removing particulates from the atmosphere before it could reach the Niland monitor (**Figure 2-24**). Entrained dust particles from the San Diego Mountains, deserts and agricultural lands in Imperial County affected air quality causing an exceedance on May 21, 2015 and May 22, 2015.

NOAA's Satellite Services Division, released text narrative for smoke/dust supports the observations and analysis of transported windblown dust particles. The first text product, valid through 7:00pm PST May 21, 2015, identified a plume of blowing dust/sand originating over southern California spreading east into southwestern Arizona. Note, the highest elevated concentrations measured by Brawley and Niland occurred between 12:00pm and 10:00pm PST. The second text product, valid through 6:00pm PST May 22, 2015, explains that the blowing dust/sand event developed again during the prior evening because of strong winds across southern California. Although both the Brawley and Niland monitors measure elevated concentrations of PM_{10} only the Brawley monitor measures concentrations above 600 $\mu g/m^3$ as early as 8:00am May 22, 2015. **Appendix A** contains copies of pertinent notices to the May 21, 2015 and May 22, 2015 event.

FIGURE 5-6
NEXRAD BASE VELOCITY

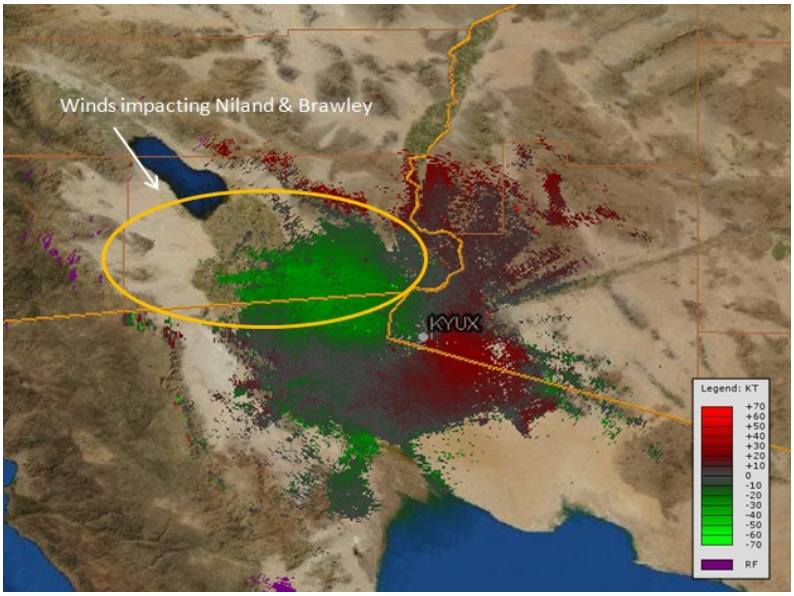

Fig 5-6: A NEXRAD base velocity image captured by the Yuma, Arizona KYUX station, at 0325 UTC (2025 PDT/1925 PST) on May 21, 2015. This image is typical of the strong winds that affected the Imperial Valley area May 21, 2015 through May 22, 2015. Green colors indicate motion toward the KYUX STATION. Red indicates motion away from the station. NEXRAD data is only available for the extreme southeastern portion of Imperial County. Dynamically generated through NOAA's Weather & Climate Toolkit

Figure 5-6 is a NEXRAD image captured by the Yuma, Arizona radar station. Green colors indicate the relative speed of winds approaching the radar, while red indicates of winds moving away from the radar. Although NEXRAD[13] data is only available for the extreme corner of southeastern Imperial County, the image provides a general idea of the intensity of the winds that passed through the area.

Wind advisories[14] are issued by the NWS when winds[15] of 30 to 39 mph are expected for one (1) hour or longer. As mentioned above, both the San Diego and Phoenix NWS offices issued Urgent Weather Messages that included wind advisories. While the Phoenix NWS office issued the advisory for a single day the San Diego NWS office continue the wind advisory to the following day, May 22, 2015. Both advisories forecasted strong gust west winds, 25 mph to 35 with gusts

[13] NEXRAD: The Next Generation Weather Radar (NEXRAD) system currently comprises 160 sites throughout the United States and select overseas locations. The NEXRAD system is a joint effort of the U.S. Departments of Commerce, Defense, and Transportation. Source: NOAA National Centers for Environmental Information.

[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

expected around 40 mph (**Appendix A**). As mentioned above, airports in Riverside County and Imperial County measured elevated wind speeds and gusts for several hours May 21, 2015 and May 22, 2015 (**Figures 2-21, 2-22, 5-4 and 5-5**). Winds at these airports measured consecutive hours of wind speeds and gusts above 25 mph. **Figure 5-7** is an illustration of the wind speeds throughout the region beginning with May 20, 2015 and ending May 23, 2015. Elevated wind speeds at most stations is evident, particularly at KIPL and KNJK. Winds started to diminish during late evening on May 22, 2015. A summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, Riverside County, Yuma County, Arizona, and Mexicali, Mexico, is shown in **Table 2-2**. For detailed meteorological station graphs see **Appendix B**.

FIGURE 5-7
96 HOUR PM_{10} CONCENTRATIONS &WIND SPEEDS NEIGHBORING SITES

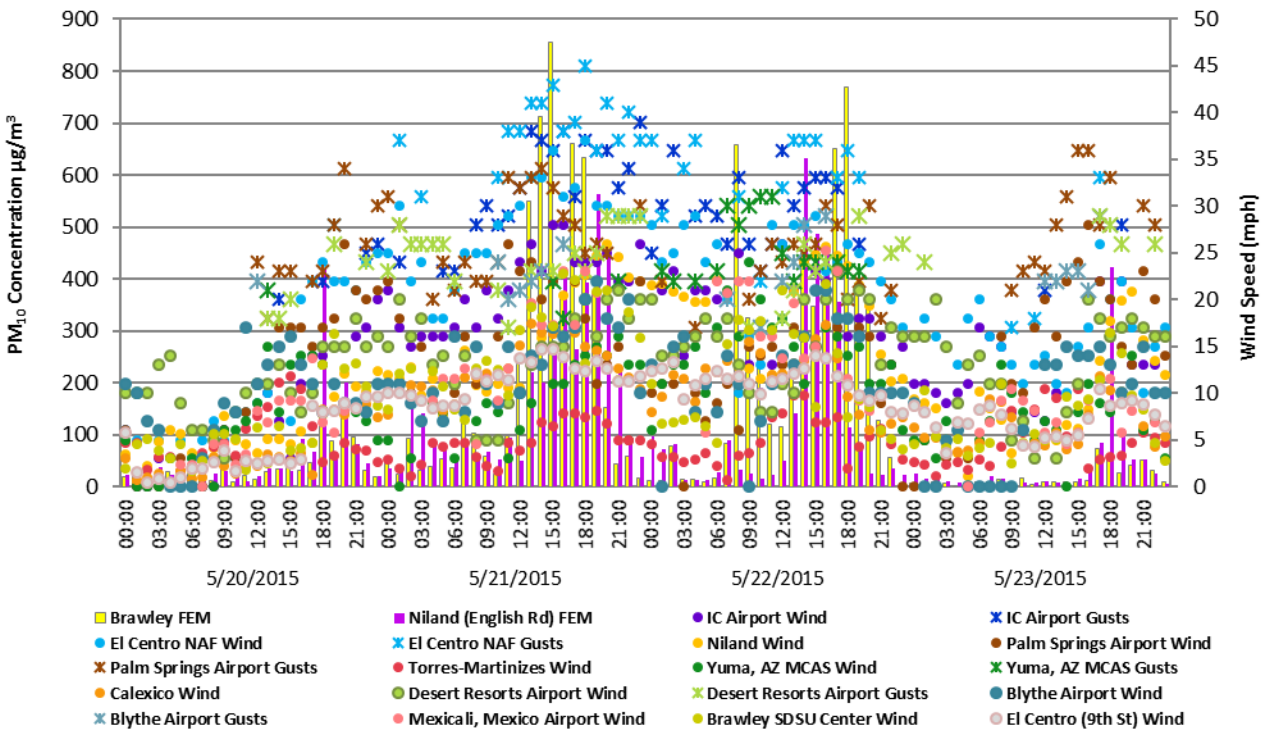

Fig 5-7: Meteorological data collected from ten sites within the Imperial, Riverside, Yuma and Mexicali, Mexico over a 4-day period from May 20, 2015 to May 23, 2015 shows a uniform spike in wind speed during the May 21, 2015 and May 22, 2015 exceptional event

Figures 5-8 and 5-9 demonstrate the temporal relationship between the high winds and the transported entrained dust affecting the Brawley and Niland monitors. The correlation of hourly BAM 1020 data from the Brawley and Niland air monitoring stations and the elevated wind speeds on May 21, 2015 and May 22, 2015 indicate that as wind speeds increase so do concentrations of PM_{10}. The peak hourly PM_{10} concentration occurred throughout the afternoon and early evening hours on May 21, 2015, which are associated with the high peak winds and gusts measured at the different stations in Imperial County. PM_{10} concentrations peaked again during the morning throughout the evening on May 22, 2015, which is also associated with high

peak winds. **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 21, 2015 and May 22, 2015**.**

FIGURE 5-8
BRAWLEY PM_{10} & WIND SPEED CORRELATION
MAY 21, 2015 & MAY 22, 2015

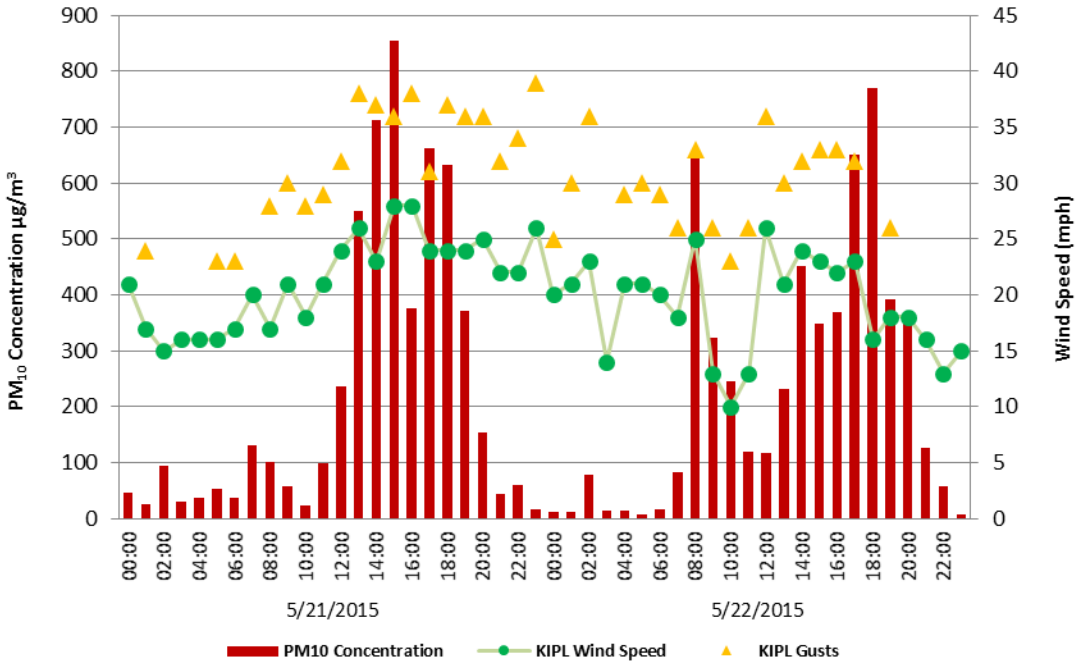

Fig 5-8: Brawley PM_{10} concentrations show a positive correlation as high winds impacted the area. Imperial County Airport is the closest upstream meteorological station to Brawley

FIGURE 5-9
NILAND PM_{10} & WIND SPEED CORRELATION
MAY 21, 2015 & MAY 22, 2015

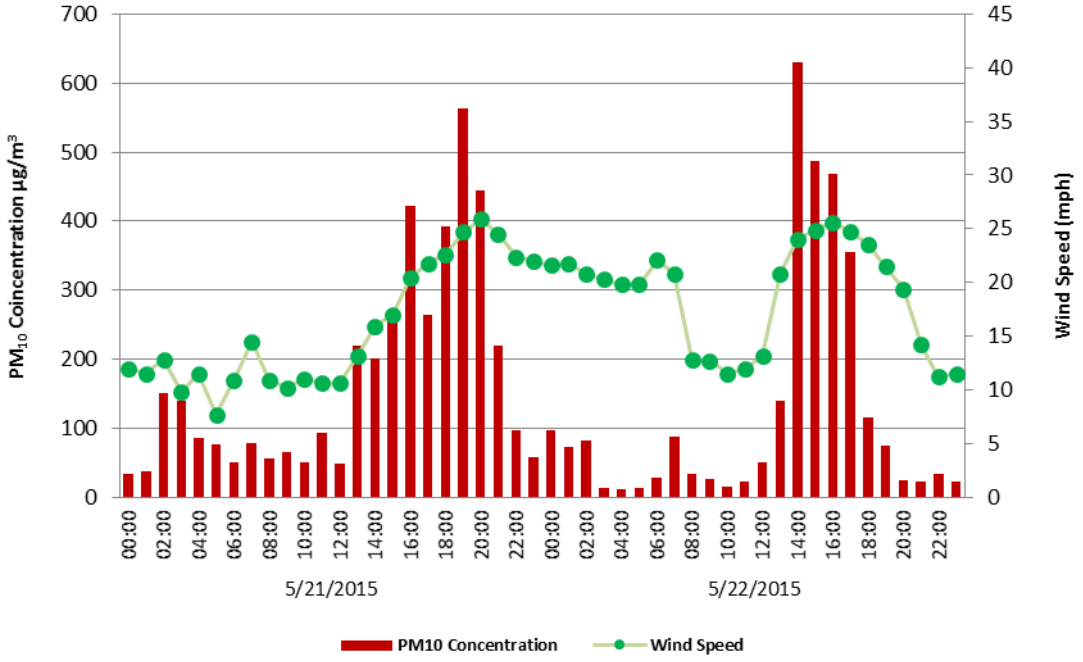

Fig 5-9: Niland PM_{10} concentrations show a correlation in increase as high winds affected the area. Elevated wind speeds continued for over an hour while correlated elevations in PM_{10} concentrations occurred. Niland Station wind data utilized

Figure 5-10 and Figure 5-11 show a four-day depiction of PM_{10} and wind speed correlations starting May 20, 2015. For May 20, 2015, Brawley and Niland stations show lower concentration levels, as winds remain light. As winds increased during the late evening hours on May 20, 2015 concentrations show similar increases. As high winds continued through May 21, 2015, concentrations began to rise shortly after noon. Concentrations at both stations dipped at both stations by 10:00pm PST May 21, 2015. By May 22, 2015 continued wind speeds lull briefly before elevating to once again at 8:00am in Brawley.

FIGURE 5-10
BRAWLEY PM_{10} & WIND SPEED CORRELATION
MAY 20, 2015 TO MAY 23, 2015

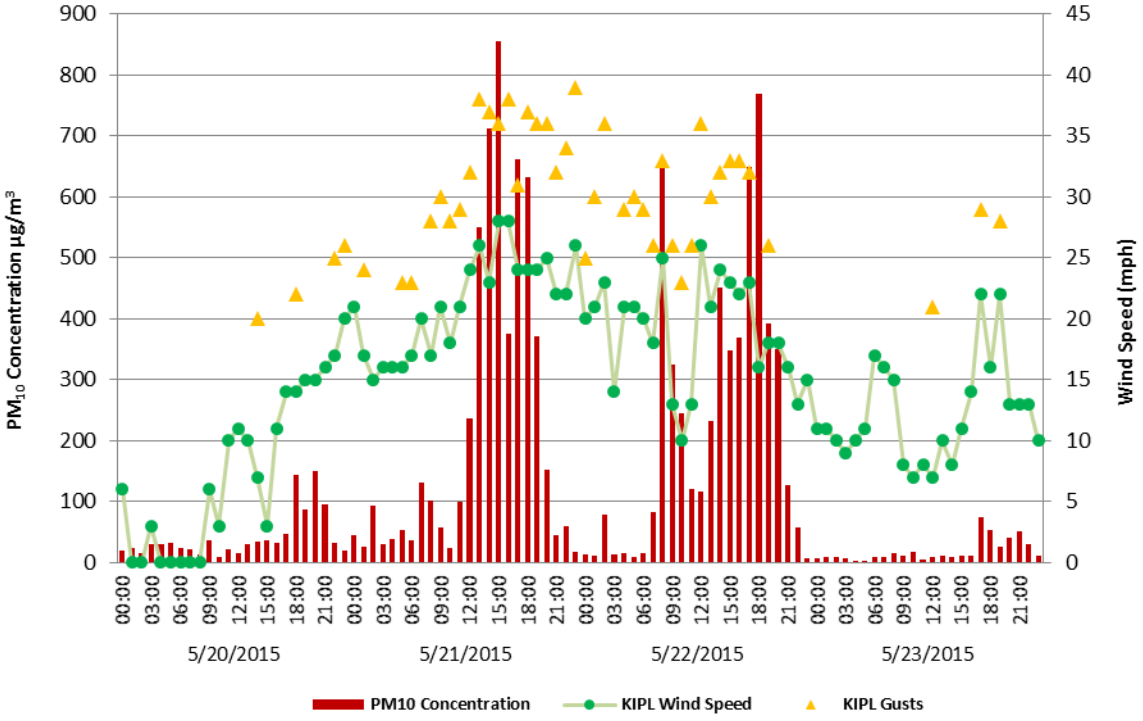

Fig 5-10: The graph shows a 96-hour positive correlation of wind speeds and PM_{10} fluctuations at the Brawley station. Wind data is from Imperial Co. Airport

FIGURE 5-11
NILAND PM_{10} & WIND SPEED CORRELATION
MAY 20, 2015 TO MAY 23, 2015

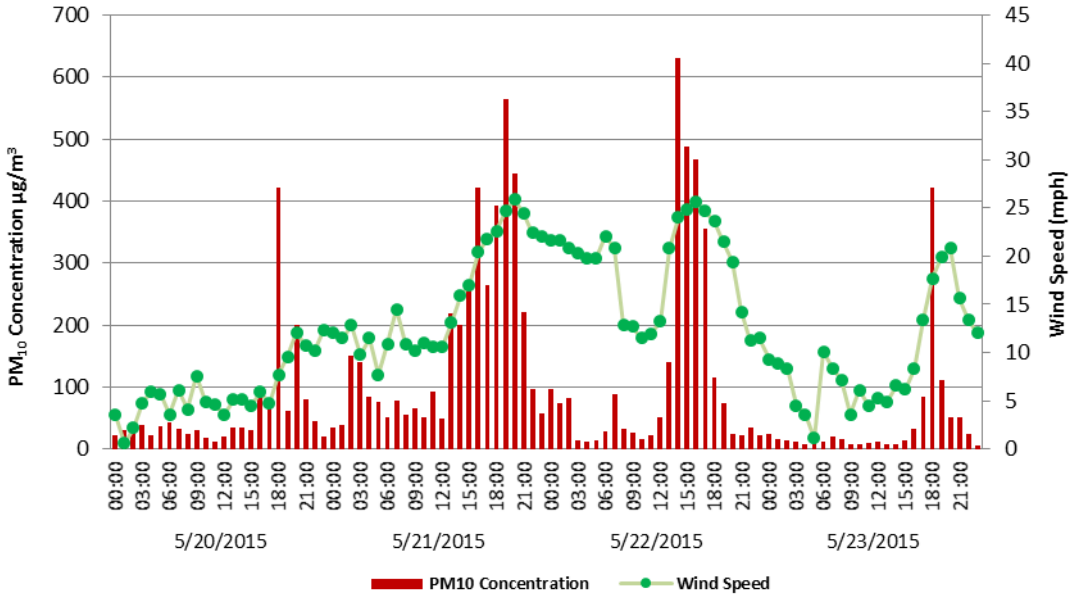

Fig 5-11: The graph shows a 96-hour positive correlation of wind speeds and PM_{10} fluctuations at the Niland station. Wind and air quality data from the EPA's AQS data bank

In order to understand the totality of the impact to the Brawley and Niland monitors, **Figure 5-12** is a four-day depiction of wind speeds, wind gusts, and associated PM_{10} concentrations at regional stations. For May 20, 2015, all stations show reduced levels of PM_{10} concentrations until winds elevate late in the day, coincident with a slight elevation in concentrations at the Niland and Brawley monitors. As winds continued increasing and remaining strong through May 21, 2015 PM_{10} levels similarly elevate at the Brawley and Niland monitors. As winds diminish slightly and briefly mid-morning May 22, 2015 concentrations similarly decrease temporarily.

FIGURE 5-12
96 HOUR PM_{10} FLUCTUATIONS & WIND SPEEDS REGIONAL SITES

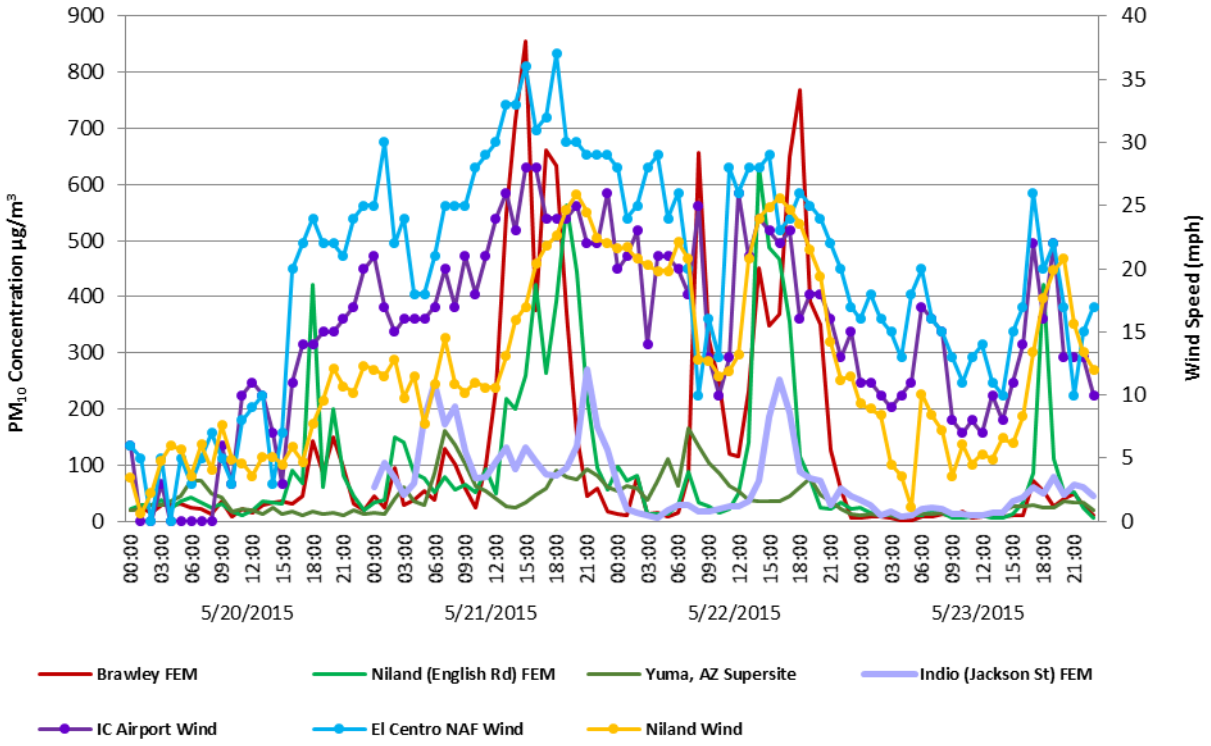

Fig 5-12: This graph illustrates that the wind event had the greatest impact on the Niland and Brawley monitors in Imperial Valley, while neighboring sites were not as severely impacted. Yuma is MST

Figure 5-13 displays PM_{10} concentrations at the Niland and Brawley monitors with wind speeds at various sites, 96-hour period. On May 21, 2015 Brawley and Niland concentrations rose beginning around noon in response to elevated winds for several hours. As winds decrease slightly so do concentrations early May 22, 2015. **Figure 5-12** shows that wind speeds at Niland increased right before the spike in concentrations. This surge of winds helped transport dust beyond the station.

FIGURE 5-13
96 HOUR PM_{10} CONCENTRATIONS & WIND SPEEDS VARIOUS SITES

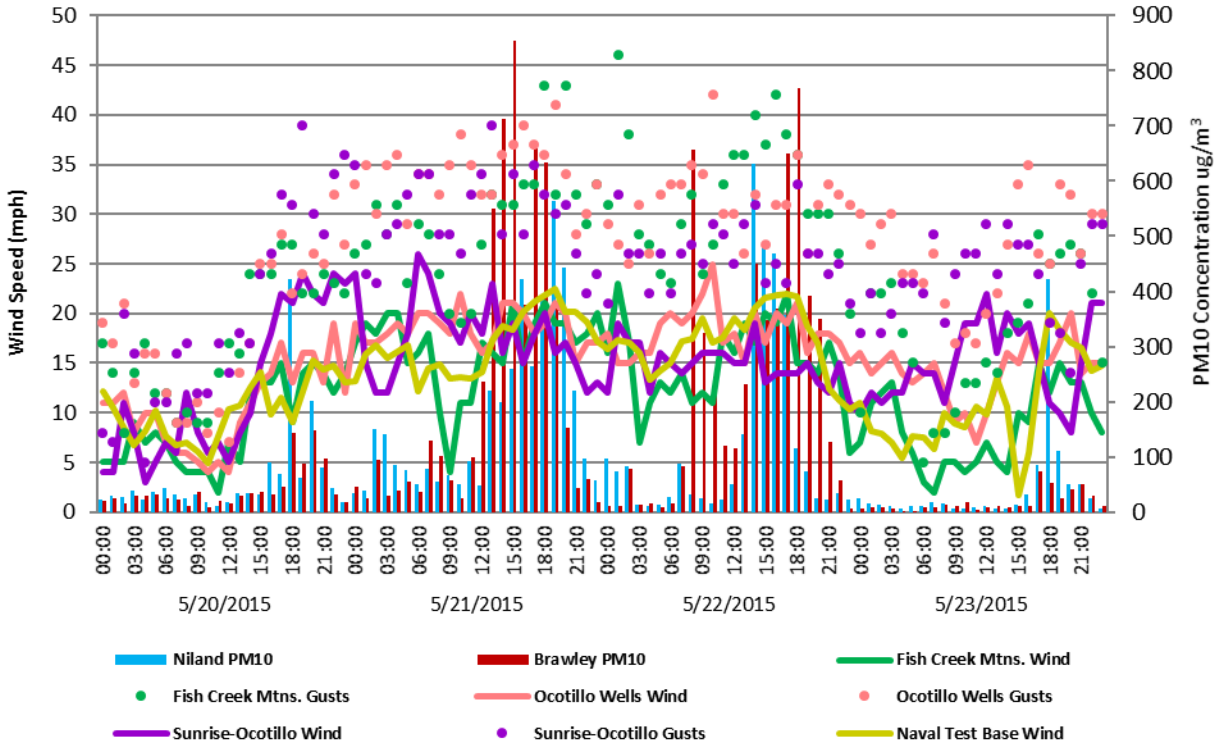

Fig 5-13: This graph illustrates the positive correlation between wind speed at various sites and PM_{10} concentrations at Brawley and Niland. On May 21, 2015 the Brawley and Niland concentrations rose beginning around noon in response to elevated winds for several hours at various stations located west of the monitors. Winds decreased slightly a bit early on May 22, 2015 as did concentrations. Winds increased starting around 7:00am PST. In Brawley concentrations elevated at 8:00am PST. Although Niland measured elevated concentrations it was not enough to cause an exceedance. Air quality data from the EPA's AQS data bank. Wind data from MesoWest

Figures 5-14 and 5-15 are the May 21, 2015 and May 22, 2015 resultant Air Quality Indices (AQI) for Brawley and Niland.[16] An AQI graph is included for comparative purposes. An indication of the affect upon air quality maybe surmised when elevated AQI levels respond to the transported windblown dust in Brawly and Niland. By 6:00pm the AQI level for Brawley reaches "Unhealthy" or red Niland's AQI soon follows. By 10:00pm, May 22, 2015, Brawley's AQI reaches "Very Unhealthy" by 12:00pm lasting through 2:00pm.

[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 5-14
IMPERIAL VALLEY AIR QUALITY INDEX FOR BRAWLEY MAY 21, 2015

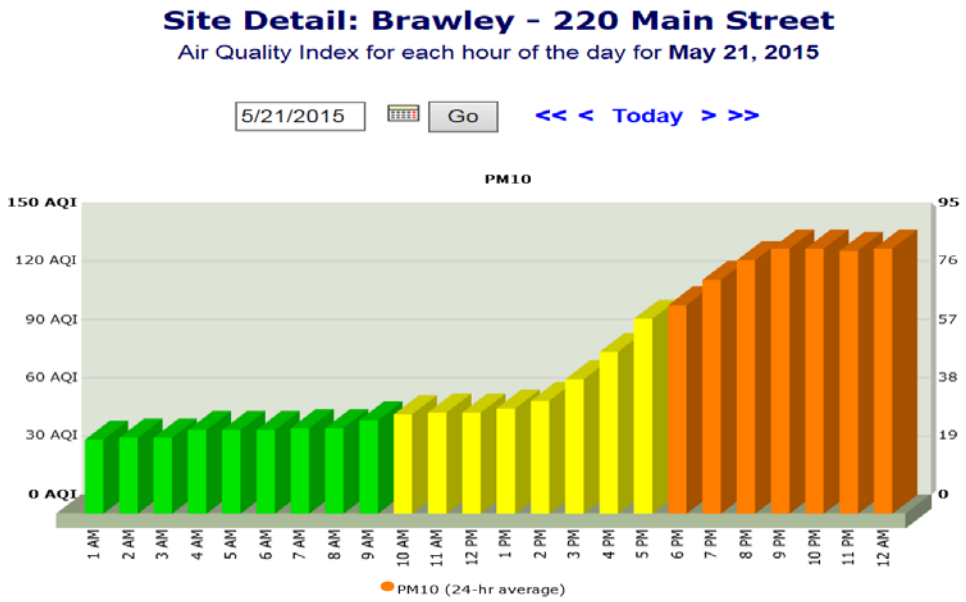

Fig 5-14: Demonstrates that air quality in Imperial County was affected by the arrival of dust laden winds created by an upper level low moving over the region

FIGURE 5-15
IMPERIAL VALLEY AIR QUALITY INDEX FOR NILAND MAY 21, 2015

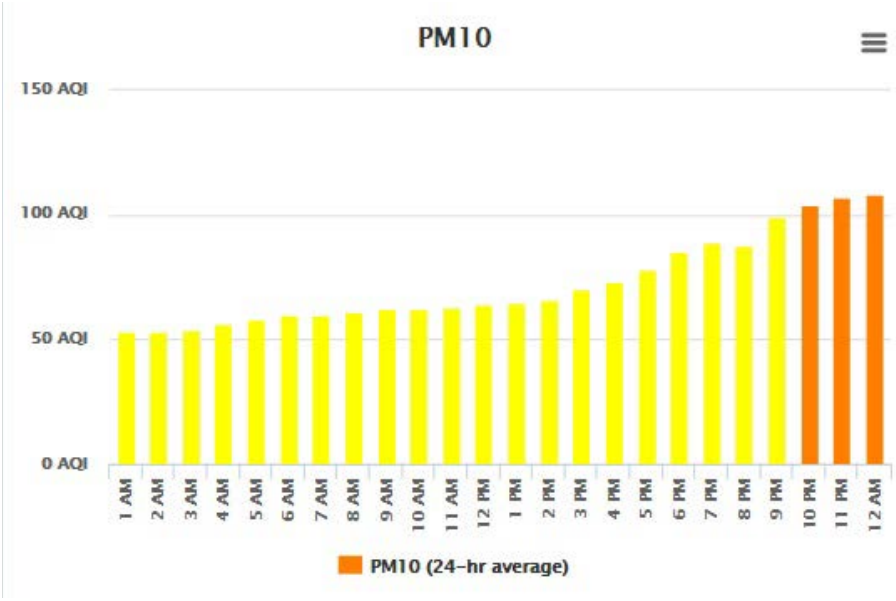

Fig 5-15: Demonstrates that air quality in Imperial County was affected by the arrival of dust laden winds created by an upper level low moving over the region

FIGURE 5-16
IMPERIAL VALLEY AIR QUALITY INDEX FOR BRAWLEY MAY 22, 2015

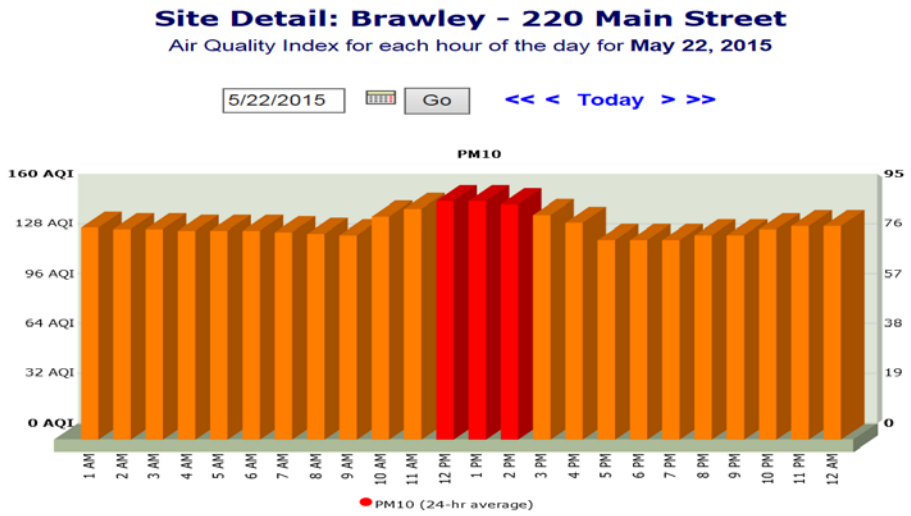

Fig 5-16: Demonstrates that air quality in Imperial County was affected by the arrival of dust laden winds created by an upper level low moving over the region

V.2 Clear Causal Summary

The preceding discussion, graphs, figures, and tables provide wind direction, wind speed, and PM_{10} concentration data illustrating the temporal representation of the strong gusty westerly winds caused by the steep pressure gradient accompanying the upper level low pressure system which moved over the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10} exceedance measured at the Brawley and Niland monitors on May 21, 2015 and May 22, 2015. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, 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 gusty westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM_{10} concentrations measured on May 21, 2015 and May 22, 2015 coincided with high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

VI Conclusions

The PM_{10} exceedance that occurred on May 21, 2015 and May 22, 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)	Pg 21-32
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	Pg 46-59
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	Pg 33-37
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	Pg 38-45
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	Pg 21-59

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 21, 2015 and May 22, 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 and Niland monitors and discussed within this report was caused by naturally occurring strong gusty winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert region to the west and southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedance on May 21, 2015 and May 22, 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 and Niland on May 21, 2015 and May 22, 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 and Niland monitors on May 21, 2015 and May 22, 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 PM_{10} 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 21, 2015 and May 22, 2015.

FIGURE 6-1
MAY 21, 2015 AND MAY 22, 2015 EXCEPTIONAL EVENT TAKE AWAY POINTS

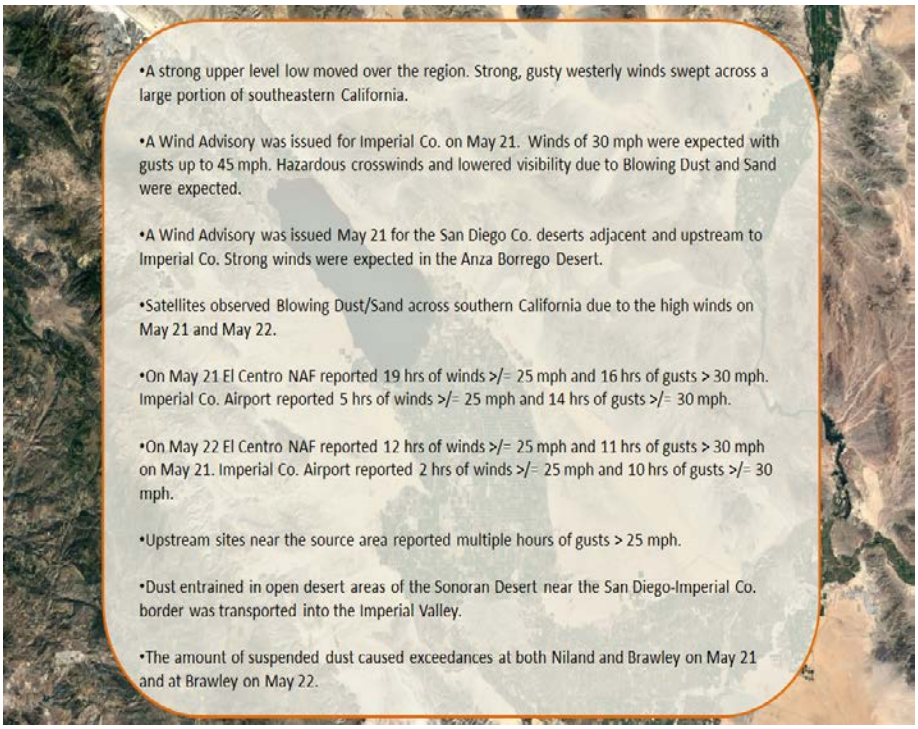

Fig 6-1: Illustrates the factors that qualify the May 21, 2015 and May 22, 2015 natural event, which affected air quality as an Exceptional Event

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

This section contains wind advisories and forecasts issued by the NWS and Imperial County on May 21, 2015 and May 22, 2015. As well as other relevant copies of notices, newspaper articles NOAA Smoke Text Products and any other notice of document that provides substantiating evidence in support of the exceptional event. For example, any AQI alerts advising of air quality conditions that may potentially affect the public.

Appendix B: Meteorological Data.

This Appendix contains the individual station graphs, wind roses, and QCLCD tables for selected monitors in Imperial County and surrounding areas. The data demonstrates the regional impact of the wind event.

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

This Appendix contains the graphs depicting the correlations between PM_{10} concentrations and elevated wind speeds for selected monitors in Imperial County, Riverside County, and Yuma, Arizona. These graphs demonstrate the regional impact of the wind event.

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.