IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

Sunrise over Mexicali on Christmas Day 2017 when many celebrate with fireworks and bonfires. Photo/Eliud Gil Samaniego: U.S.-Mexico Environmental Program Spring 2018 Newsletter: Border 2020 Stakeholders: https://www.epa.gov/sites/production/files/2018-05/documents/spring_2018_newsletter.pdf

November 29 2018
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

An exceedance of the National Ambient Air Quality Standard (NAAQS) for PM_{10} at the Niland and Westmorland monitors in Imperial County, California on November 29, 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)
PST	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

In 2007, the United States Environmental Protection Agency (US EPA) adopted the "Treatment of Data Influenced by Exceptional Events Rule" (EER)[1] to govern the review and handling of certain air quality monitoring data for which the normal planning and regulatory processes are not appropriate. Under the terms of the EER, the US EPA may exclude monitored exceedances of the National Ambient Air Quality Standard (NAAQS) if a State adequately demonstrates that an exceptional event caused the exceedance.

The 2016 revision to the EER added sections 40 CFR §50.1(j)-(r) [Definitions], 50.14(a)-(c) and 51.930(a)-(b) to 40 Code of Federal Regulations (CFR). These sections contain definitions, criteria for US EPA concurrence, procedural requirements and requirements for State demonstrations. The demonstration must satisfy all of the rule criteria for US EPA to concur with the requested exclusion of air quality data from regulatory decisions.

Title 40 CFR §50.14(c)(3)(iv) outlines the elements that a demonstration must include for air quality data to be excluded:

TABLE 1-1 TITLE 40 CFR §50.14(c)(3)(iv) 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. 9
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. 18
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. 28
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	Pg. 33
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. 39

[1] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

Aside from the above, a State must demonstrate that it has met several procedural requirements during the demonstration process, including:

TABLE 1-2 PROCEDURAL CHECKLIST EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM_{10})		DOCUMENT SECTION
1	**Public Notification [40 CFR §50.14(c)(1)]** – In accordance with mitigation requirement at 40 CFR 51.930(a)(1), notification to the public promptly whenever an event occurs or is reasonably anticipated to occur which may result in the exceedance of an applicable air quality standard	Pg. 3 and Appendix C
2	**Initial Notification of Potential Exceptional Event [40 CFR §50.14(c)(2)]** - Submission to the Administrator of an Initial Notification of Potential Exceptional Event and flagging of the affected data in US EPA's Air Quality System (AQS) as described in 40 CFR §50.14(c)(2)(i),	Pg. 3
3	**Public Comment Process [40 CFR §50.14(c)(3)(v)]** - Documentation of fulfillment of the public comment process described in 40 CFR §50.14(c)(3)(v), and	Pg. 4 and Appendix C
4	**Mitigation of Exceptional Events [40 CFR §51.930]** - Implementation of any applicable mitigation requirements (Mitigation Plan) as described in 40 CFR §51.930	Pg. 4

The Imperial County Air Pollution Control District (ICAPCD) has been submitting criteria pollutant data since 1986 into the US EPA's Air Quality System (AQS). In Imperial County, prior to 2017, Particulate Matter Less Than 10 Microns (PM_{10}) was measured by either Federal Reference Method (FRM) Size Selective Instruments (SSI) or Federal Equivalent Method (FEM) Beta Attenuation Monitor's, Model 1020 (BAM 1020). Effective 2017 Imperial County stopped utilizing FRM instruments relying solely on BAM 1020 monitors to measure PM_{10}. It is important to note that the use of non-regulatory data within this document, typically continuous PM_{10} data prior to 2013, measured in local conditions, does not cause or contribute to any significant differences in concentration difference or analysis.

As such, this report demonstrates that a naturally occurring event caused an exceedance observed on November 29, 2018 which elevated particulate matter within San Diego, Riverside and Imperial counties and affected air quality. The analyses contained in this report includes regulatory and non-regulatory data that provides support for the elements listed in **Table 1-1** and **Table 1-2**. This demonstration substantiates that this

event meets the definition of the US EPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Public Notification [40 CFR §50.14(c)(1)]

The ICAPCD utilizes a web-based public notification process to alert the public of forecasted weather conditions and potential changes in ambient air concentrations that may affect the public. The ICAPCD identifies these public notifications as Advisory Events. On November 28, 2018 and November 29, 2018, the ICAPCD published advisories concerning the potential for elevated concentrations of particulate matter caused by strong gusty westerly winds preceding the passage of a Pacific Storm by Thursday, November 29, 2018. Along with the advisories the ICAPCD published wind advisories for all of Imperial County and two afternoon updates to the advisory on November 28, 2018 that included a Blowing Dust Advisory. **Appendix C** contains copies of notices pertinent to the November 29, 2018 event.

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

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 process identified within the EER as the Initial Notification of Potential Exceptional Event (INPEE) is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

On November 29, 2018, a naturally occurring event elevated particulate matter within San Diego, Riverside and Imperial counties, causing an exceedance at the Niland (06-025-4004) monitor and the Westmorland monitor (06-025-4003). Subsequently, the ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM_{10} hourly concentrations from the Niland and Westmorland monitors on November 29, 2018. After review, CARB submitted the INPEE for the November 29, 2018 event in July of 2019. The submitted request included a brief description of the meteorological conditions for November 20, 2018 indicating that a potential natural event occurred. The ICAPCD has engaged in discussions with US EPA Region IX regarding the demonstration prior to formal submittal.

[2] "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

I.3 Public Comment Process [40 CFR §50.14(c)(3)(v)(A-C)]

(A) The CARB and USEPA have reviewed and commented on the draft version of the November 29, 2018 exceptional event prepared by the ICAPCD. After addressing all substantive and non-substantive comments by both CARB and USEPA the ICAPCD has published a notice of availability in the Imperial Valley Press announcing a 30-day public review process. The published notice invites comments by the public regarding the request, by the ICAPCD, to exclude the measured concentrations of 331 $\mu g/m^3$ measured by the Niland monitor; and 296 $\mu g/m^3$ measured by the Westmorland monitor on November 29, 2018.

(B) Concurrently with the Public Review period for the November 29, 2018 exceptional event, the ICAPCD is formally submitting to CARB for remittance to USEPA the Final November 29, 2018 exceptional event.

(C) Upon the ending of the review period the ICAPCD will remit to CARB and USEPA all comments received during the Public Review period along with a formal letter addressing any comments that dispute or contradict factual evidence in the demonstration

The ICAPCD acknowledges that with the submittal to US EPA of the 2018 exceptional events, there is supporting evidence of documented recurring seasonal events that affect air quality in Imperial County.

I.4 Mitigation of Exceptional Events [40 CFR §51.930]

According to 40 CFR §51.930(b) all States having areas with historically documented or known seasonal events, three events or event seasons of the same type and pollutant that recur in a 3-year period, are required to develop and submit a mitigation plan to the US EPA.

The ICAPCD received notice from US EPA September 15, 2016 identifying Imperial County as an area required to develop and submit a mitigation plan within two years of the effective date, September 30, 2016, of the final published notification to states with areas subject to mitigation requirements. On September 21, 2018, after notice and opportunity for public comment the ICAPCD submitted the High Wind Exceptional Event Fugitive Dust Mitigation Plan (Mitigation Plan) for review and verification. Subsequently, on November 28, 2018 CARB received verification from US EPA of its review and approval of the Mitigation Plan. For a copy of the Mitigation Plan visit the Imperial County Air Pollution Control District website at

https://www.co.imperial.ca.us/AirPollution/otherpdfs/MitigationPlan.pdf.

The Imperial County Mitigation Plan contains important geographical and meteorological descriptions, pages 3 through 6, of the areas within Imperial County and the surrounding areas that are sources of transported fugitive dust. **Figure 1-1** helps depict the geological aspects that are within Imperial County and outside of Imperial County that affect air quality.

Essentially, the Anza-Borrego Desert State Park, which lies in a unique geologic setting along the western margin of the Salton Trough, extends north from the Gulf of California (Baja California) to the 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. These areas are sources of transported fugitive dust emissions into Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increase in wind speeds.

During the monsoonal season, natural open desert areas to the east, southeast, and south of Imperial County are sources of transported fugitive dust emissions when thunderstorms cause outflows to blow winds across natural opens desert areas within Arizona and Mexico.

FIGURE 1-1
IMPERIAL COUNTY

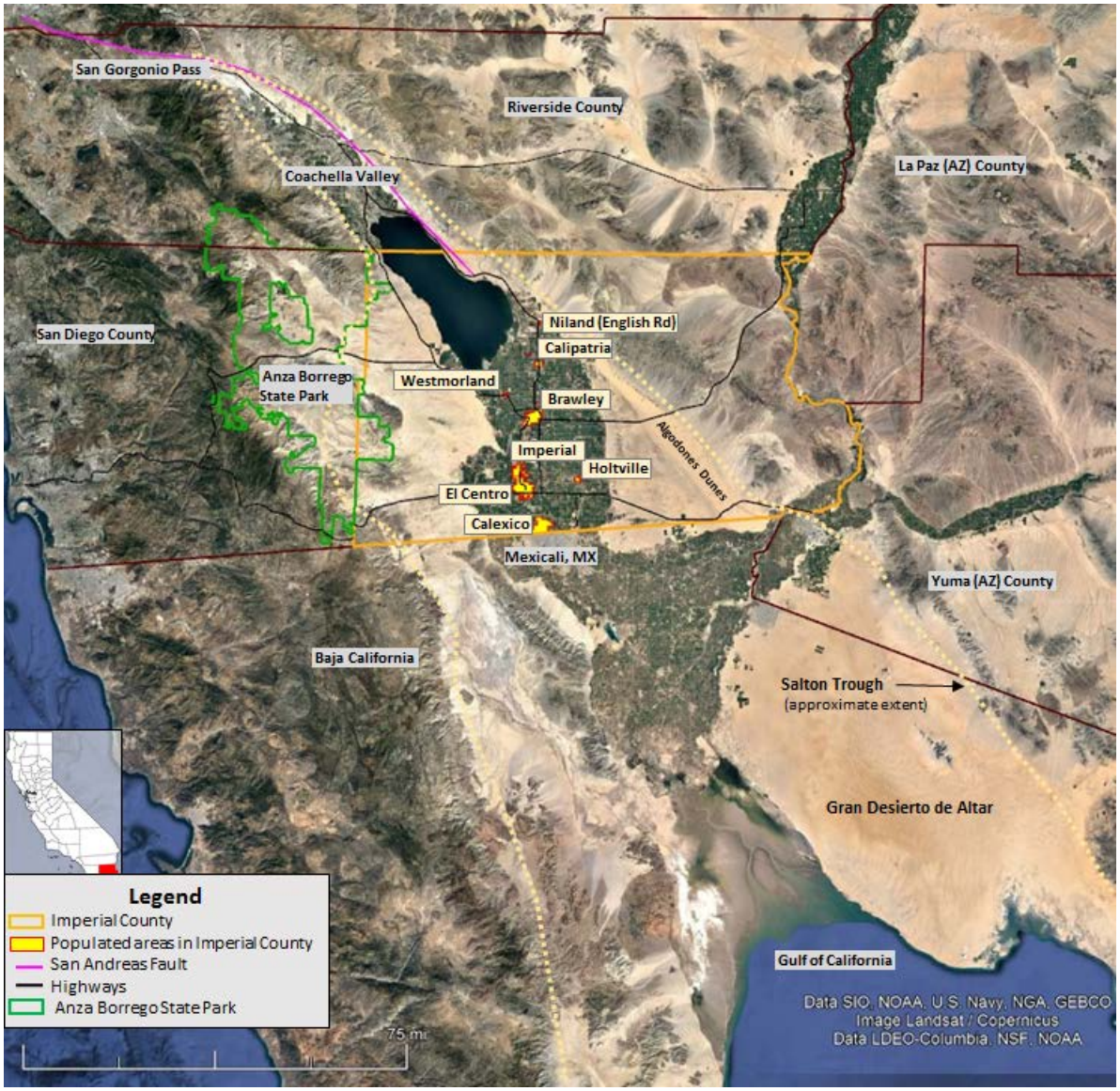


Fig 1-1: Imperial County a Southern California border region, within far southeast California bordering Arizona and Mexico has a small economically diverse region with a population of 174,528

Likewise, the Mitigation Plan contains a high wind event meteorological analysis broken down into four types of seasonal natural occurrences that cause elevated particulate matter that affects Imperial, San Diego, Riverside and Yuma Counties. The historical analysis has defined the meteorological events that lead to high winds and elevated PM_{10} events in Imperial County, page 7, as follows:

- **Type 1:** Pacific storms and frontal passages;
- **Type 2:** Strong pressure and surface pressure gradients;
- **Type 3:** Monsoonal Gulf Surges from Mexico; thunderstorm downburst, outflow winds and gust fronts from thunderstorms
- **Type 4:** Santa Ana wind events

A complete description of these events begins on page 8 of the Mitigation Plan. While there is some overlap in discussed components between the Mitigation Plan and this demonstration such as the public notification process and the warning process, the Mitigation Plan does elaborate a little further. The Mitigation Plan discusses in detail the educational component, the notification component, the warning component and the implementation of existing mitigation measures, such as Regulation VIII.

Finally, the Mitigation Plan contains a complete description of the methods, processes and mechanisms used to minimize the public exposure, page 14, retain historical and real-time data, page 15, and the consultation process with other air quality managers to abate and minimize air impacts within Imperial County, page 16.

In all, the Mitigation Plan helps explain the recurring events, by type and influence upon Imperial County and provides supporting justification of a natural event.[3]

[3] Title 40 Code of Federal Regulations §50.1 (k) defines a Natural Event as meaning 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.

FIGURE 1-2
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

Fig 1-2: Depicts a select group of PM_{10} monitoring sites in Imperial County, eastern Riverside County, and southwestern Arizona (Yuma County). Generated through Google Earth

II Conceptual Model – A narrative that describes the event causing the exceedance and a discussion of how emissions from the event led to the exceedance at the affected monitor

II.1 Description of the event causing the exceedance

Days before and during Thursday, November 29, 2018 the National Weather Service (NWS) offices in Phoenix and San Diego issued Area Forecast Discussions describing a "potent" low pressure system moving inland from the California coast that was forecast to bring strong gusty west to southwest winds across the local mountains and deserts and create patchy blowing dust[4,5]. The severity of the winds caused the San Diego and Phoenix offices multiple Urgent Weather Messages advising of advisory level winds composed within and along the San Diego County Mountains and deserts west of Imperial County.[6] These strong gusty westerly winds in excess of 25 mph with potential gusts at or above 55 mph along mountain ridgetops and deserts and equally strong winds across western Imperial County were forecast to reduce visibility due to blowing dust and sand. In addition to the gusty westerly winds the San Diego NWS office anticipated the Pacific Storm would bring snow and up to 0.30 inches of precipitation along the lower deserts however only trace precipitation was measured at the El Centro NAF (KNJK) and the Imperial County Airport (KIPL).[7]

Overall, the best description given of the event was provided by the San Diego NWS office in one of its earlier Area Forecast Discussions:

> "A potent low pressure system moving along in the fast, nearly zonal mid-latitude flow across the central and eastern Pacific is expected to be off the California coast approaching 130W latitude on Wednesday, moving inland through California Wednesday night and Thursday with the global models similar on the timing and track...Advisory strength south to southwest winds are possible ahead of the front for much of southwest California. Following the frontal passage, southwest to west winds are expected to be strongest near the mountain ridge tops to the desert foothills of the mountains with gusts to around 65 mph possible."[8]

Appendix A contains all pertinent NWS notices.

[4] National Weather Service, Area Forecast Discussion, No., 27, 2018, San Diego office, 448am PST
[5] National Weather Service, Area Forecast Discussion, Nov., 28, 2018, Phoenix office, 345am MST
[6] National Weather Service, Urgent Weather Message, Nov., 28, 2018, San Diego office, 345am PST
[7] National Weather Service, Area Forecast Discussion, Nov., 28, 2018, San Diego office, 930pm PST
[8] National Weather Service, Area Forecast Discussion, Nov., 27, 2018, San Diego office, 0448pm PST

II.2 How emissions from the event led to an exceedance

On November 29, 2018, the air monitors in Imperial, Riverside and Yuma counties measured elevated concentrations of particulate matter when a forecasted cold, low-pressure trough moved inland from the California coast and brought gusty westerly winds to southeastern California and western Arizona. The strong gusty westerly winds associated with the system generated emissions from within the open mountain ranges and surrounding open natural deserts within San Diego and Imperial Counties. These windblown dust emissions were transported to all the Imperial County regional air quality monitors causing an exceedance of the PM_{10} NAAQS (**Table 2-1**).

FIGURE 2-1
MONITORING AND METEOROLOGICAL SITES

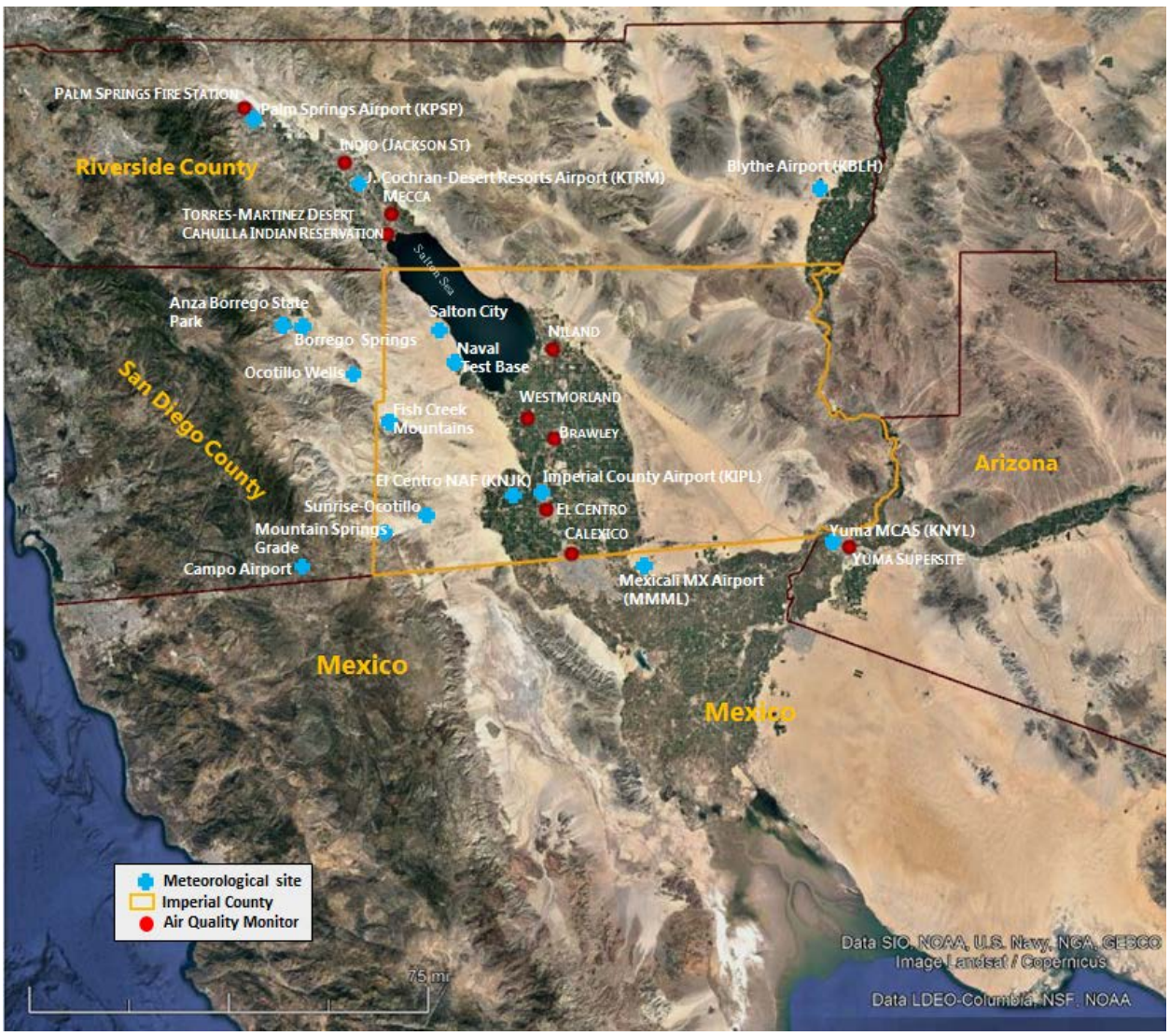


Fig 2-1: Includes a general location of the sites used in this analysis. The site furthest south is in Mexicali, Mexico and the site furthest north is the Palm Springs Fire Station

TABLE 2-1
HOURLY CONCENTRATIONS OF PARTICULATE MATTER

SITE	DATE	000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	Hrly MAX	24-HR AVERAGE
PALM SPRINGS FIRE STATION	20181128	14	12	11	10	8	10	18	31	24	17	21	29	19	18	16	19	33	38	42	33	22	14	12	9	42	20
	20181129	16	14	13	15	19	22	24	48	45	34	27	11	5	2	2	2	6	5	11	6	5	4	4	3	**48**	14
	20181130	2	3	2	4	3	4	5	10	10	9	9	28	11	7	10	10	10	11	18	15	13	12	12	11	28	9
INDIO	20181128	24	24	24	20	23	34	66	80	82	34	25	27	11	16	24	32	43	97	102	86	52	21	18	13	102	40
	20181129	11	13	13	19	19	27	35	45	46	43	35	21	30	44	79	12	10	12	7	19	49	5	4	3	**79**	25
	20181130	5	6	6	6	4	10	11	37	38	12	5	2	11	10	10	14	20	17	15	13	13	11	14	12	38	12
MECCA	20181128	18	10	9	6	9	28	22	22	42	21	9	9	24	12	22	61	96	45	76	33	41	47	56	44	96	31
	20181129	18	20	16	16	20	25	30	42	57	48	35	52	40	192	136	123	45	578	126	48	74	8	4	10	**578**	73
	20181130	3	3	2	5	7	5	12	17	17	10	9			9	12	15	29	27	19	13	11	16	19	23	29	12
TORRES-MARTINEZ TRIBAL	20181128	28	21	16	16	13	21	266	104	56	36	22	20	22	24	35	53	65	74	67	75	39	43	31	23	266	48
	20181129	20	23	21	21	22	26	51	33	38	46	34	23	1639	189	503	131	372	530	879	200	83	38	19	17	**1639**	206
	20181130	6	4	2	1	0	1	26	26	17	15	13	20	23	27	26	15	19	17	12	11	11	11	8	13	27	13
WESTMORLAND	20181128	23	18	19	11	21	21	28	48	161	113	105	266	192	61	84	88	216	107	84	44	138	62	23	30	266	81
	20181129	27	24	19	12	8	19	74	96	745	915	995	842	995	995	246	381	181	100	241	92	19	15	66	15	**995**	296
	20181130	14	14	23	14	6	8	27	19	18	75	49	117	80	59	89	188	86	66	50	48	25	50	25	20	188	48
BRAWLEY	20181128	41	42	28	21	25	32	53	47	50	74	75	63	48	69	88	104	108	118	76	42	44	49	15	15	118	55
	20181129	10	12	8	4	46	23	59	42	224	40	49	45	50	913	625	223	374	120	179	146	138	20	76	11	**913**	143
	20181130	8	7	8	6	6	66	32	12	11	15	39	51	114	108	68	200	119	179	26	25	22	21	16	14	200	48
NILAND	20181128	15	16	18	14	23	29	25	39	44	31	129	36	36	45	48	59	40	67	79	121	105	70	53	54	129	49
	20181129	63	46	46	29	29	27	18	38	84	684	995	995	995	282	528	995	332	203	995	468	67	17	6	15	**995**	331
	20181130	16	9	6	7	12	9	10	11	17	4	48	3	20	6	9	122	99	28	29	42	28	16	18	17	122	24
EL CENTRO	20181028	64	64	67	50	45	35	37	37	40	40	33	29	35	33	24	34	40	62	51	60	54	49	54	41	67	44
	20181029	38	39	34	38	64	116	142	170	132	122	73	63	68		80	96	110	115	70	69	55	60	64	60	**170**	81
	20181030	41	57	58	51	27	44	62	80	41	47	51	40	39	45	46	46	54	62	63	56	55	48	34	32	80	49
CALEXICO	20181128	119	114	176	108	85	114	191	222	296	212	125	95	83	73	79	76	142	135	133	144	126	57	43	64	296	125
	20181129	50	30	61	90	78	35	29	58	83	81	81		61	65	53	741	171	71	54	56	48	18	27	13	**741**	89
	20181130	15	37	26	6	24	29	25	11	13	36	47	78	46	48	49	33	31	25	29	22	19	17	26	20	78	29
YUMA AZ SUPERSITE (PST)	20181128	27	80	33	19	24	34	107	72	150	83	41	22	20	18	20	20	33	39	52	63	34	68	75	50	150	49
	20181129	42	38	39	46	58	61	47	80	58	34	29	28	25	28	195	108	243	420	133	23	41	50	30	42	**420**	79
	20181130	14	17	17	38	38	45	44	51	35	25	29	58	73	30	41	141	94	69	50	35	35	31	18	27	141	43
YUMA AZ SUPERSITE (MST)	20181128	46	27	80	33	19	24	34	107	72	150	83	41	22	20	18	20	20	33	39	52	63	34	68	75	150	49
	20181129	50	42	38	39	46	58	61	47	80	58	34	29	28	25	28	195	108	243	420	133	23	41	50	42	**420**	79
	20181130	30	14	17	17	38	38	45	44	51	35	25	29	58	73	30	41	141	94	69	50	35	35	31	27	141	44

Color coding information – **Red bold** highlighted sites indicate sites that exceeded the NAAQS. **Bold Blue** dates indicate date of Exceptional Event. **Red fill and Red bold** hourly concentrations represent concentrations above 100 µg/m^3. Pink squares around concentrations identify peak hourly concentrations

FIGURE 2-2
CONCENTRATIONS FOR ALL SITES LISTED IN TABLE 2-1

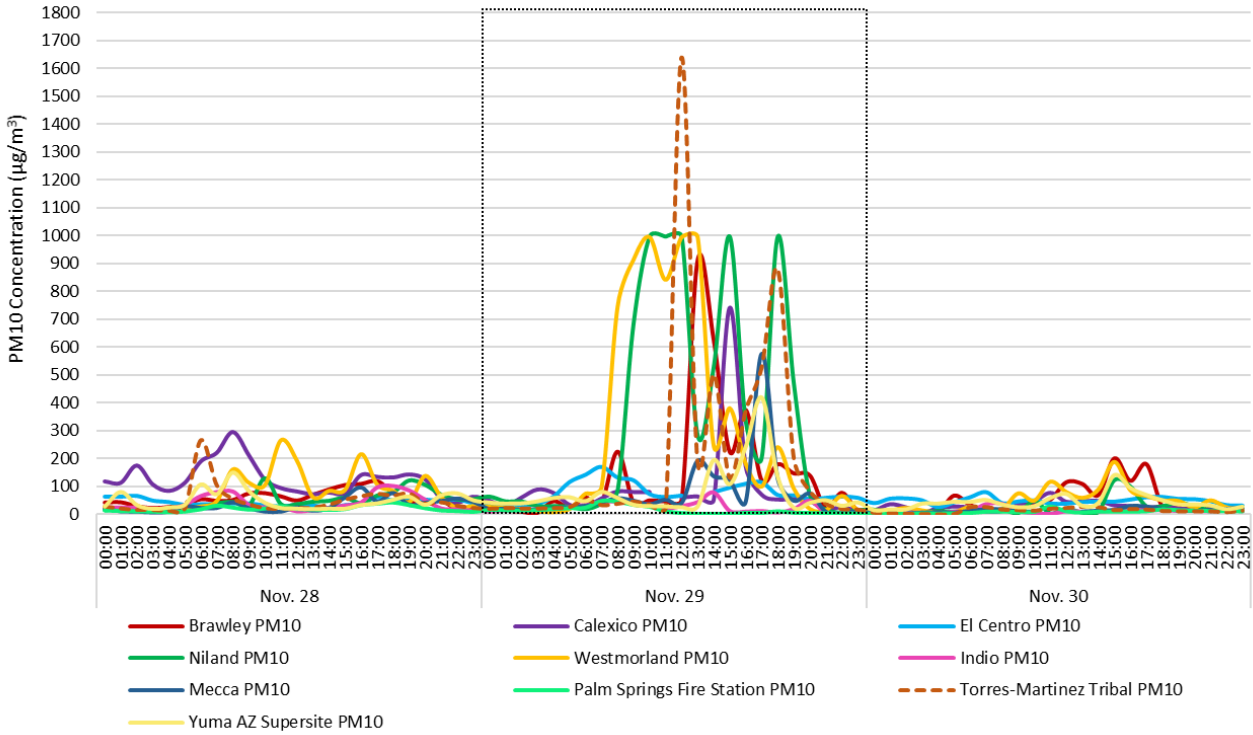


Fig 2-2: is a three-day graphical representation of the PM_{10} concentrations measured at the sites identified in **Table 2-1**. Note the consistency between the air quality monitors

Wind speed, wind direction and the airflow patterns combined all help explain how windblown emissions resulting from the strong gusty westerly winds associated with the passing of the Pacific storm affected the Niland and Westmorland monitors on Thursday, November 29, 2018.

As mentioned above, the early weather forecast notices issued by both the San Diego and Phoenix NWS offices indicated that a Pacific storm would increase the onshore pressure gradient and produce strong gusty westerly winds across the San Diego County Mountains and deserts and Imperial County as early as the evening hours of Wednesday, November 28, 2018 through Thursday, November 29, 2018. As mentioned above, several Urgent Weather Messages were issued by the NWS office in San Diego and Phoenix advising of advisory level strong gusty westerly winds within the San Diego Mountains and Imperial County (**Appendix A**).

Figures 2-3 and 2-4 depict the compiled wind data for regional and neighboring airports and upstream sites. Airports within Imperial, Riverside and Yuma Counties measured wind speeds at or above 25 mph or measured wind gusts at or above 25 mph, all coincident with measured elevated concentrations.

FIGURE 2-3
LOCAL AND VICINITY AIRPORT WIND SPEEDS AND GUST

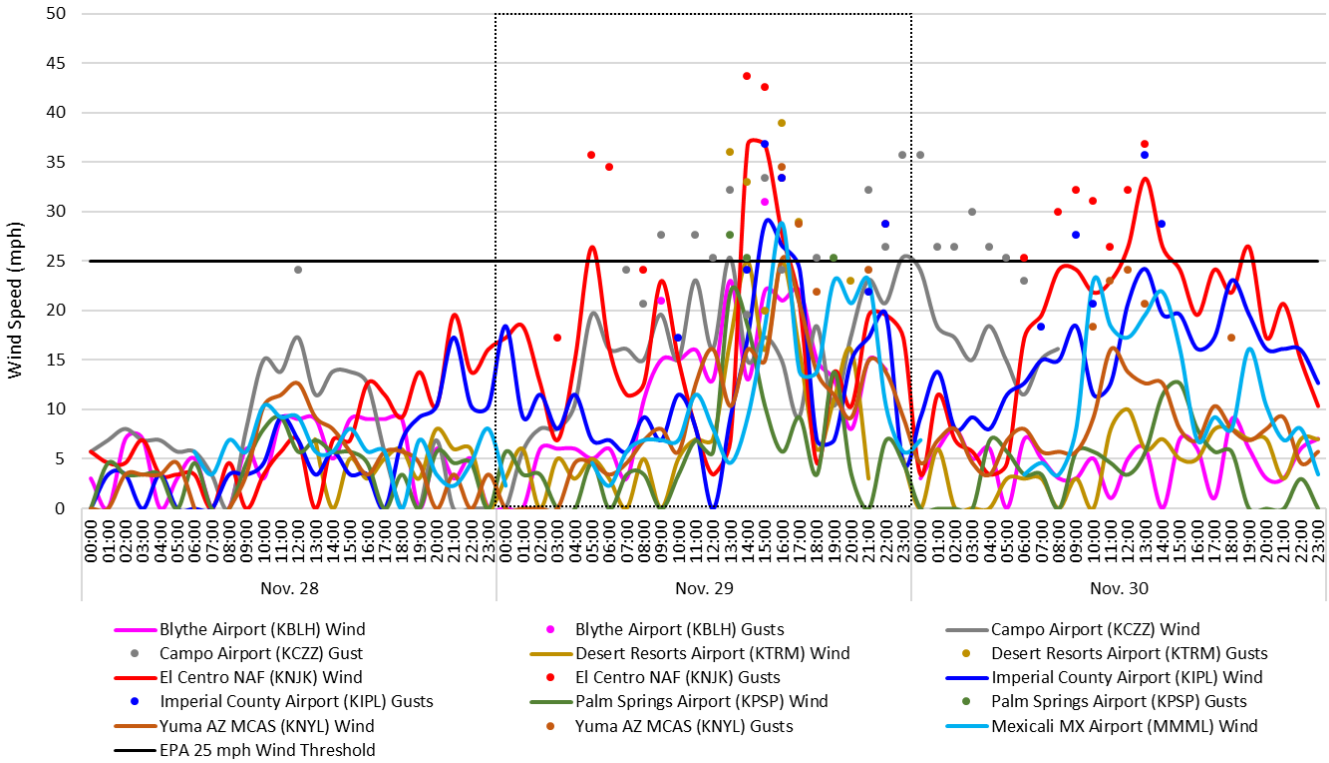


Fig 2-3: is a three-day graphical representation of the measured wind speed and wind gust (if available) from local and neighboring airports. Note the elevated wind speeds are consistent for sites with minor variations. All data derived from the Local Climatological Data Hourly Observations (LCDHO) reports released by the NOAA https://www.ncdc.noaa.gov/

FIGURE 2-4
WIND SPEEDS AND GUST UPSTREAM SITES

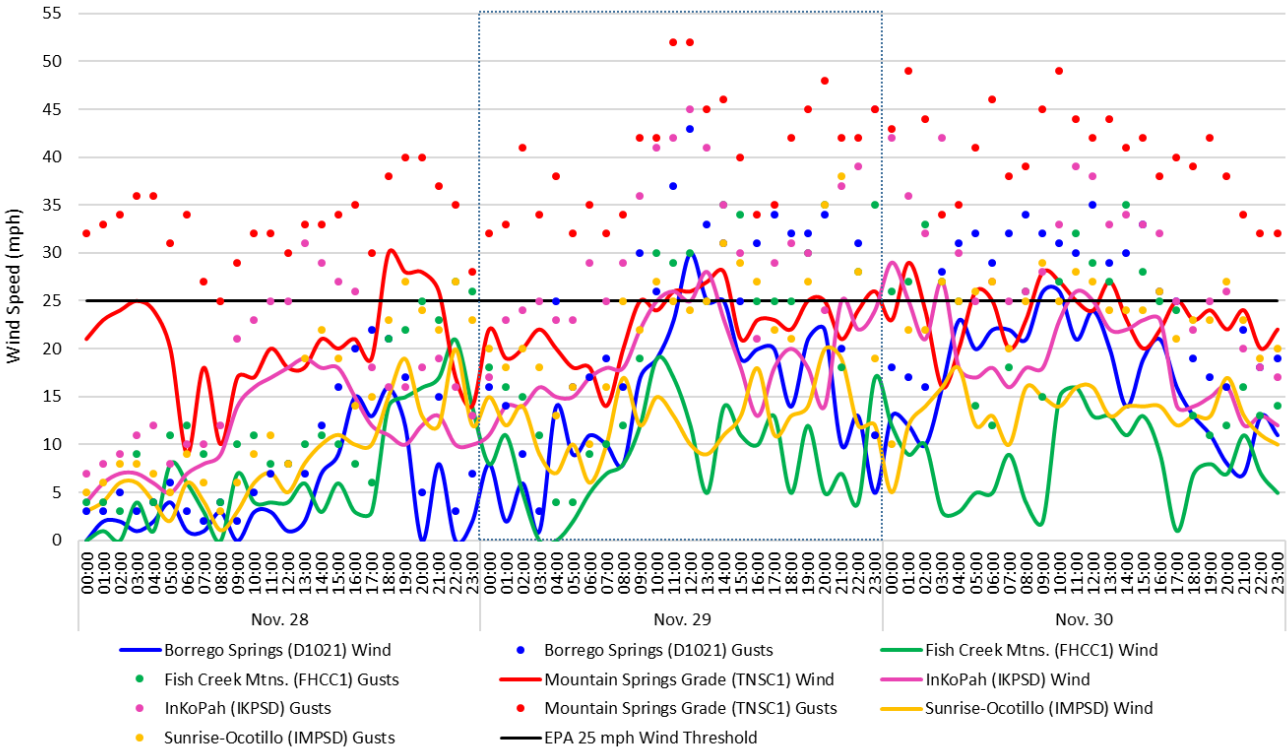


Fig 2-4: is a three-day graphical representation of the measured wind speed and wind gust (if available) from sites located upstream from the Imperial County monitors. All data (except KIPL and KNJK) derived from the University of Utah's Meso West https://mesowest.utah.edu/index.html

The National Oceanic and Atmospheric Administration (NOAA) Laboratory HYSPLIT back-trajectory HYSPLIT models[9] provide supporting evidence of the westerly airflow within Imperial County on November 29, 2018. As the Pacific Storm continues moving inland on November 29, 2018 and passes through the region the HYSPLIT back-trajectory models in **Figures 2-5 through 2-7** depict the airflow during the morning (0800 PST), mid-day (1200 PST), and evening hours (1800 PST) on November 29, 2018 to help illustrate the shift of airflow, from a southwest direction to a due west direction.

Figure 2-5 depicts the southwesterly airflow with a northerly influence among sites within the northern portion of Imperial County during the early morning hours of November 29, 2018. The 1800 PST hour is coincident with measured concentrations well above 100

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

µg/m^3 at the Westmorland and Brawley monitors. Niland follows one hour later. **Figure 2-6** depicts the southwesterly airflow consistently among all sites and is coincident with measured peak hourly concentrations at the Westmorland and Niland monitors. **Figure 2-7** depicts airflow with a distinctive due west direction at all air quality sites, coincident with the passing of the Pacific storm further east.

FIGURE 2-5
HYSPLIT MODEL All SITES NOVEMBER 29, 2018 0800 PST

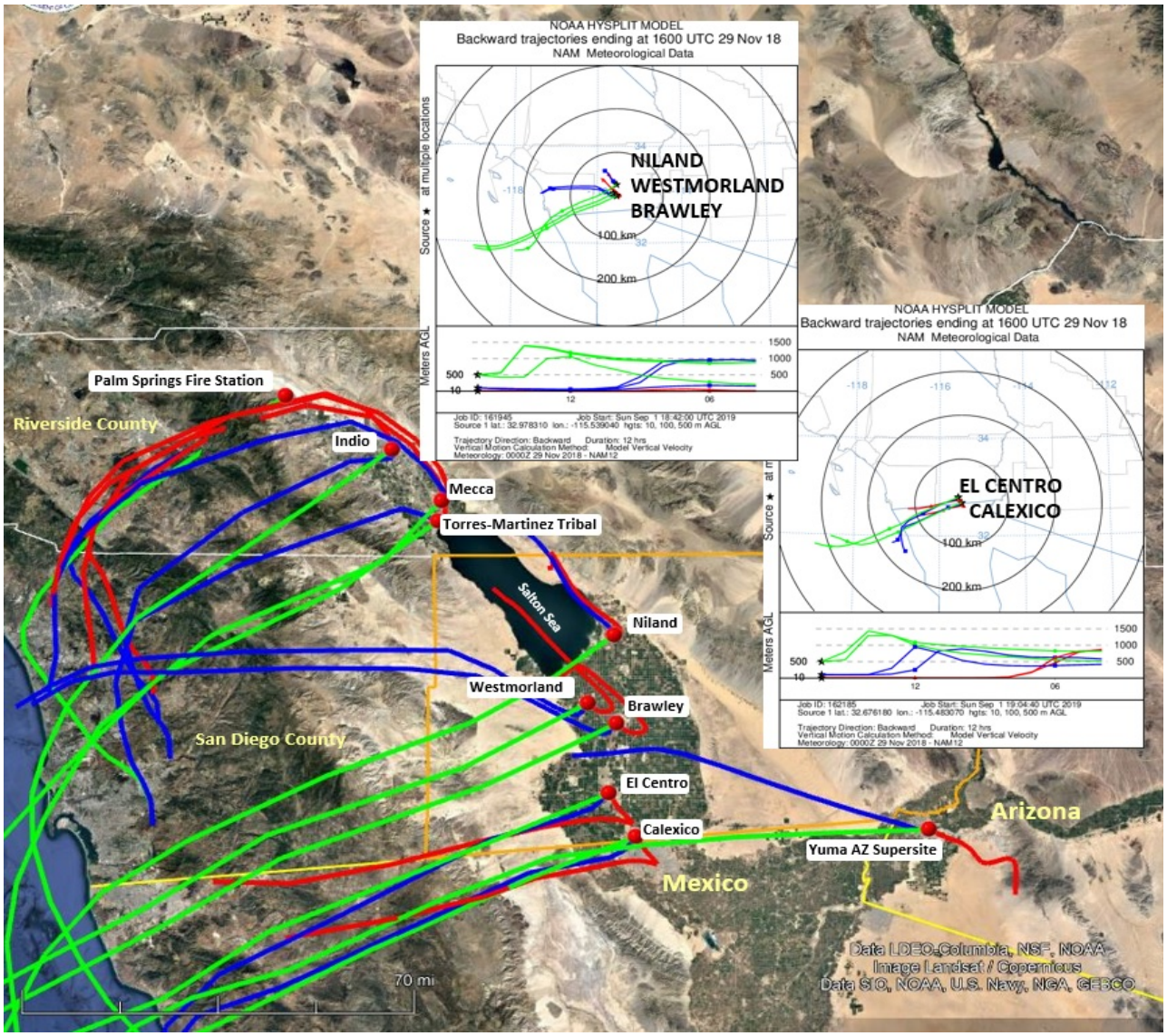


Fig 2-5: A 12-hour HYSPLIT back-trajectory ending at 0800 PST on November 29, 2018 for all sites identified in **Table 2-1**. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-6
HYSPLIT MODEL All SITES NOVEMBER 29, 2018 1200 PST

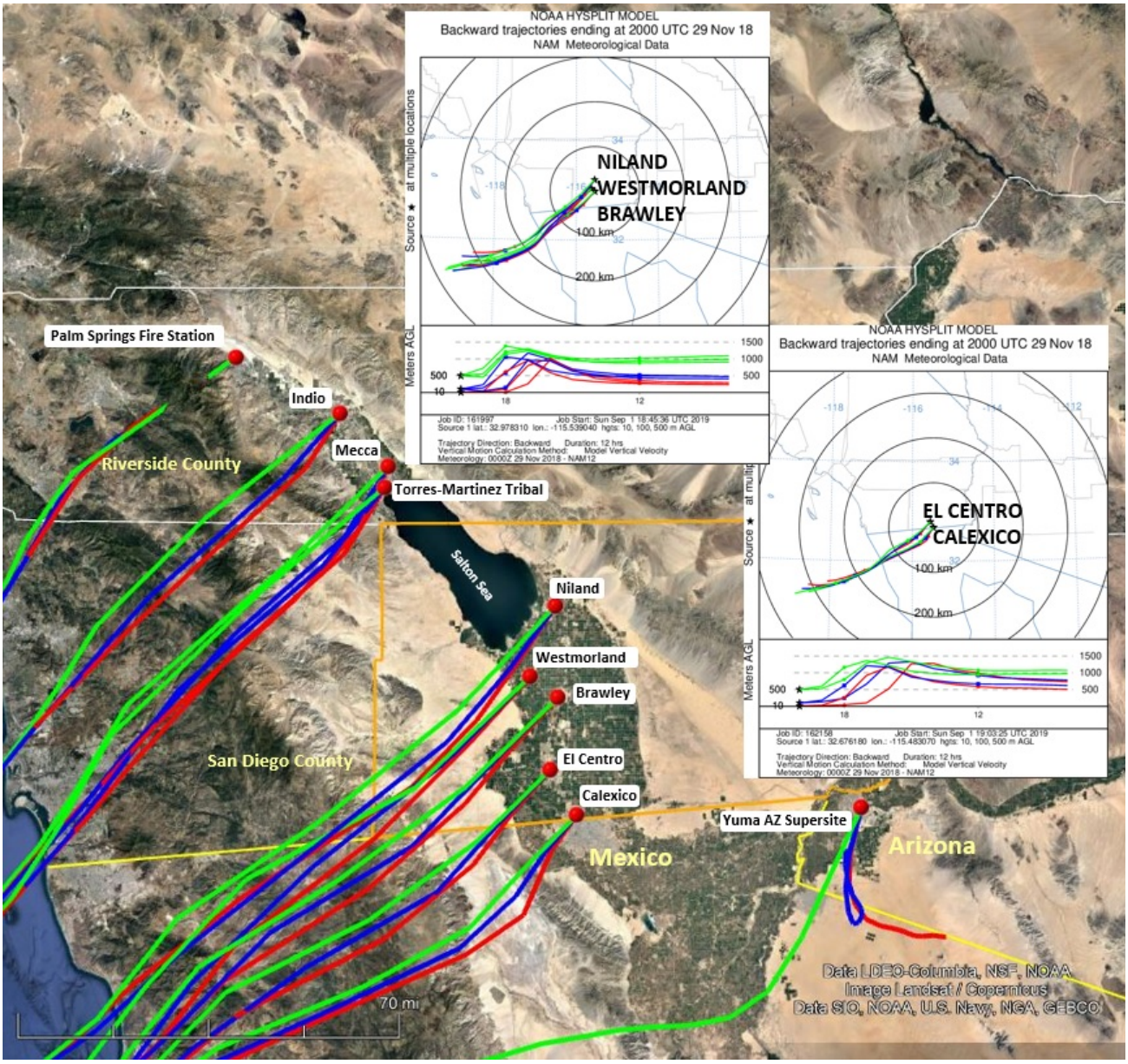


Fig 2-6: A 12-hour HYSPLIT back-trajectory ending at 1200 PST, November 29, 2018 for all sites depicted in **Table 2-1.** Note that by now air flow is southwesterly at all heights for all sites except Yuma, Arizona. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

FIGURE 2-7
HYSPLIT MODEL All SITES NOVEMBER 29, 2018 1800 PST

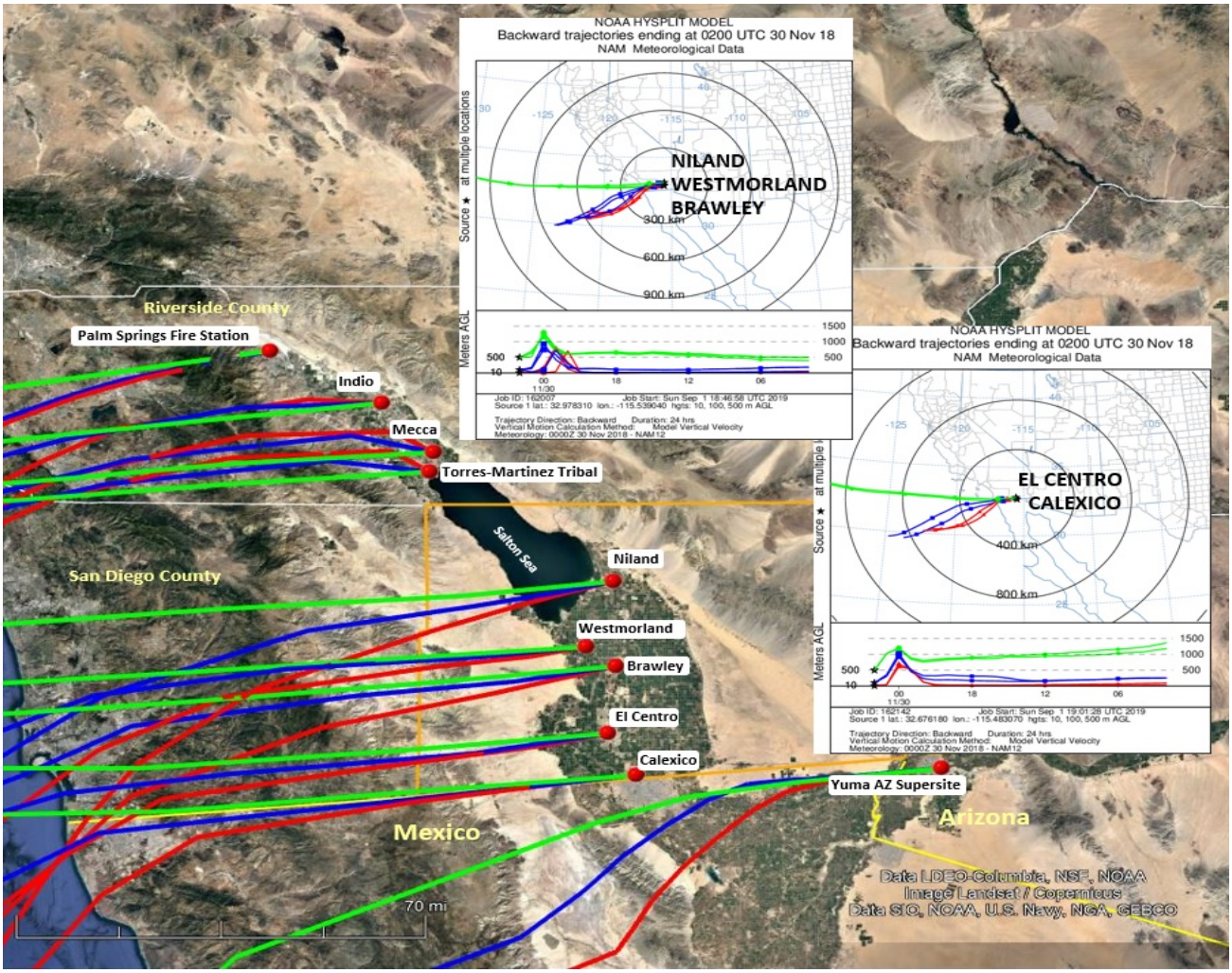


Fig 2-7: A 24-hour HYSPLIT back-trajectory ending at 1800 PST, on November 29, 2018 for all sites depicted in **Table 2-1**. As the Pacific Storm moves further east, airflow shifts due west. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

As strong gusty southwest to west winds blew over open natural mountains and desert areas west of Imperial County, fugitive windblown dust significantly affected all air quality monitors within Imperial County. The intensity of the winds prompted the NWS offices in San Diego and Phoenix to issues several Urgent Weather Messages advising of wind gusts in excess of 25 mph. Both local airports, the Imperial County Airport (KIPL) and the El Centro Naval Air Facility (KNJK) measured elevated winds at or above 25 mph with gust peaking at 39 mph and 44 mph at KIPL and KNJK, respectively. Additionally, meteorological locations WSW and W of Niland and Westmorland measured elevated winds at or above 25 mph.

III Clear Causal Relationship – A demonstration that the event affected air quality illustrating the relationship between the event and the monitored exceedance

As mentioned above, a potent low-pressure system (Pacific storm) moved inland through California during the evening hours of Wednesday, November 28, 2018, through Thursday, November 29, 2018 causing a strong onshore flow resulting in strong gusty westerly winds within the San Diego County Mountains and deserts and into Imperial County.[10] Although the cold front provided snow showers and rainfall, particularly along the coastal slopes (west side) of the San Diego County mountains before saturation could set in, preceding gusty westerly winds generated fugitive dust emission from the natural open mountainous areas in San Diego County, located to the northwest, west and southwest of Imperial County, and transported those emissions into Imperial County causing an exceedance at the Niland and Westmorland monitors.[11] An Area Forecast Discussion issued by the Phoenix NWS office discussed the potential for blowing dust due to the gusty winds caused by the weather system:

> "…By Thursday afternoon, this system will dig into the Southwest with a strong cold front pegged to move from west to east across the region. The front will push through Southeast California by midday Thursday bringing very strong winds capable of producing areas of blowing dust. As such, a wind advisory is in effect for portions of western Imperial County and Joshua Tree National Park from this morning until Friday evening."[12]

While elevated wind speeds play a significant and important role in the transportation of dust, gust and precipitation plays an equally significant role in deposition of particulates onto a monitor and the overall affect onto ambient air.[13] As winds and gusts increased on November 29, 2018 and transported windblown from open natural mountains and deserts entered Imperial County air quality degraded. As mentioned in Section I.1 above, the ICAPCD issued an advisory of the potential for elevated particulate matter and the potential of degradation of air quality in the Westmorland area to a Moderate or Unhealthy level. In addition, the NWS service issued Urgent Weather Messages advising of the potential for advisory level winds and blowing dust.[14]

Figure 3-1 below provides an illustration of the meteorological conditions, as described above and demonstrated in the HYSPLITs, for November 29, 2018, which affected air

[10] National Weather Service, Area Forecast Discussion, Nov., 28, 2018, San Diego office, 527 am PST
[11] National Weather Service, Area Forecast Discussion, Nov., 27, 2018, San Diego office, 1028 am PST
[12] National Weather Service, Area Forecast Discussion, Nov., 29, 2018 Phoenix office, 216 am MST
[13] Gust is a rapid fluctuation of wind speed with variations of 10 knots or more between peaks and lulls; National Weather Service Glossary https://w1.weather.gov/glossary/index.php?letter=g
[14] National Weather Service, Urgent Weather Message, Nov. 28, 2018, San Diego office, 345am PST— National Weather Service, Area Forecast Discussion, Nov. 28, 2018, Phoenix office, 305pm MST

quality in Imperial County causing an exceedance at the Niland and Westmorland monitors. Those air quality monitors located further north and open to greater northern influences, i.e. the Westmorland and Niland monitors, measured higher hourly concentrations for longer periods of time than those monitors located either to the south or much more central within Imperial County.

FIGURE 3-1
VISUAL RAMP-UP ANALYSIS AS DISCUSSED FOR NOVEMBER 29, 2018

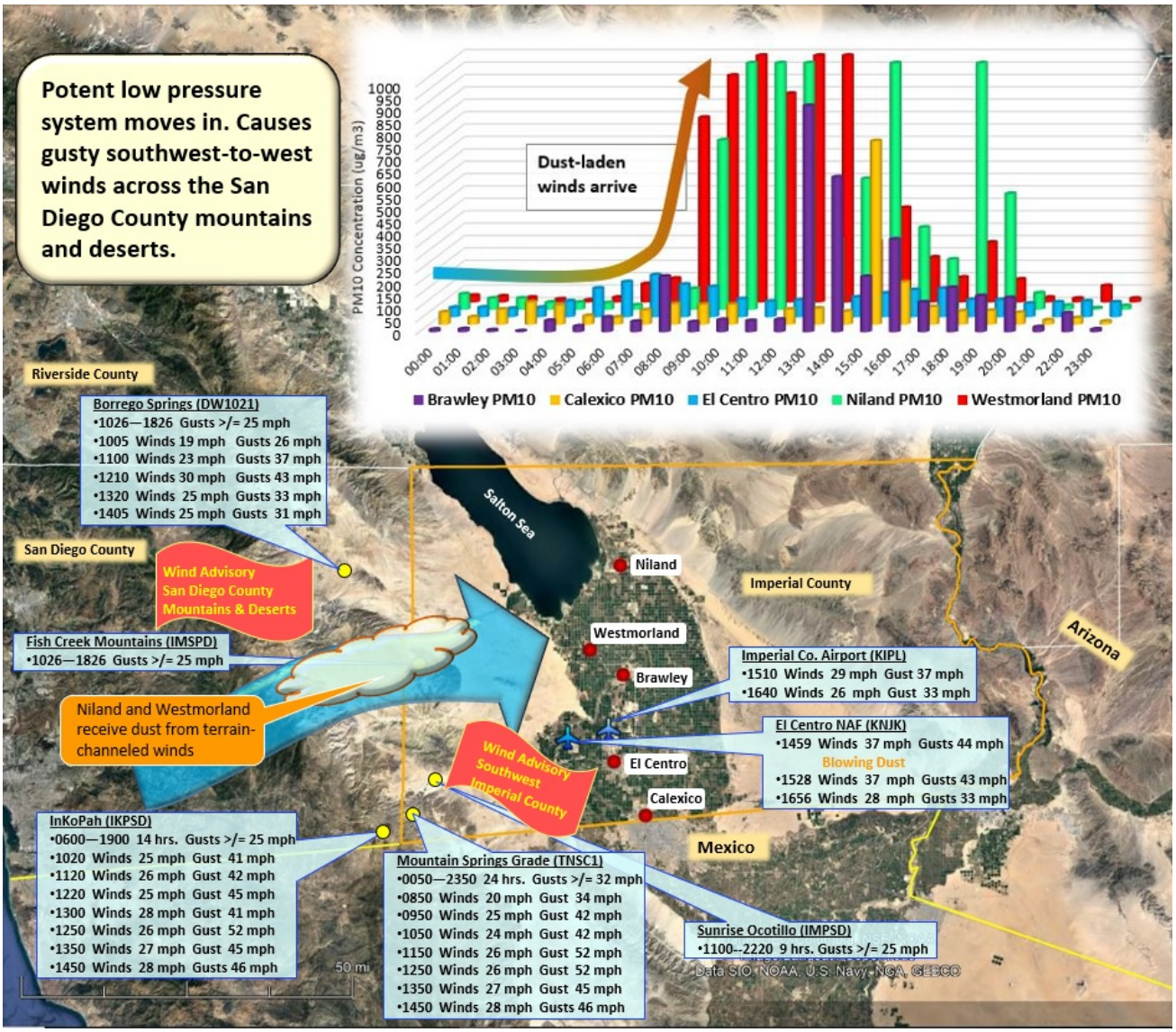


Fig 3-1: Gusty southwest-to-west winds at upwind sites generated and transported dust from the mountains and deserts west of Imperial County. Air quality data is from the EPA's AQS data bank. Google Earth base map

An indicator of the affect to air quality can be discerned from the level of visibility at any given time and day. While the ICAPCD air monitoring stations do not measure levels of visibility the local and surrounding airports do.[15] The El Centro Naval Air Facility (KNJK), Imperial County Airport (KIPL), and Janet Cochran-Desert Resorts Airport (KTRM) reported reduced visibility coincident with elevated wind speeds, wind gusts and hourly concentrations of particulates at both the Niland and Westmorland monitors. **Figure 3-2** and **Tables 3-1 to 3-3** provide information regarding the reduced visibility in Imperial County and the relation to hourly concentrations at local air monitors.

While **Figure 3-2** is a graphical representation of the reduced visibility within Imperial County and surrounding areas, **Tables 3-1 to 3-3** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM_{10} concentrations at the Niland and Westmorland monitors. Together, the data provides the supporting relationship between the elevated winds, blowing dust and reduced visibility.

According to the compiled information found in **Figure 3-2,** visibility reduced at three of the major airports, the El Centro NAF (KNJK), the Imperial County Airport (KIPL) and the Jacqueline Cochran Airport (KTRM) on November 29, 2018 coincident with elevated hourly concentrations at the air quality monitors in Imperial County.

[15] According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can "see". The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet. Therefore, a representative visibility utilizes an algorithm. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; http://www.nws.noaa.gov/asos/vsby.htm

FIGURE 3-2
72-HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

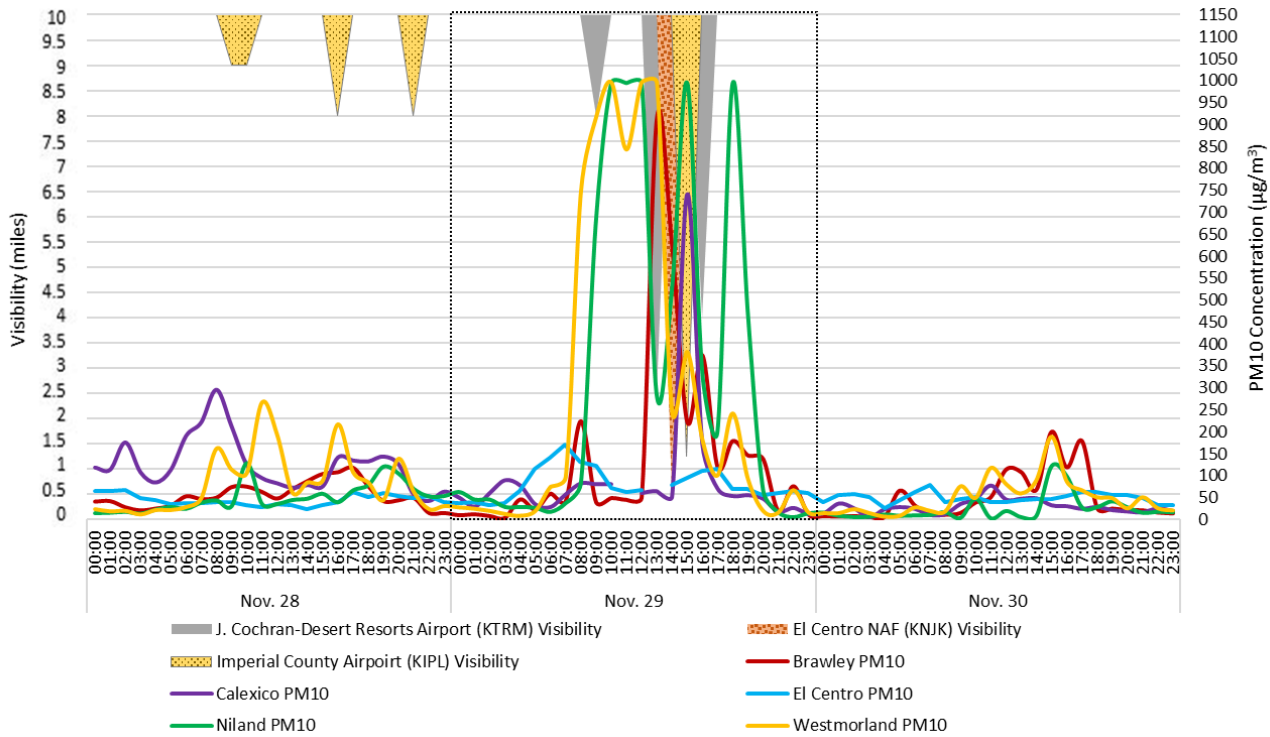


Fig 3-2: is a graphical representation of the compiled data from the El Centro NAF (KNJK) Airfield. Imperial County Airport (KIPL), and Janet Cochran-Desert Resorts Airport (KTRM). Reported reduced visibility is coincident with elevated winds and hourly levels of concentrations either just prior to peak concentrations or after. Visibility data from the NCEI's QCLCD data bank

Because the EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states[16] the **Tables 3-1 and 3-3** are provided in support of the relationship between the elevated winds and elevated concentrations. In each table the measured elevated concentrations of PM_{10} either follow or occur during periods of elevated winds or gusts. Each table has a select group of meteorological sites that compare the hourly winds with the closest measured hourly concentrations at the Niland and Westmorland monitors with a final table comparing concentrations at all three northern air quality monitors.

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

TABLE 3-1
WIND SPEEDS AND PM_{10} CONCENTRATIONS NOVEMBER 29, 2018

	INKOPAH (IKPSD)			MOUNTAIN SPRINGS GRADE (TNSC1)			EL CENTRO NAF (KNJK)				IMPERIAL COUNTY AIRPORT (KIPL)			BORREGO SPRINGS (DW1021)			NILAND
HR	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**OBS.**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**PM_{10} (µg/m³)**
0000	11	17	232	22	32	219	17		260		18		270	8	16	303	63
0100	14	23	223	19	33	215	18		260		9		270	2	14	0	46
0200	14	24	217	20	41	215	13		260		12		280	6	9	257	46
0300	16	25	219	22	34	217	7	17	280		8		240	1	3	120	29
0400	15	23	217	20	38	222	15		250		12		230	14	25	282	29
0500	15	23	218	18	32	230	26	36	240		7		160	9	16	266	27
0600	17	29	220	18	35	230	16	35	190		7		150	11	17	277	18
0700	18	25	219	14	32	227	12		180		6		130	10	19	276	38
0800	18	29	224	20	34	227	13	24	210		9		160	8	16	305	84
0900	22	36	222	25	42	208	23		240		7		70	17	30	286	684
1000	25	41	221	24	42	203	15		230		12	17	90	19	26	228	995
1100	26	42	219	26	52	206	8		360		8		270	23	37	248	995
1200	25	45	220	26	52	217	3				0		0	30	43	241	995
1300	28	41	226	27	45	222	7				9		290	25	33	266	282
1400	23	35	222	28	46	231	37	44	260	**BLDU**	17	24	290	25	31	257	528
1500	18	30	224	21	40	206	37	43	270		29	37	270	19	25	297	995
1600	13	21	214	23	34	233	28	33	250		26	33	260	20	31	253	332
1700	18	29	220	23	35	237	21		250		24		260	20	34	314	203
1800	20	31	225	22	42	236	5		310		7		250	14	32	313	995
1900	18	30	220	25	45	233	14		240		7		270	21	32	272	468
2000	14	24	228	25	48	230	10		270		15		250	22	34	266	67
2100	25	37	222	21	42	225	20		260		17	22	270	10	20	255	17
2200	22	39	220	24	42	237	20	29	240		20	29	260	13	31	308	6
2300	24	45	221	26	45	238	17		240		5		290	5	11	336	15

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for InKoPah (IKPSD), Mountain Springs Grade (TNSC1), and Borrego Springs (DW1021) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees. OBS. = Observations of Blowing Dust. Due to the different times that wind data and air quality data is sampled at various sites, the hour given represents the hour in which the measurement was taken. Air quality data from the EPA AQS repository

TABLE 3-2
WIND SPEEDS AND PM_{10} CONCENTRATIONS NOVEMBER 29, 2018

	INKOPAH (IKPSD)			MOUNTAIN SPRINGS GRADE (TNSC1)			EL CENTRO NAF (KNJK)				IMPERIAL COUNTY AIRPORT (KIPL)			BORREGO SPRINGS (DW1021)			WESTMORLAND
HR	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**OBS.**	**W/S**	**W/G**	**W/D**	**W/S**	**W/G**	**W/D**	**PM_{10} ($\mu g/m^3$)**
0000	11	17	232	22	32	219	17		260		18		270	8	16	303	27
0100	14	23	223	19	33	215	18		260		9		270	2	14	0	24
0200	14	24	217	20	41	215	13		260		12		280	6	9	257	19
0300	16	25	219	22	34	217	7	17	280		8		240	1	3	120	12
0400	15	23	217	20	38	222	15		250		12		230	14	25	282	8
0500	15	23	218	18	32	230	26	36	240		7		160	9	16	266	19
0600	17	29	220	18	35	230	16	35	190		7		150	11	17	277	74
0700	18	25	219	14	32	227	12		180		6		130	10	19	276	96
0800	18	29	224	20	34	227	13	24	210		9		160	8	16	305	745
0900	22	36	222	25	42	208	23		240		7		70	17	30	286	915
1000	25	41	221	24	42	203	15		230		12	17	90	19	26	228	995
1100	26	42	219	26	52	206	8		360		8		270	23	37	248	842
1200	25	45	220	26	52	217	3				0		0	30	43	241	995
1300	28	41	226	27	45	222	7				9		290	25	33	266	995
1400	23	35	222	28	46	231	37	44	260	**BLDU**	17	24	290	25	31	257	246
1500	18	30	224	21	40	206	37	43	270		29	37	270	19	25	297	381
1600	13	21	214	23	34	233	28	33	250		26	33	260	20	31	253	181
1700	18	29	220	23	35	237	21		250		24		260	20	34	314	100
1800	20	31	225	22	42	236	5		310		7		250	14	32	313	241
1900	18	30	220	25	45	233	14		240		7		270	21	32	272	92
2000	14	24	228	25	48	230	10		270		15		250	22	34	266	19
2100	25	37	222	21	42	225	20		260		17	22	270	10	20	255	15
2200	22	39	220	24	42	237	20	29	240		20	29	260	13	31	308	66
2300	24	45	221	26	45	238	17		240		5		290	5	11	336	15

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for InKoPah (IKPSD), Mountain Springs Grade (TNSC1), and Borrego Springs (DW1021) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees. OBS. = Observations of Blowing Dust. Due to the different times that wind data and air quality data is sampled at various sites, the hour given represents the hour in which the measurement was taken. Air quality data from the EPA AQS repository

TABLE 3-3
WIND SPEEDS AND PM_{10} CONCENTRATIONS NOVEMBER 29, 2018

	INKOPAH (IKPSD)			MOUNTAIN SPRINGS GRADE (TNSC1)			EL CENTRO NAF (KNJK)				IMPERIAL COUNTY AIRPORT (KIPL)			BORREGO SPRINGS (DW1021)			BRAWLEY	NILAND	WESTMORLAND
HR	W/S	W/G	W/D	W/S	W/G	W/D	W/S	W/G	W/D	OBS.	W/S	W/G	W/D	W/S	W/G	W/D	PM10 (µg/m3)	PM_{10} (µg/m^3)	PM_{10} (µg/m^3)
0000	11	17	232	22	32	219	17		260		18		270	8	16	303	10	63	27
0100	14	23	223	19	33	215	18		260		9		270	2	14	0	12	46	24
0200	14	24	217	20	41	215	13		260		12		280	6	9	257	8	46	19
0300	16	25	219	22	34	217	7	17	280		8		240	1	3	120	4	29	12
0400	15	23	217	20	38	222	15		250		12		230	14	25	282	46	29	8
0500	15	23	218	18	32	230	26	36	240		7		160	9	16	266	23	27	19
0600	17	29	220	18	35	230	16	35	190		7		150	11	17	277	59	18	74
0700	18	25	219	14	32	227	12		180		6		130	10	19	276	42	38	96
0800	18	29	224	20	34	227	13	24	210		9		160	8	16	305	224	84	745
0900	22	36	222	25	42	208	23		240		7		70	17	30	286	40	684	915
1000	25	41	221	24	42	203	15		230		12	17	90	19	26	228	49	995	995
1100	26	42	219	26	52	206	8		360		8		270	23	37	248	45	995	842
1200	25	45	220	26	52	217	3				0		0	30	43	241	50	995	995
1300	28	41	226	27	45	222	7				9		290	25	33	266	913	282	995
1400	23	35	222	28	46	231	37	44	260	**BLDU**	17	24	290	25	31	257	625	528	246
1500	18	30	224	21	40	206	37	43	270		29	37	270	19	25	297	223	995	381
1600	13	21	214	23	34	233	28	33	250		26	33	260	20	31	253	374	332	181
1700	18	29	220	23	35	237	21		250		24		260	20	34	314	120	203	100
1800	20	31	225	22	42	236	5		310		7		250	14	32	313	179	995	241
1900	18	30	220	25	45	233	14		240		7		270	21	32	272	146	468	92
2000	14	24	228	25	48	230	10		270		15		250	22	34	266	138	67	19
2100	25	37	222	21	42	225	20		260		17	22	270	10	20	255	20	17	15
2200	22	39	220	24	42	237	20	29	240		20	29	260	13	31	308	76	6	66
2300	24	45	221	26	45	238	17		240		5		290	5	11	336	11	15	15

Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for InKoPah (IKPSD), Mountain Springs Grade (TNSC1), and Borrego Springs (DW1021) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees. OBS. = Observations of Blowing Dust. Due to the different times that wind data and air quality data is sampled at various sites, the hour given represents the hour in which the measurement was taken. Air quality data from the EPA AQS repository

As mentioned above, Area Forecast Discussions and Urgent Weather Messages containing a Wind Advisory described the strong gusty westerly winds for the region extending from the San Diego County mountains and deserts and Imperial County. The strong Pacific storm strengthened the pressure gradient and produced strong gusty westerly winds that affected different regional air monitors in Riverside and Imperial counties (**Table 2-1**).

The ICAPCD monitors air quality for each of its stations and issues web-based Air Quality Indices in response to changes in air quality.[17] As transported windblown dust entered Imperial County on November 29, 2018 air quality degraded in Imperial County. Overall, the strong winds associated with the strong Pacific storm affected air quality in Imperial County.

FIGURE 3-3
IMPERIAL VALLEY AIR QUALITY INDEX FOR NILAND
NOVEMBER 29, 2018

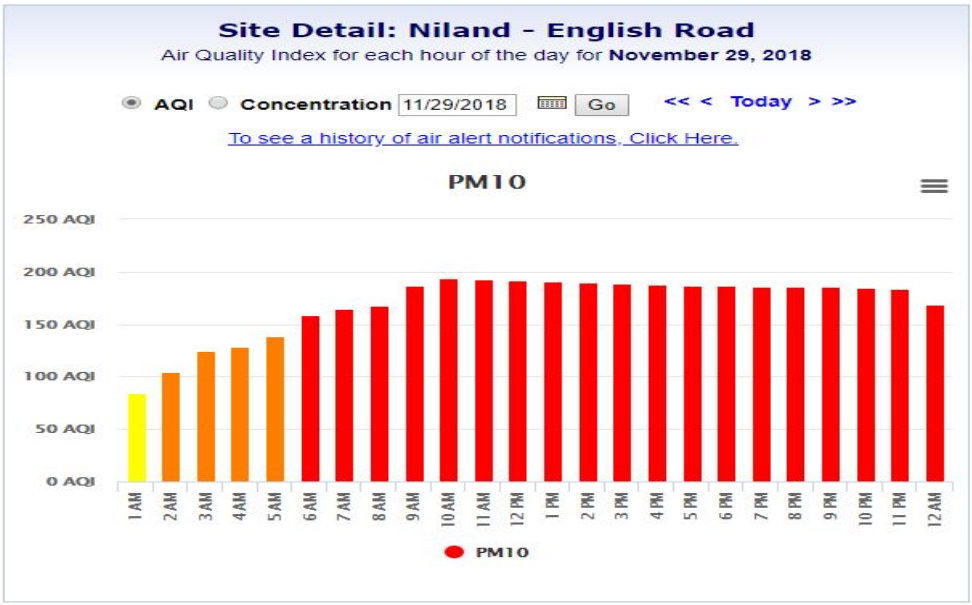


Fig 3-3: The degradation, or affect upon air quality, maybe determined when the AQI changes from a "Yellow" or Moderate level to a "Red" or Unhealthy level

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

FIGURE 3-4
IMPERIAL VALLEY AIR QUALITY INDEX FOR WESTMORLAND
NOVEMBER 29, 2018

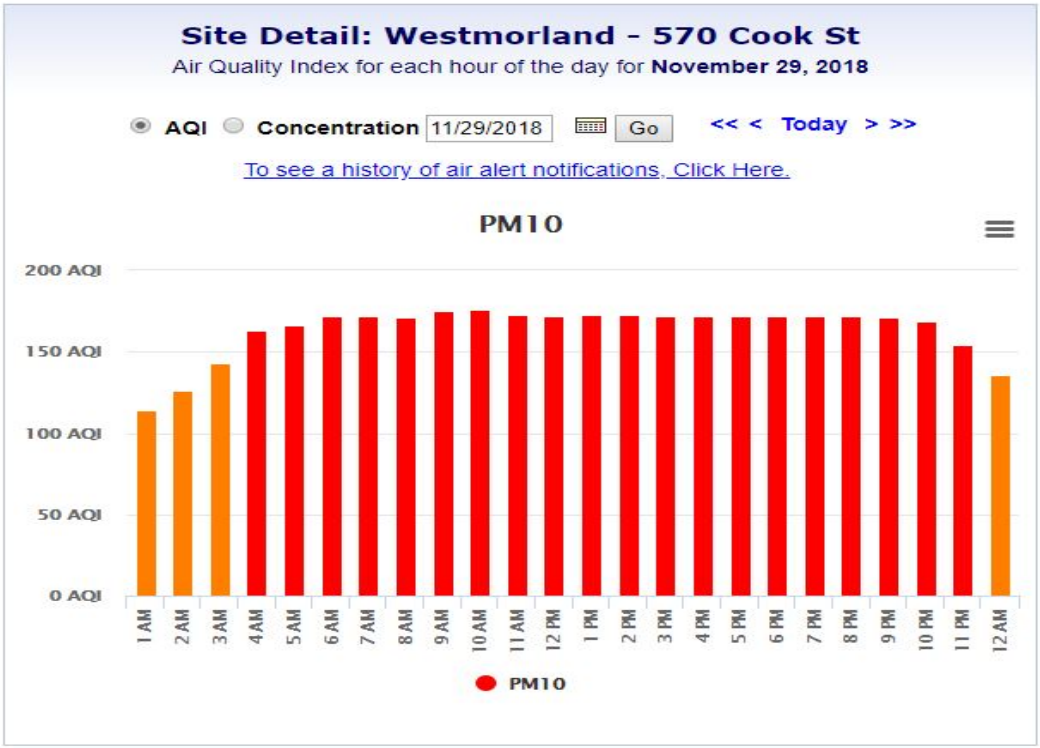


Fig 3-4: The degradation, or affect upon air quality, maybe determined when the AQI changes from a "Yellow" or Moderate level to a "Red" or Unhealthy level

III.1 Summary of Forecasts and Warnings

Days before and during Thursday, November 29, 2018 the National Weather Service (NWS) offices in Phoenix and San Diego issued Area Forecast Discussions describing a potent low pressure system with an associated cold front (Pacific Storm) moving across the region.[18] The Pacific Storm was forecasted to move inland through California during the evening hours of Wednesday, November 28, 2018 through southeastern California (Imperial County) on Thursday, November 29, 2018, bringing rain, snow to the high elevations, and strong gusty winds across the mountains and deserts of San Diego County.[19] The NWS office issued Urgent Weather Messages advising the public of advisory level winds in excess of 25 mph and potential gusts at or above 55 mph (with isolated gusts to 65 mph) along mountain ridgetops and deserts.[20] **Appendix A** contains all pertinent NWS notices.

[18] National Weather Service, Area Forecast Discussion, No., 27, 2018, San Diego office, 448 am PST; National Weather Service, Area Forecast Discussion, Nov. 28, 2018, Phoenix office, 345 am MST
[19] National Weather Service, Area Forecast Discussion, Nov. 28, 2018, San Diego office, 930 pm MST
[20] National Weather Service, Urgent Weather Message, Nov. 28, 2018, San Diego office, 345am PST— National Weather Service, Area Forecast Discussion, Nov. 28, 2018, Phoenix office, 305pm MST

III.2 Summary of Wind Observations

As demonstrated above wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), and Imperial County as well as from other automated meteorological instruments upstream from the Niland and Westmorland monitors. Data analysis indicates that during November 29, 2018 different sites measured wind speeds at or above 25 mph.

IV Concentration to Concentration Analysis – An analyses comparing the event-influenced concentrations to concentrations at the same monitoring site at other times

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.

Figures 4-1 through 4-4 show the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Niland and Westmorland monitor for the period of January 1, 2010 through November 29, 2018. The compiled data set below includes non-regulatory data prior to 2013. As a consequence, continuous monitoring data (hourly concentrations) prior to 2013 were not reported into the US EPA Air Quality System (AQS).[21] The difference between the standard and local condition concentrations is not significant enough to change the outcome of the analysis.

Compiled and plotted 24-hour averaged PM_{10} concentrations, between January 1, 2010 and November 29, 2018, as measured by the Niland and Westmorland monitors were used to establish the historical and seasonal variability over time.[22] All figures illustrate that the exceedance, which occurred on November 29, 2018, was outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs obtained through the EPA's AQS data bank.

[21] 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/m^3) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP 760torr and 25C). 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.

[22] FRM sampling ended December 2016.

FIGURE 4-1
NILAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO NOVEMBER 29, 2018

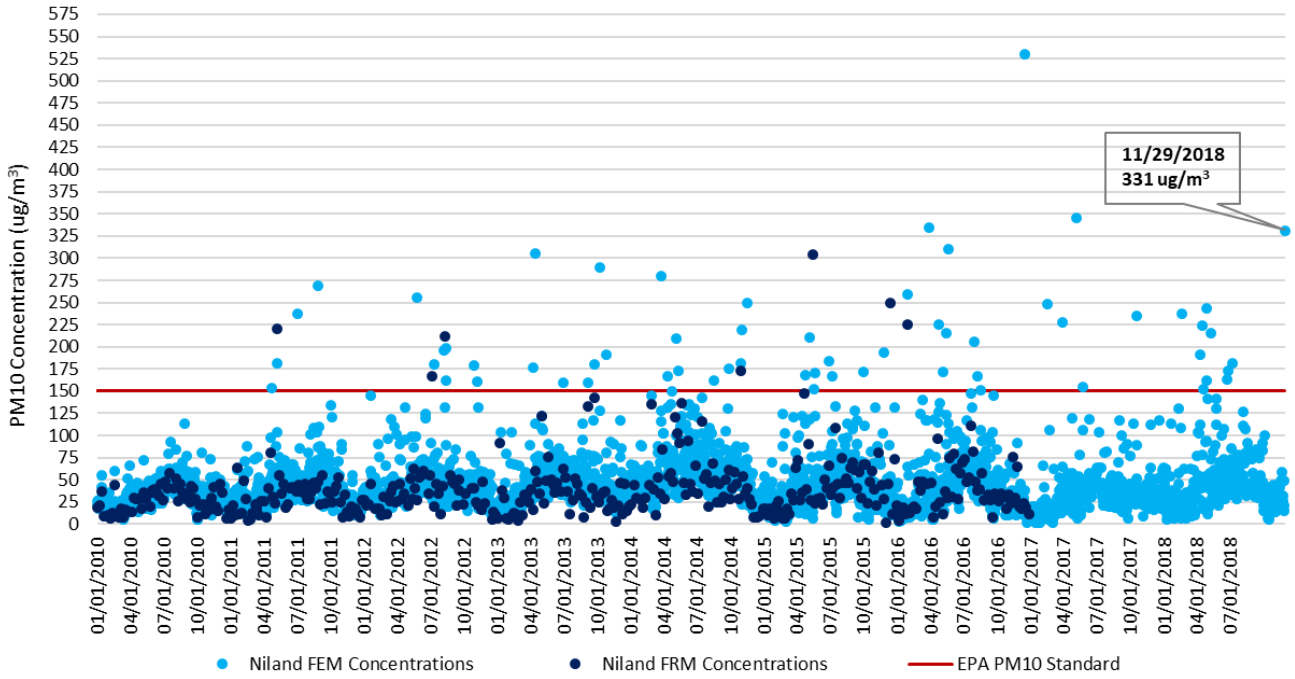


Fig 4-1: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 331 µg/m^3 on November 29, 2018 by the Niland monitor was outside the normal historical concentrations when compared to similar event days and non-event days

The time series, **Figure 4-1,** for Niland included 3,255 sampling days (January 1, 2010 through November 29, 2018). Of the 3,255 sampling days the Niland monitor measured 60 exceedance days which translates into an occurrence rate less than 2%. Historically, there were six (6) exceedance days measured during the first quarter, twenty-five (25) exceedance days measured during the second quarter, sixteen (16) exceedance days measured during the third quarter; and thirteen (13) exceedance days measured during the fourth quarter.

FIGURE 4-2
WESTMORLAND HISTORICAL COMPARISON
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
JANUARY 1, 2010 TO NOVEMBER 29, 2018

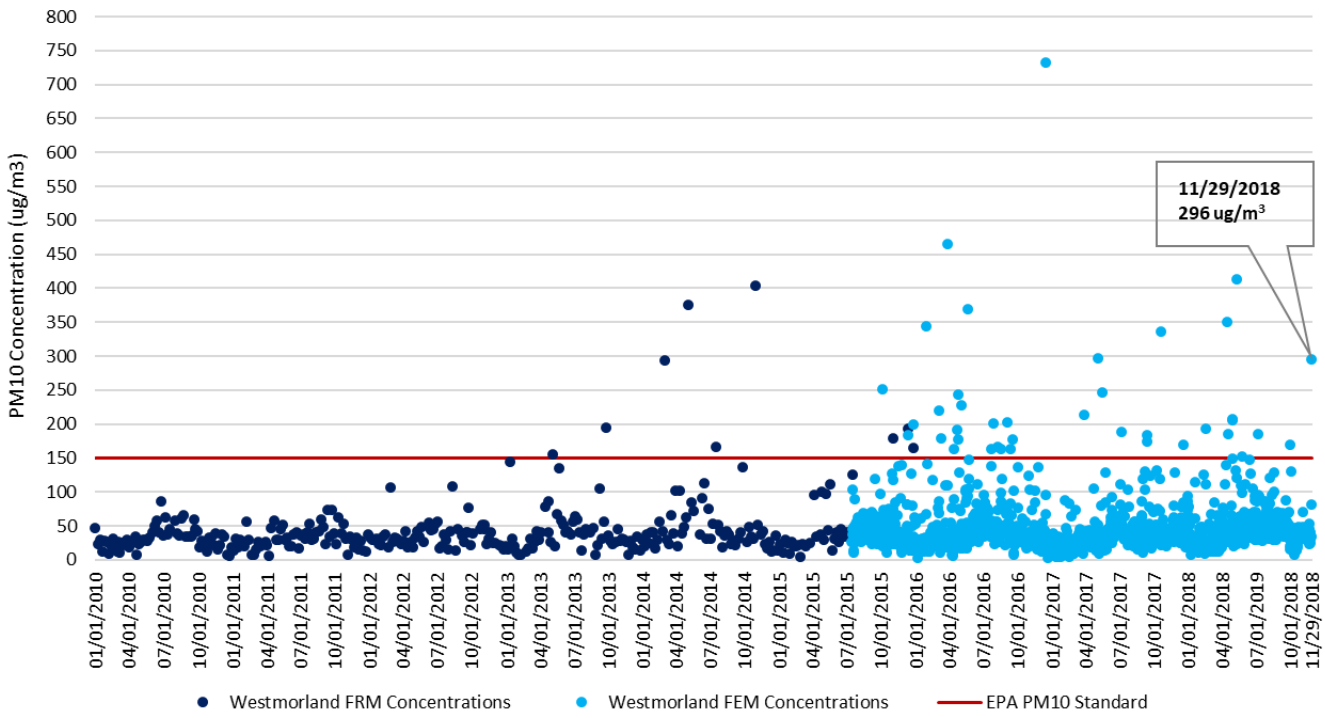
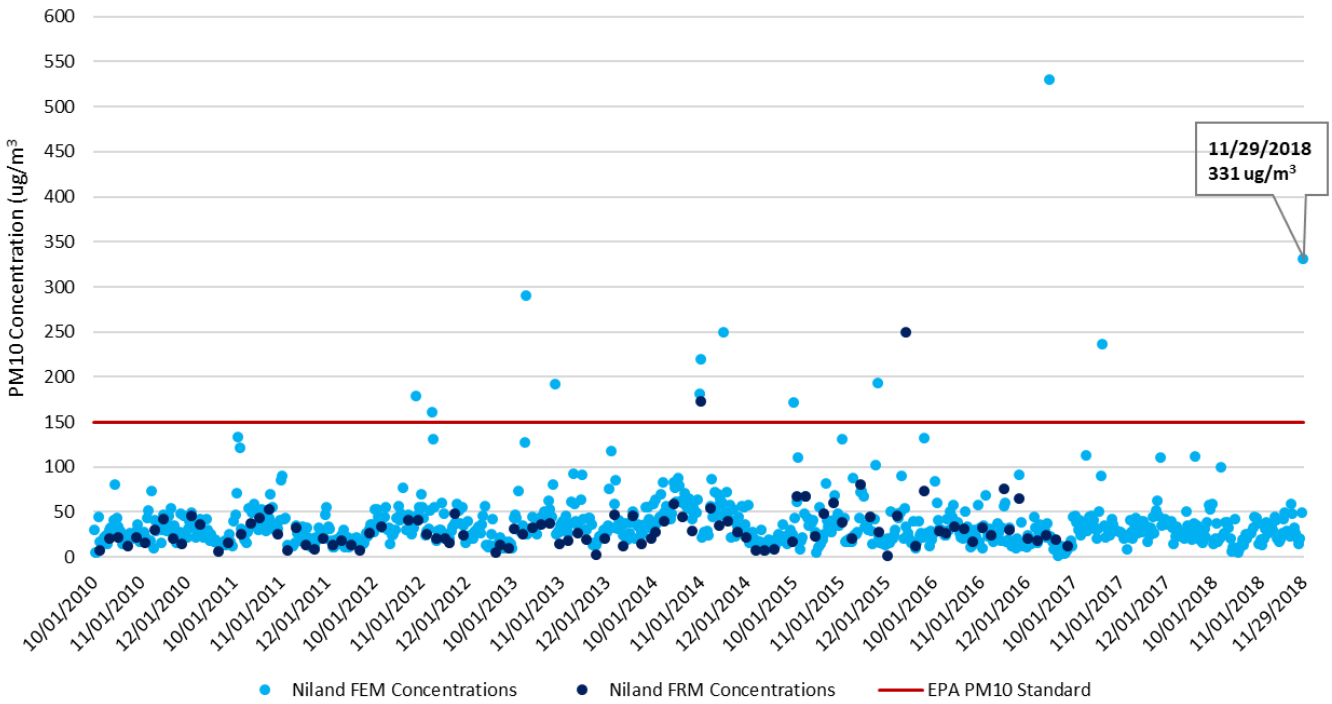


Fig 4-2: A comparison of PM_{10} historical concentrations demonstrates that the measured concentration of 296 µg/m^3 on November 29, 2018 by the Westmorland monitor was outside the normal historical concentrations when compared to similar event days and non-event days

The time series, **Figure 4-2,** for Westmorland included 1,184 sampling days (January 1, 2010 through November 29, 2018). Of the 1,184 sampling days the Westmorland monitor measured 45 exceedance days which translates into an occurrence rate less than 4%. Historically, there were seven (7) exceedance days measured during the first quarter, fifteen (15) exceedance days measured during the second quarter, thirteen (13) exceedance days measured during the third quarter; and ten (10) exceedance days measured during the fourth quarter.

FIGURE 4-3
NILAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 TO NOVEMBER 29, 2018**

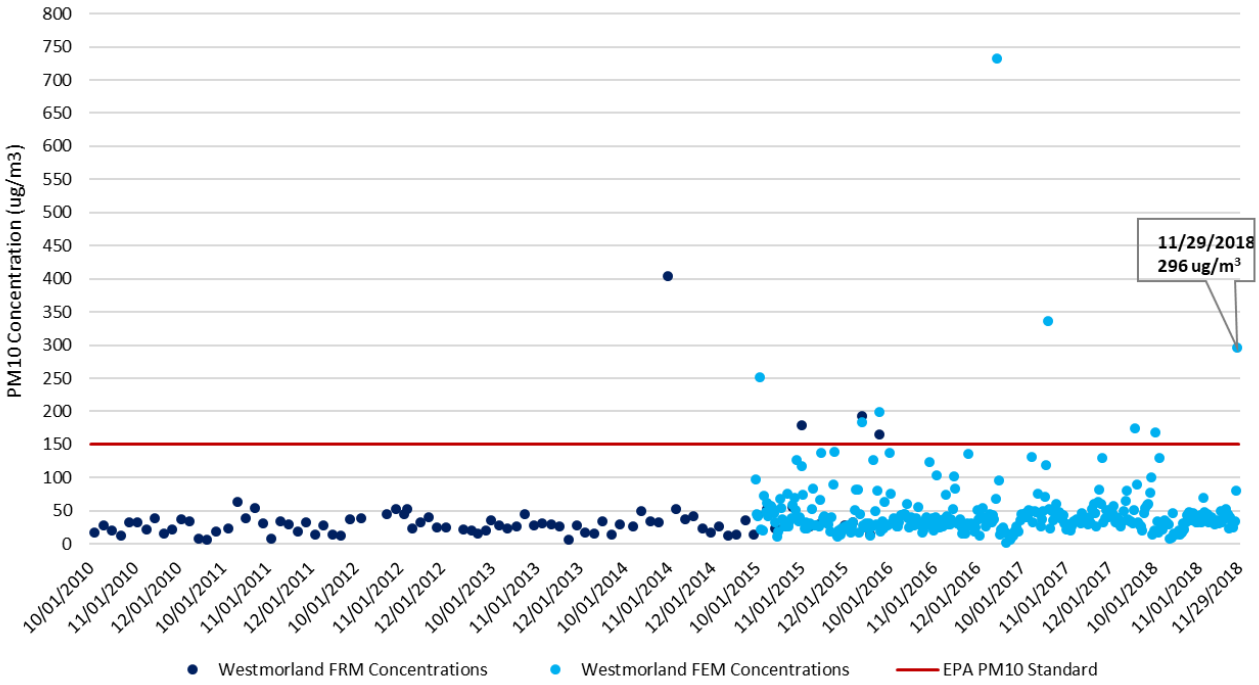


*** Quarterly: October 1, 2010 to December 31, 2017 and October 1, 2018 to November 29, 2018**

Fig 4-3: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 331 µg/m^3 on November 29, 2018 by the Niland monitor was outside the seasonal concentrations when compared to similar event days and non-event days

Figure 4-3 illustrates the seasonal fluctuations over a period of 796 sampling days, 898 credible samples and thirteen (13) exceedance days. This translates to less than a 2% seasonal exceedance occurrence rate.

FIGURE 4-4
WESTMORLAND SEASONAL COMPARISON
FRM AND FEM PM_{10} 24-HR AVG CONCENTRATIONS
***OCTOBER 1, 2010 TO NOVEMBER 29, 2018**



*** Quarterly: October 1, 2010 to December 31, 2017 and October 1, 2018 to November 29, 2018**
Fig 4-4: A comparison of PM_{10} seasonal concentrations demonstrates that the measured concentration of 296 µg/m^3 on November 29, 2018 by the Westmorland monitor was outside the seasonal concentrations when compared to similar event days and non-event days

Figure 4-4 illustrates the seasonal fluctuations over a period of 415 sampling days, 426 credible samples and ten (10) exceedance days. This translates to a 2.3% seasonal exceedance occurrence rate.

Examining the historical and seasonal time series concentrations as they relate to the November 29, 2018 measured exceedances, the exceedances measured on November 29, 2018 are clearly outside the normal concentration levels when comparing to similar event days and non-event days.

V Both Not Reasonably Controllable and Not Reasonably Preventable – A demonstration that the event was both not reasonably controllable and not reasonably preventable

The analysis above, under the Clear Causal Relationship, indicates that the primary sources affecting air quality in Imperial County originated within the natural open areas of the San Diego Mountains and the natural open deserts to the northwest (Riverside County), west and southwest of Imperial County. The origination of these emissions from these areas affected all the air quality monitors on November 29, 2018. Since Imperial County does not have jurisdiction over emissions emanating from San Diego County, it is not reasonably controllable or preventable by Imperial County. For a brief description of the controls implemented by sources beyond the control of Imperial County see section V.1 below.

As mentioned above in Section I.4, Mitigation of Exceptional Events contains significant information regarding the application of Best Available Control Measures that are used as measures to abate or minimize contributing controllable sources of identified pollutants (**Page 12, sub-section II.2 of the High Wind Mitigation Plan**). In addition, the mitigation plan explains the methods utilized to minimize public exposure to high concentrations of identified pollutants, the process utilized to collect and maintain data pertinent to any identified event, and the mechanisms utilized to consult with other air quality managers within the affected area regarding the appropriate responses to abate and minimize affects.

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. The October 16, 2012 adopted revision reflects the specific revisions to Regulation VIII, which USEPA approved on April 22, 2013. Since 2006, ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 5-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

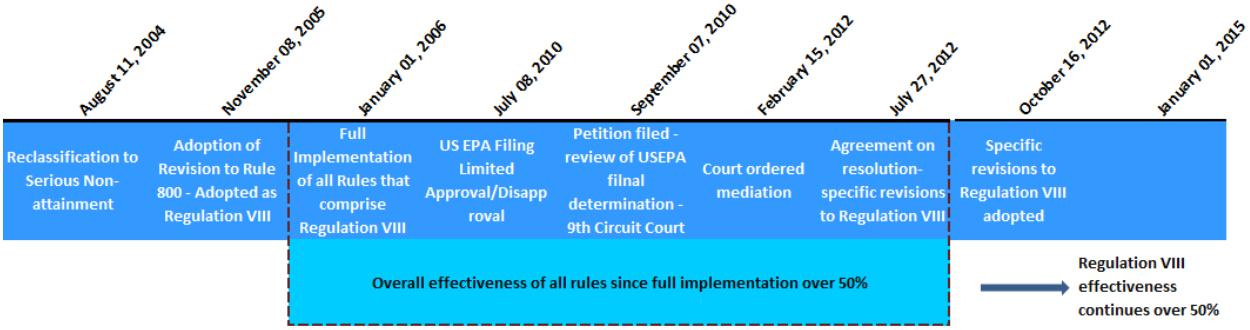


Fig 5-1: Regulation VIII Graphic Timeline

V.1 Other PM_{10} Control Measures

In addition to the rules and regulations listed above, other PM_{10} control measures have been committed to, and implemented by, local California air districts bordering ICAPCD. San Diego County (to the west of Imperial County) and eastern Riverside County (outside

of the Coachella Valley Planning Area and to the north and northeast of Imperial County) are both designated unclassified for the PM_{10} NAAQS and are not required to have BACM controls for PM_{10}. The Coachella Valley Planning Area in Riverside County, to the north and northwest of Imperial County, is designated a PM_{10} nonattainment area, and a redesignation request and maintenance plan were submitted to USEPA in 2010. These three areas and their relevant PM_{10} rules are indicated in **Tables 5-1 to 5-3**.

TABLE 5-1
SAN DIEGO AIR POLLUTION CONTROL DISTRICT (SDAPCD)

RULES REGULATING EXISTING AND NEW NON-POINT SOURCES IN SAN DIEGO COUNTY	
RULE NUMBER AND TITLE	DESCRIPTION
Rule 52 – Particulate Matter	Limits the amount of particulate matter that may be discharged from any source.
Rule 52.1 – NSPS and NESHAPS Particulate Matter Requirements	Ensures that sources subject to NSPS or NESHAPS also conform to Regulation X and XI, respectively.
Rule 54 – Dust and Fumes	Minimizes the amount of dust that can be discharged in a specified time period.
Rule 55 – Fugitive Dust Control	Provides a mechanism to regulate operations that may cause fugitive dust emissions.
Rule 101 – Burning Control	Establishes conditions, including high winds, under which burning would be curtailed or prohibited.

TABLE 5-2
MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT (AQMD)

RULES REGULATING EXISTING AND NEW NON-POINT SOURCES IN EASTERN RIVERSIDE COUNTY OUTSIDE OF THE COACHELLA VALLEY PLANNING AREA	
RULE NUMBER AND TITLE	DESCRIPTION
Rule 403 – Fugitive Dust	Limits the amount of particulate matter that may be discharged from specific sources, not including unpaved public roads or farm roads, or industrial or commercial facilities.
Rule 404 – Particulate Matter Concentration	Limits the concentration of PM_{10} allowed in discharged gas.
Rule 405 – Solid Particulate Matter Weight	Limits the amount of PM_{10} that can be discharged on an hourly basis.

TABLE 5-3
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

RULES REGULATING EXISTING AND NEW NON-POINT SOURCES IN RIVERSIDE COUNTY AND THE COACHELLA VALLEY, INSIDE OF THE COACHELLA VALLEY PLANNING AREA	
RULE NUMBER AND TITLE	DESCRIPTION
Rule 403– Fugitive Dust	Requires implementation of control measures to prevent, reduce, or mitigate fugitive dust emissions.
Rule 403.1 – Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources	Establishes special requirements for Coachella Valley dust sources under high-wind conditions and requires SCAPCD approval of dust control plans for sources not subject to local government ordinances.
Rule 1156 – Further Reductions of Particulate Emissions from Cement Manufacturing Facilities	Establishes requirements to reduce particulate matter emissions from cement manufacturing operations and properties.
Rule 1157 – PM_{10} Emission Reductions from Aggregate and Related Operations	Establishes additional source specific performance standards and specifies operational PM_{10} controls specific to aggregate and related operations.
Rule 1186 – PM_{10} Emissions from Paved and Unpaved Roads and Livestock Operation	Limits the amount of particulate matter entrained as a result of vehicular travel on paved and unpaved public roads, and at livestock operations.
Rule 1466 – Control of Particulate Emissions from Soils with Toxic Air Contaminants	Establishes a PM_{10} ambient dust concentration limit, dust control measures, and notification requirements prior to earth-moving activities or when PM_{10} dust concentrations are exceeded.

V.2 Wind Observations

As previously discussed, wind data analysis indicates that on November 29, 2018 different sites measured wind speeds at or above 25 mph. Wind speeds of 25 mph are normally sufficient to overcome most PM_{10} control measures. During the November 29, 2018 event, wind speeds were above the 25 mph threshold, overcoming the reasonable controls in place.

V.3 Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County and specifically around Niland and Westmorland during the November 29, 2018 PM_{10} exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive

dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on November 29, 2018, officially declared as No Burn Day, related to agricultural burning, waste burning or dust.

FIGURE 5-2
PERMITTED SOURCES

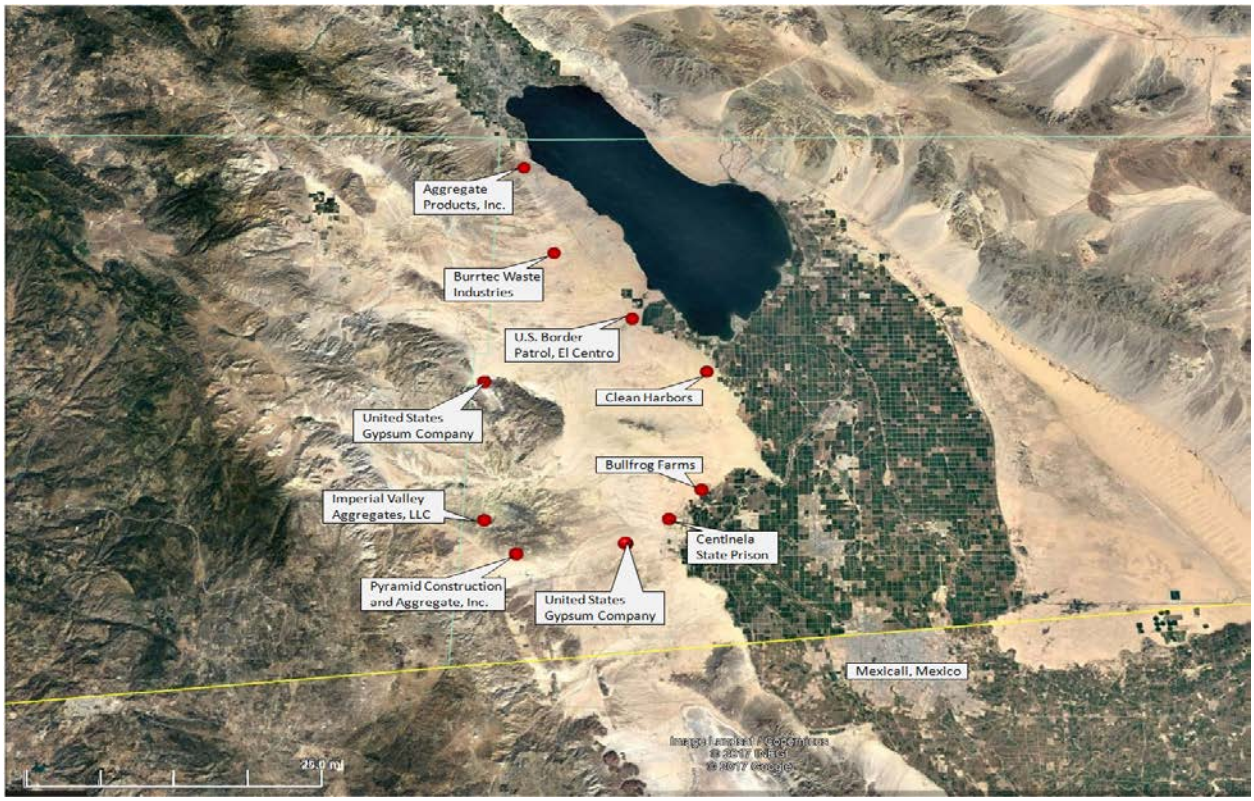


Fig 5-2: The above map identifies those permitted sources located west, northwest and southwest of the Niland and Westmorland monitors. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the 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. Base map from Google Earth

FIGURE 5-3
NON-PERMITTED SOURCES

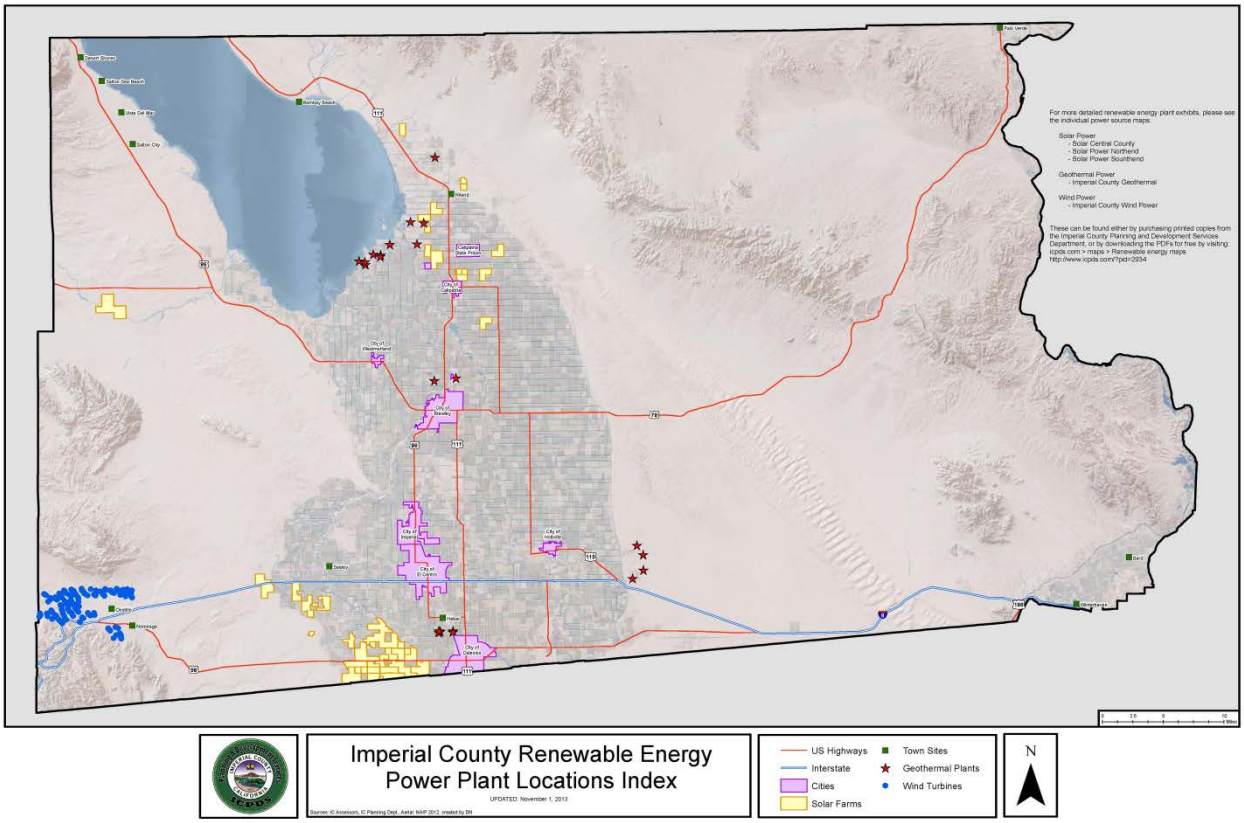


Fig 5-3: The above map identifies those power sources located west, northwest and southwest of the Niland and Westmorland monitors. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants

VI A Natural Event – A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.

Typically, Pacific weather disturbances during this time of year will bring westerly winds into the region. In addition to the strong gusty westerly winds brought by what the NWS identified as a "potent" Pacific storm that moved inland through California during the evening hours of hours of Wednesday, November 28, 2018 through Thursday, November 29, 2018 cooling, snow and light rain within the San Diego mountains affected the level of saltation and deposition on to the air quality monitors in Imperial County.[23] The strength of the gusty westerly winds were of a magnitude that prompted the NWS offices in San Diego and Phoenix to issue Urgent Weather Messages advising the public of advisory level winds in excess of 25 mph and potential gusts at or above 55 mph along mountain ridgetops and deserts.[24]

As mentioned above, as the Pacific Storm moved inland, before snow showers and rainfall, could saturation within the San Diego Mountains, preceding strong gusty northwesterly winds, generated the largest amounts of fugitive dust emissions from the natural open mountainous areas in San Diego and Riverside County, located to the west and northwest of Imperial County, during the morning hours of November 29, 2018 and transported those emissions into Imperial County. As the system moved further east, through the day, emissions primarily from the natural open mountain areas of San Diego and the natural open deserts west of Imperial County added to already affected air quality monitors causing an exceedance at the Niland and Westmorland monitors.[25] As the Pacific storm moved further eastward, precipitation was measured in trace levels, through the rest of the day, at the El Centro NAF (KNJK) and the Imperial County Airport (KIPL) with mountain areas measuring precipitation at higher levels (**Table 6-1**).[26] Indicators of humid conditions can be discerned when levels of humidity increase, at KIPL humidity reached peak levels of 81 percent and remained above 50% through the day. As the Pacific Storm moved further east the precipitation within the San Diego mountains would have reduced the amount of saltation and deposition to air quality monitors during the late afternoon to evening hours. Therefore, those monitors further north and exposed to the open natural deserts in Riverside County felt the full impact of heavy windblown dust emissions

[23] National Weather Service, Area Forecast Discussion, No., 27, 2018, San Diego office, 448am PST; National Weather Service, Area Forecast Discussion, Nov. 28, 2018, Phoenix office, 345am MST
[24] National Weather Service, Urgent Weather Message, Nov. 28, 2018, San Diego office, 345am PST— National Weather Service, Area Forecast Discussion, Nov. 28, 2018, Phoenix office, 305pm MST
[25] National Weather Service, Area Forecast Discussion, Nov., 27, 2018, San Diego office, 1028am PST
[26] National Weather Service, Area Forecast Discussion, Nov. 30, 2018, San Diego office, 430pm PST

while air quality monitors, centralized in Imperial County or further south did not experience the same impact.

TABLE 6-1

PRECIPITATION TOTALS		
LOCATION*	**11/29/2018**	**11/30/2018**
Campo Airport (KCZZ)	1.07	0.35*
El Centro NAF (KNJK)	T	T
Imperial County Airport (KIPL)	T	

*KCZZ, KNJK and KIPL from QCLCD. KCZZ on November 30 has only partial data available.

Finally, the intensity of the gusty westerly winds was sufficient to overcome the reasonable controls in place in Imperial County.

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 III, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the November 29, 2018 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 reasonably controlled, where human activity played little or no direct causal role. This demonstration provides evidence that the primary source areas of windblown dust transported into Imperial County came from San Diego and Riverside counties where Imperial County has no jurisdiction. In any event, despite reasonable controls in place within Imperial County, high winds overwhelmed all reasonable controls where human activity played little to no direct causal role. The PM_{10} exceedance measured at the Niland and Westmorland monitors were caused by naturally occurring strong gusty westerly winds that transported windblown dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that

the PM_{10} exceedance at the Niland and Westmorland monitors on November 29, 2018, 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} exceedance that occurred at Niland and Westmorland on November 29, 2018, was caused by the transport of windblown dust into Imperial County by strong westerly winds associated with a storm that passed through the region. At the time of the event, anthropogenic sources, within Imperial County were reasonably controlled. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The comparative analysis of different meteorological sites to PM_{10} concentrations measured at the Niland and Westmorland monitors in Imperial County demonstrates a consistency of elevated gusty westerly winds with elevated concentrations of PM_{10} on November 29, 2018. In addition, temporal analysis indicates that the elevated PM_{10} concentrations and the gusty westerly winds were an event that was widespread, regional and not preventable. Days before 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 transported windblown dust to the exceedance on November 29, 2018.

VI.5 Concentration to Concentration Analysis

The historical annual and seasonal 24-hr average PM_{10} measured concentrations at the Niland and Westmorland monitors was outside the normal historical concentrations when compared to event and non-event days.

VI.6 Conclusion

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the strong gusty westerly winds that preceded the identified cold front associated with the unseasonably deep trough as it passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM_{10}

exceedance measured at all the air quality monitors in Imperial County on November 29, 2018.

In particular, the clear causal relationship and not reasonably controllable or preventable sections provide evidence that high gusty westerly winds transported fugitive emissions from open natural Mountain and desert areas, located within the San Diego, Riverside and Imperial counties (all part of the Sonoran Desert). In addition, because anthropogenic sources in upwind areas were reasonably controlled at the time of the event, this event meets the definition of a Natural Event.[27]

[27] 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.