EL PASO COUNTY PM_{10} EXCEPTIONAL EVENT DEMONSTRATION FOR DECEMBER 23, 2020 AT THE SOCORRO HUECO AND EL PASO MIMOSA MONITORS

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CHAPTER 1: INTRODUCTION

Exceptional events are unusual or naturally occurring events that affect air quality and are not reasonably controllable or preventable. An event may also be caused by human activity that is unlikely to recur at a particular location. Under Section 319 of the federal Clean Air Act (FCAA), states are responsible for identifying air quality monitoring data affected by an exceptional event and requesting the United States Environmental Protection Agency (EPA) to exclude the data from consideration when determining whether an area is in attainment or nonattainment of a National Ambient Air Quality Standard (NAAQS). The EPA has promulgated an exceptional event rule, 40 Code of Federal Regulations (CFR) §50.14, as well as guidance to implement the requirements of the FCAA regarding exceptional events. States are required to identify air quality monitoring data potentially affected by exceptional events by flagging the data submitted into the EPA Air Quality System (AQS) database. If the EPA concurs with this demonstration, the flagged data will not be eligible for consideration when making NAAQS compliance determinations.

This document discusses the Texas Commission on Environmental Quality (TCEQ) proposed exceptional event day flag for particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}), occurring on December 23, 2020, as listed in Appendix A. This proposed exceptional event flag is for daily average measurements from the Federal Reference Method (FRM) PM_{10} monitors at the Socorro Hueco (C49) and Riverside/El Paso Mimosa (C9996) sites. The data being requested for exclusion have regulatory significance and affect the regulatory determination concerning the portion of El Paso County in which the Riverside/El Paso Mimosa (C9996) site is located. This site falls within the area officially designated as nonattainment by the EPA for the 1987 PM_{10} NAAQS. The Socorro Hueco air monitoring site falls outside the area officially designated as nonattainment by the EPA for the 1987 PM_{10} NAAQS. Although outside of the nonattainment area, the data from the Socorro Hueco monitor is relevant to assist with maintaining this portion of El Paso County's attainment status. The El Paso County PM_{10} and particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) sites, including the Riverside/El Paso Mimosa (C9996) and Socorro Hueco (C49) sites, are shown in Figure 1-1: *El Paso County PM_{10} Monitoring Sites* and Figure 1-2: *El Paso County $PM_{2.5}$ Monitoring Sites.*

With this demonstration, the TCEQ is providing detailed evidence to support concurrence by the EPA for the PM_{10} exceptional event flags shown in Table A-1 of Appendix A. This document was posted on the main TCEQ webpage at [TCEQ Exceptional Event Flag Demonstrations](https://www.tceq.texas.gov/airquality/monops/pm_flags.html) (https://www.tceq.texas.gov/airquality/monops/pm_flags.html) for a 30-day public comment period. Comments received were reviewed and are included with this demonstration to the EPA for consideration. No comments disputing or contradicting factual evidence provided in the demonstration were received.

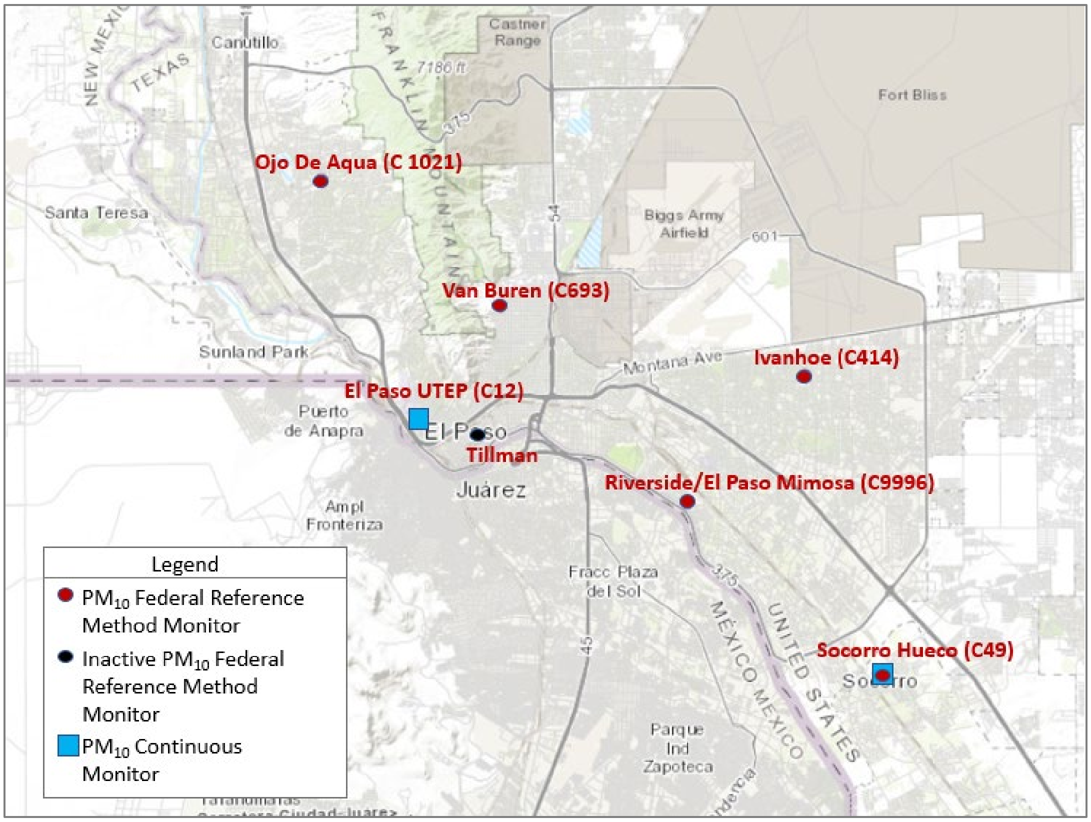

Figure 1-1: El Paso County PM_{10} Monitoring Sites

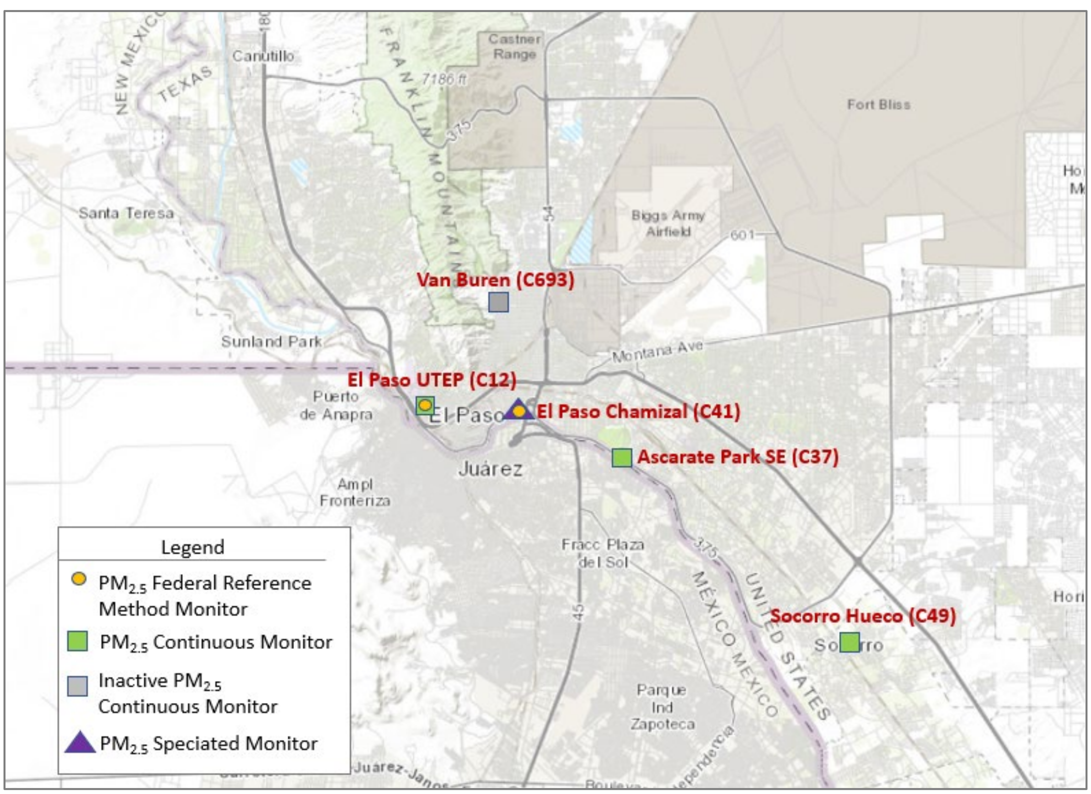

Figure 1-2: El Paso County $PM_{2.5}$ Monitoring Sites

1.1 EXCEPTIONAL EVENT DEFINITION AND CRITERIA

An exceptional event is defined in 40 CFR §50.1(j) as "an event(s) and its resulting emissions that affect air quality in such a way that there exists a clear causal relationship between the specific event(s) and the monitored exceedance(s) or violation(s), is not reasonably controllable or preventable, is an event(s) caused by human activity that is unlikely to recur at a particular location or a natural event(s), and is determined by the [EPA] Administrator in accordance with 40 CFR §50.14 to be an exceptional event." Furthermore, 40 CFR §50.14(c)(3)(iv) states that the demonstration to justify data exclusion shall include:

- 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);
- 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;
- Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times;
- A demonstration that the event was both not reasonably controllable and not reasonably preventable; and
- A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.

Additionally, 40 CFR §50.14(c)(3)(v) requires that the state must:

- Document that the state followed the public comment process and that the comment period was open for a minimum of 30 days;
- Submit the public comments it received along with its demonstration to the Administrator; and
- Address in the submission to the Administrator those comments disputing or contradicting factual evidence provided in the demonstration.

These eight requirements must all be satisfied for data to be excluded from regulatory decisions as an exceptional event. Requirements one through five will be addressed individually in this demonstration document, and documentation for six through eight will be provided as an addendum upon final submittal to the EPA.

Mitigation of exceptional events is also required by 40 CFR §51.930, which reads:

A State requesting to exclude air quality data due to exceptional events must take appropriate and reasonable actions to protect public health from exceedances or violations of the national ambient air quality standards. At a minimum, the State must:

- provide for prompt public notification whenever air quality concentrations exceed or are expected to exceed an applicable ambient air quality standard;
- provide for public education concerning actions that individuals may take to reduce exposures to unhealthy levels of air quality during and following an exceptional event; and
- provide for the implementation of appropriate measures to protect public health from exceedances or violations of ambient air quality standards caused by exceptional events.

These requirements will be addressed in Chapter 6: *Mitigation of Exceptional Events* in this demonstration.

1.2 SUMMARY OF APPROACH

The TCEQ used several methods for developing a demonstration that shows the high PM_{10} measurements in question qualify as exceptional events. Analyses performed by the TCEQ included:

- evaluating historical trends in PM_{10} and $PM_{2.5}$ data from long-term FRM monitoring sites for a period of over 10 years;
- identifying dust contributions in observed $PM_{2.5}$ concentrations using $PM_{2.5}$ speciation data from El Paso's Chemical Speciation Network (CSN) monitor at the Chamizal site; and
- tracking blowing dust from primary source areas with available satellite imagery from the National Oceanic and Atmospheric Administration (NOAA) (NOAA, 2021).

1.2.1 Data and Imagery Used

For the analyses presented in this document, the TCEQ used monitoring data, satellite imagery, and backward trajectory information. The particulate data are presented in micrograms per cubic meter ($\mu g/m^3$). PM_{10} data are in standard conditions (SC) which are adjusted to a standard temperature of 25 degrees centigrade and atmospheric pressure of 760 millimeters of mercury. $PM_{2.5}$ data are in local conditions of temperature and pressure measured at the monitor as required for reporting to EPA's AQS database. The satellite imagery includes three-channel composite true color visible imagery with 0.25-kilometer resolution from the NOAA Terra polar orbiting satellite's Moderate Resolution Imaging Spectroradiometer (MODIS) sensor and the Suomi-National Polar orbiting Partnership satellite's Visible Infrared Imaging Radiometer Suite sensor. True Color imagery was designed to display the Earth in colors similar to what we might see with our own eyes. True Color imagery facilitates rapid delineation of surface types and atmospheric features.

As detailed in Table 1-1: *El Paso County PM_{10} and $PM_{2.5}$ Sampler Types*, the monitoring data include FRM non-continuous PM_{10} and $PM_{2.5}$ daily measurements, non-continuous $PM_{2.5}$ speciated daily measurements, and continuous PM_{10} and $PM_{2.5}$ measurements used for daily reporting of the EPA Air Quality Index (AQI). All of the data in Table 1-1 are available in the EPA's AQS database (EPA1, 2021) except for the continuous PM_{10} monitors at the El Paso UTEP (C12) and Socorro Hueco (C49) sites, which are not reported to AQS.

Air parcel trajectories that will be presented in this document were produced using the NOAA Applied Research Laboratory (ARL) Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model available on the ARL HYSPLIT webpage (http://www.arl.noaa.gov/hysplit/) (NOAA ARL, 2021). HYSPLIT models simulate the dispersion and trajectory of substances transported and dispersed through our atmosphere over local to global scales. In this document, backward trajectory analysis was used to determine the origin of air masses and establish source-receptor relationships. These trajectories show the modeled path of the air mass, arriving at hours chosen based on relevance to this event, on the way to a chosen point relevant to the study. Times are most frequently listed in Mountain Standard Time (MST), but from some sources time is listed in Coordinated Universal Time (UTC), which is seven hours ahead of MST.

Table 1-1: El Paso County PM_{10} and $PM_{2.5}$ Sampler Types

Site Name	AQS Site Identifier	AQS Parameter Identifier	POC	Sampler Type
Ascarate Park SE (C37)	481410055	88502	3	$PM_{2.5}$ continuous
El Paso Chamizal (C41)	481410044	88101	1	$PM_{2.5}$ FRM non-continuous
El Paso Chamizal (C41)	481410044	88502	5	$PM_{2.5}$ non-continuous speciated
El Paso UTEP (C12)	481410037	81102	4	PM_{10} continuous
El Paso UTEP (C12)	481410037	88101	1	$PM_{2.5}$ FRM non-continuous
El Paso UTEP (C12)	481410037	88502	3	$PM_{2.5}$ continuous
Ivanhoe (C414)	481410029	81102	1	PM_{10} FRM non-continuous
Ojo De Agua	481411021	81102	1	PM_{10} FRM non-continuous
Ojo De Agua	481411021	81102	2	PM_{10} FRM non-continuous
Riverside/El Paso Mimosa (C9996)	481410038	81102	1	PM_{10} FRM non-continuous
Socorro Hueco (C49)	481410057	81102	1	PM_{10} FRM non-continuous
Socorro Hueco (C49)	481410057	81102	2	PM_{10} FRM non-continuous
Socorro Hueco (C49)	481410057	81102	4	PM_{10} continuous
Socorro Hueco (C49)	481410057	88502	3	$PM_{2.5}$ continuous
Van Buren (C693)	481410693	81102	1	PM_{10} FRM non-continuous
Van Buren (C693)*	481410693	88502	1	$PM_{2.5}$ continuous
Tillman (C413)**	481410002	81102	2	PM_{10} FRM non-continuous

Notes:
*Last recorded data in 2017
**Last recorded data in 2013
Abbreviations:
AQS EPA's air quality system database
POC AQS parameter occurrence code to differentiate collocated monitors.
FRM Federal Reference Method

1.2.2 Analysis Methods

Several methods were used to determine if the proposed event qualifies as an exceptional event. These methods include time series plots to show trends and events, comparison to statistical percentiles to show relevance, examination of satellite and webcam imagery for evidence of dust plumes, and review of backward-in-time air trajectories for independent confirmation of transport path of the affected air. In addition, daily averages of hourly PM_{10} and $PM_{2.5}$ continuous data were compiled for comparison with non-continuous data and Interagency Monitoring of Protected Visual Environments (IMPROVE) calculated particulate matter components. $PM_{2.5}$ speciation components (IMPROVE, 2021) (Eldred, 2003) were calculated from $PM_{2.5}$ CSN speciation data to confirm the predominance of the soil component in high wind blowing dust events.

The TCEQ also used El Paso County PM_{10} monitoring data on high wind speed non-event days to compare with the high wind speed dust events. Surrogate days were selected based on daily wind speed and direction comparable to event days. Each day recorded a peak area one-hour average wind speed greater than or equal to 25 miles per hour (mph).

1.3 SUMMARY OF FINDINGS

Information provided in this demonstration supports the conclusion that the high PM_{10} daily average measurements proposed as exceptional events qualify as exceptional events. The measured PM_{10} concentrations on December 23, 2020 were not reasonably controllable or preventable, were associated with a natural event due to internationally and domestically transported dust associated with high winds, and were in excess of normal historical fluctuations. The TCEQ requests the EPA's concurrence on this exceptional event and to have this flagged day removed from consideration when making compliance determinations for the annual PM_{10} NAAQS.

CHAPTER 2: NARRATIVE CONCEPTUAL MODEL OF EVENT

2.1 EL PASO CLIMATE

Much of Far West Texas, including El Paso County, is part of the Chihuahuan Desert which extends into Arizona, New Mexico, and the Mexican state of Chihuahua. Rainfall in this area is highly variable from year-to-year with an average of 8.77 inches per year measured at National Weather Service (NWS) weather station at the El Paso International Airport (KELP) over the period from 2000 through 2020. Precipitation information is shown in Figure 2-1: *Annual Precipitation Measured at El Paso International Airport from 2000 through 2020.*

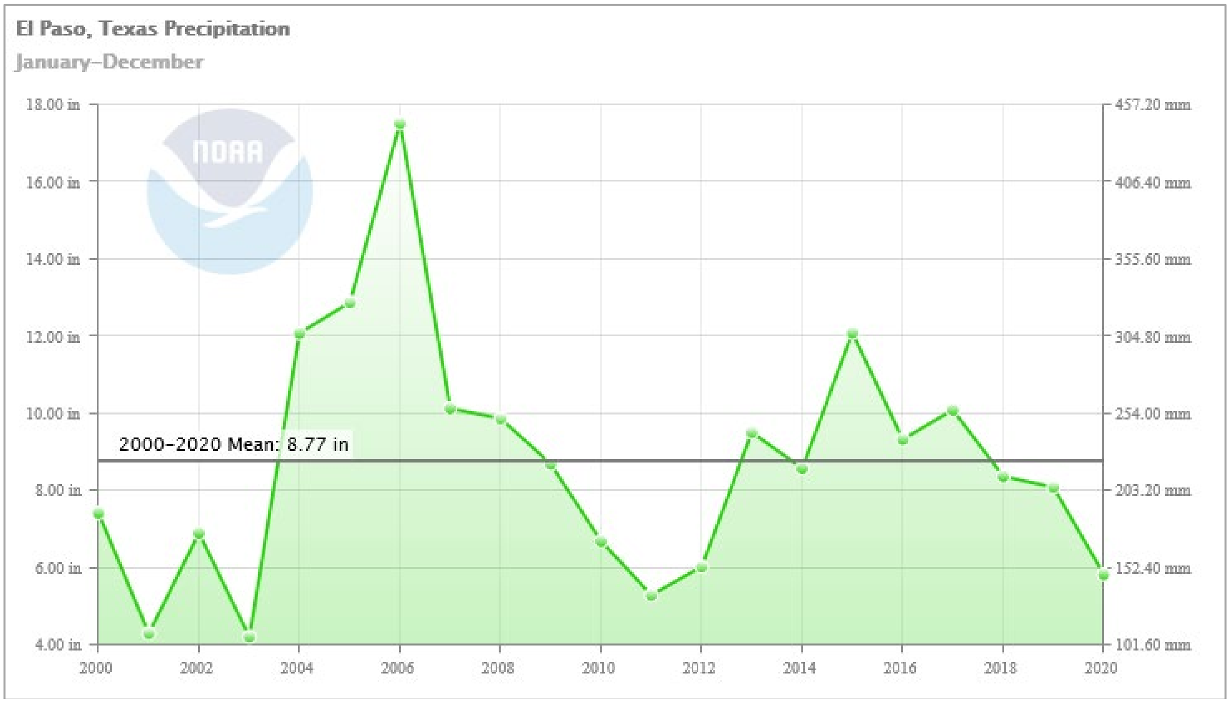

Figure 2-1: Annual Precipitation Measured at El Paso International Airport from 2000 through 2020

A large portion of this scarcely vegetated desert contains dried lakebeds and playas made of loose, fine soils. These soils can easily be picked up and remain in the air by moderate to high wind gusts of 30 miles per hour (mph) or greater (TCEQ1, 2007). The overall frequency and intensity of these dust storms are highly dependent on weather conditions and existing moisture content of the soils. Because similar meteorological trends are expected to continue, it is likely that similar dust storms will continue to occur in future years.

2.2 EL PASO COUNTY PARTICULATE MATTER AIR QUALITY TRENDS

Trends in particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) annual maximum 24-hour averages for El Paso County show variability year-to-year. This variability is influenced by causes including dust events, coinciding with sampling days. PM_{10} trends from Federal Reference Method (FRM) monitors currently in operation or with a long period of record in El Paso County are presented in Figure 2-2: *El Paso County PM_{10} Annual Maximum 24-hour Averages for FRM Monitoring Sites,* *Including Exceptional Event Days*. The following are gaps in data displayed in Figure 2-2:

- The Tillman (C413) PM_{10} FRM monitor was deactivated effective April 11, 2013.
- The Ivanhoe (C414), Riverside (C9996), Van Buren (C693), and Ojo de Agua (C1021) PM_{10} FRM data were retroactively invalidated following a 2016 technical systems audit finding that the laboratory performing the gravimetric analysis on samples collected from October 25, 2013 through October 21, 2016 did not use the federally required method. This caused years 2014, 2015, and 2016 to have less than 75% valid data, which was therefore incomplete. Additionally, the Ojo de Agua (C1021) PM_{10} FRM monitors (both primary and collocated) were officially activated effective April 15, 2013, making the year 2013 incomplete for this site as well.
- The site access agreement for the original Socorro site was unexpectedly terminated by the property owner in early 2012. The site was relocated to the Hueco Elementary School and began operating in late 2012. Consequently, there are no PM_{10} FRM data available at Socorro from January 28 through December 23, 2012. This caused the year 2012 to have less than 75% valid data, which was therefore incomplete.
- The Riverside (C9996) PM_{10} air monitoring site, deployed in 1988, was relocated approximately 0.37 miles and renamed El Paso Mimosa (C9996) in December 2019.

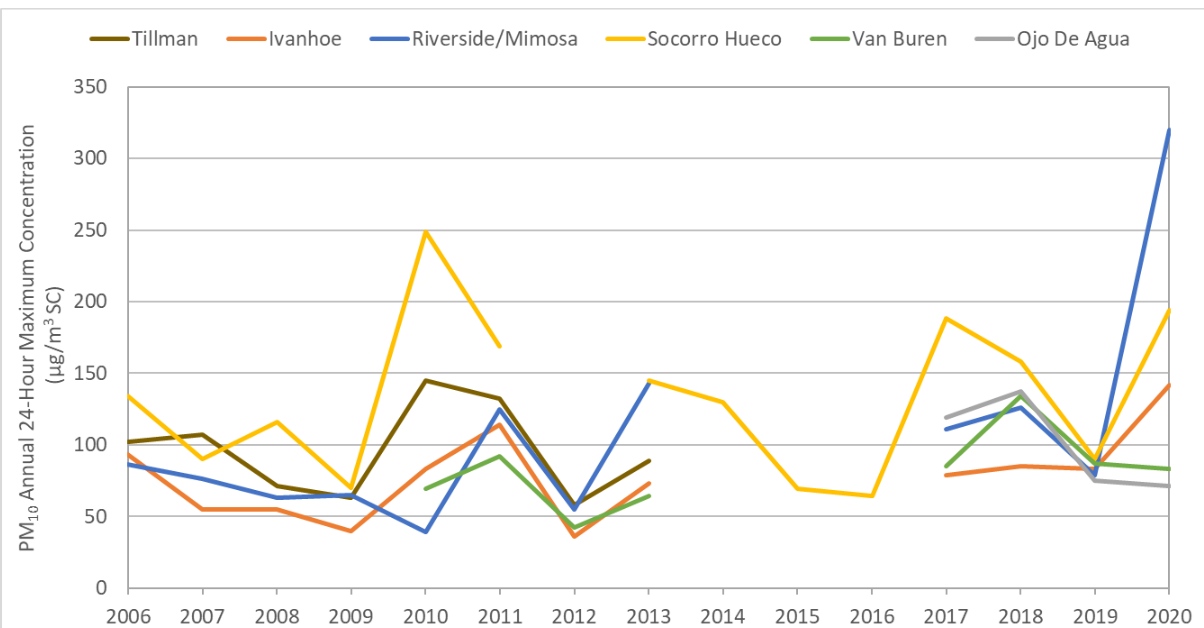

Figure 2-2: El Paso County PM_{10} Annual Maximum 24-hour Averages for FRM Monitoring Sites, Including Exceptional Event Days

Overall, annual average particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) levels in El Paso County have been relatively stable since 2006, while the 98th percentile of $PM_{2.5}$ 24-hour average measurements have shown more variability from year-to-year. Because the 98th percentile of the 24-hour average represents the highest 2% of all 24-hour measurements, the presence or absence of dust events on sampling days can greatly influence trend variability. Figure 2-3: *El Paso $PM_{2.5}$ Annual Averages and Annual 98th Percentile of 24-hour Averages for Long-Term*

FRM Monitoring Sites, Including Exceptional Event Days graphically depicts trends in both the annual and 98th percentile of the 24-hour average using FRM $PM_{2.5}$ data collected from the El Paso Chamizal (C41) and El Paso UTEP (C12) sites.

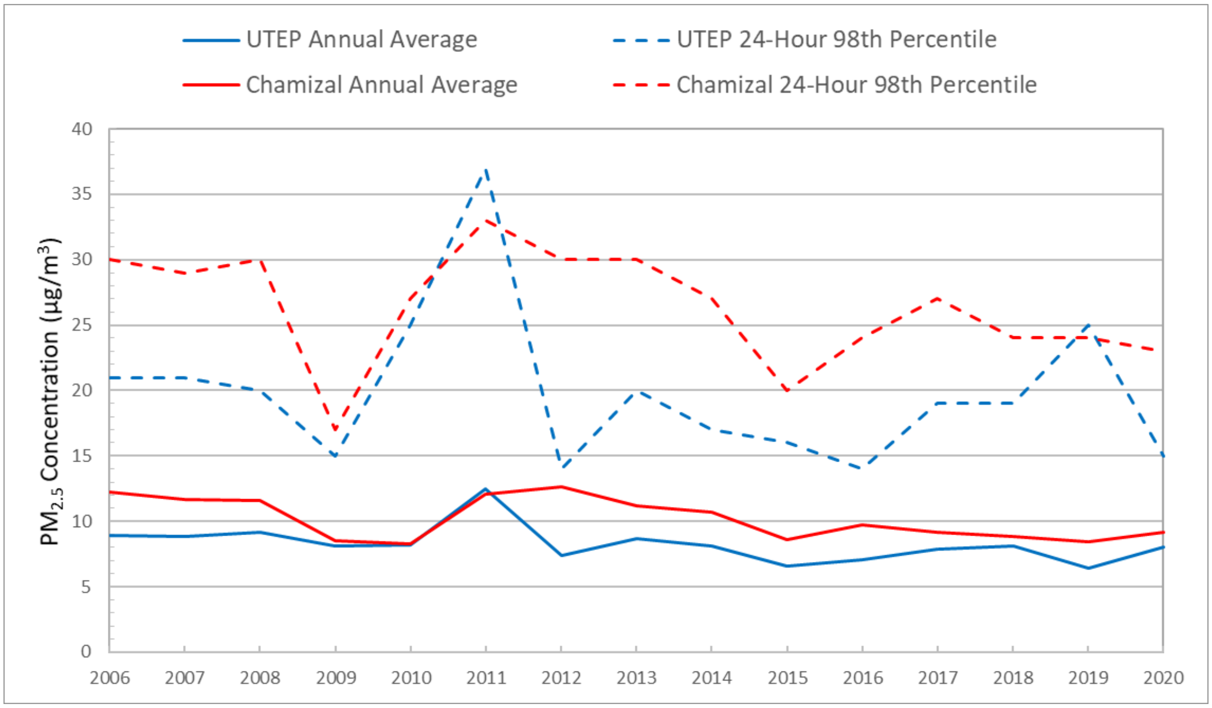

Figure 2-3: El Paso $PM_{2.5}$ Annual Averages and Annual 98th Percentile of 24-hour Averages for Long-Term FRM Monitoring Sites, Including Exceptional Event Days

Historically, PM_{10} and $PM_{2.5}$ levels in El Paso County have been heavily impacted by natural high-wind events where large amounts of blowing dust are generated outside of and transported into El Paso County. These dust events are most commonly caused by regional high winds associated with large low-pressure systems. Regional blowing dust from the White Sands area in New Mexico can also be transported into El Paso County. Additionally, regional blowing dust generated in eastern New Mexico and the Texas Panhandle behind strong cold fronts can be transported into El Paso County. These large regional-scale dust storms occur mainly in the spring but can occur from late October into early June. On a local scale, high winds from nearby thunderstorms can generate dust that is transported into El Paso County. These local-scale thunderstorm high-wind dust events are most common in June and July. Long-range transport from other types of events also influences particulate matter concentrations in El Paso County, including smoke from fires, haze, and anthropogenic emissions in the United States (U.S.) and Mexico. These smoke and haze transport events affect $PM_{2.5}$ levels more than PM_{10} levels because $PM_{2.5}$ particles, being smaller than PM_{10} particles, can remain aloft for longer periods of time and can thus travel greater distances.

2.2.1 Blowing Dust and Wind

The United States Environmental Protection Agency (EPA) High Wind Dust Event Guidance (EPA, 2019) suggests using a peak sustained wind speed of 25 mph, at averaging times as short as one minute and as long as one hour, as a threshold for determining possible influence from blowing dust. In El Paso, two-minute sustained wind measurements are available from the NWS weather station at KELP, while five-minute and one-hour sustained wind measurements are available from several area Texas Commission on Environmental Quality (TCEQ) monitoring sites in the area. Peak wind gust measurements are available from both the NWS weather station and most TCEQ monitoring sites in the area.

Without the influence of blowing dust, higher wind speeds normally result in particulate concentrations that are dominated by incoming background levels which involves particulate transported from outside of El Paso County. At higher wind speeds, the impact of local sources becomes substantially diluted. This dilution is proportional to wind speed for a given vertical mixing height which is the height of vertical mixing of air and suspended particles above the ground. Additionally, high winds cause mechanical mixing. Mechanical mixing is a process that uses the kinetic energy of relative fluid motion at night and weakens the formation of nocturnal inversions (an increase in temperature with increasing height above the earth's surface), thus supporting deeper vertical mixing and lower pollutant concentrations.

An evaluation of PM_{10} and $PM_{2.5}$ measurements in El Paso County versus peak area sustained hourly wind speeds reveals that an increase in particulate levels is observed when peak area hourly wind speeds reach 25 mph or more, indicating a strong influence from wind-blown dust. Figure 2-4: *El Paso County Daily Peak PM_{10} Average for FRM Measurements versus El Paso County Daily Peak Sustained Hourly Wind Speed for 2006 through 2020* shows that the highest PM_{10} concentrations were recorded when peak area wind speeds exceeded 25 mph. Of particular interest in Figure 2-4 are the seven daily PM_{10} FRM measurements, six of which occurred at the Socorro Hueco site, in the upper righthand box bounded by the PM_{10} 24-hour National Ambient Air Quality Standard and high wind threshold lines in red. Five of these measurements are exceptional events the EPA has previously approved; the other two, circled in blue, are the proposed exceptional events that are the subject of this demonstration. Figure 2-5: *El Paso County Daily Peak $PM_{2.5}$ Average for FRM Measurements versus El Paso County Daily Peak Sustained Hourly Wind Speed for 2006 through 2020* shows that, similar to PM_{10}, $PM_{2.5}$ concentrations are greatest when peak area hourly wind speeds exceed 25 mph. The 25-mph wind speed is consistent with the EPA high wind threshold of 25 mph for western states including Texas.

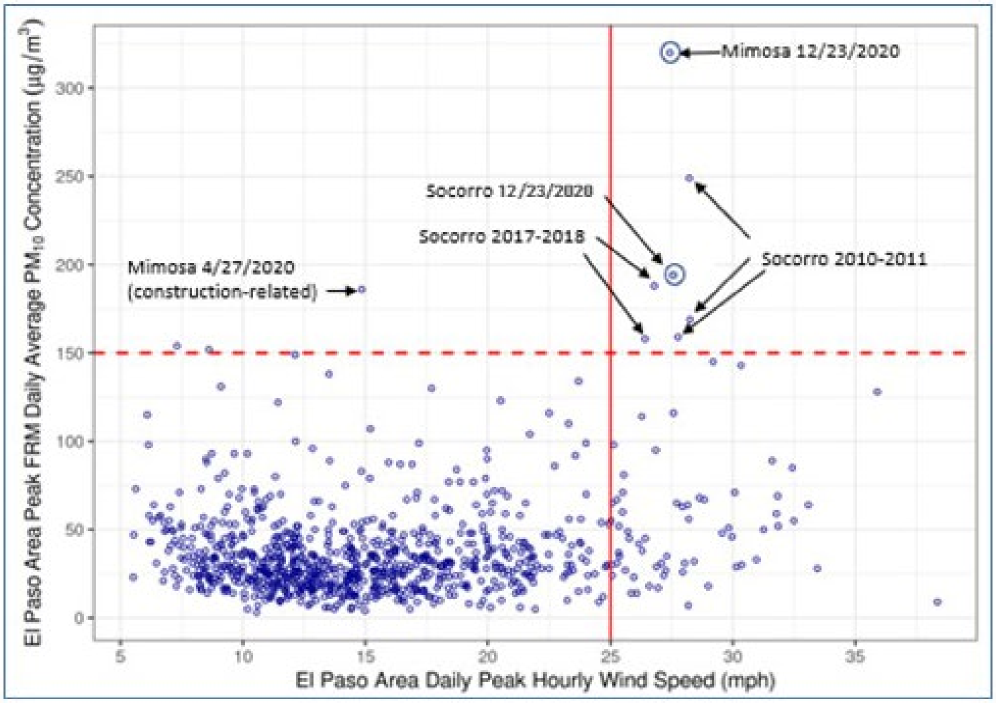

Figure 2-4: El Paso County Daily Peak PM_{10} Average for FRM Measurements versus El Paso County Daily Peak Sustained Hourly Wind Speed for 2006 through 2020

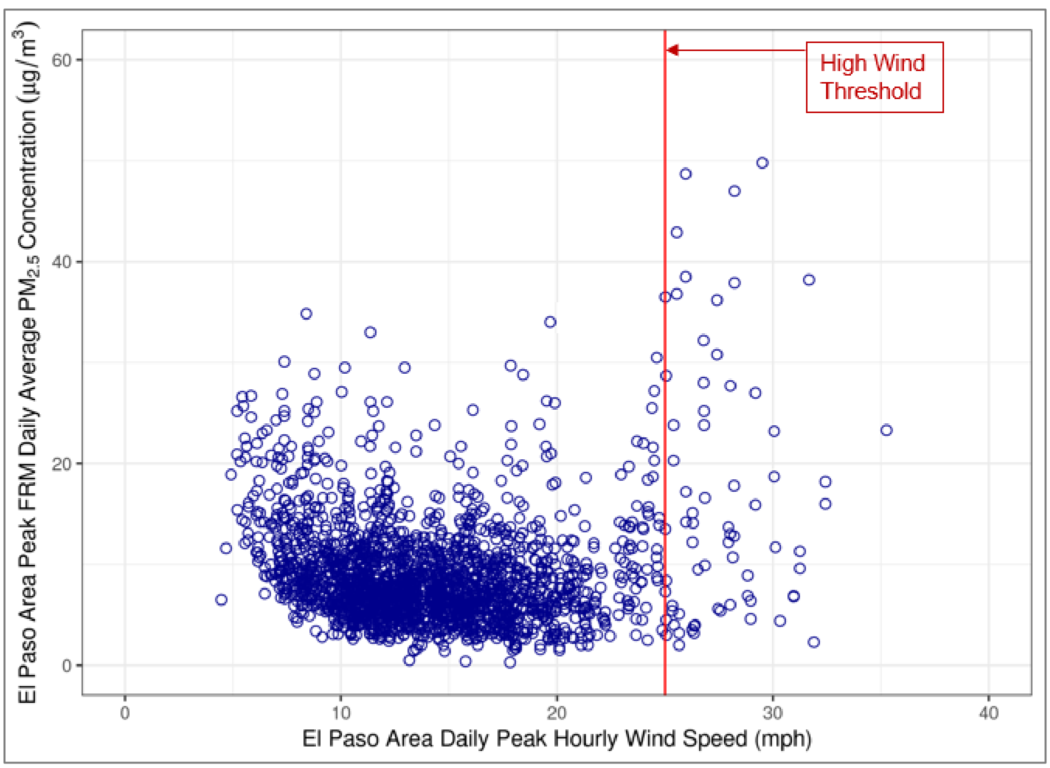

Figure 2-5: El Paso County Daily Peak $PM_{2.5}$ Average for FRM Measurements versus El Paso County Daily Peak Sustained Hourly Wind Speed for 2006 through 2020

Specific to the Socorro Hueco (C49) air monitoring site, Figure 2-6: *Socorro Hueco (C49) Hourly Average Continuous PM_{10} Concentration versus Hourly Wind Speed for 2019 and 2020* shows the dramatic decrease in the frequency of hourly PM_{10} measurements in the zero through 200 micrograms per cubic meter ($\mu g/m^3$) range once hourly winds reach 20 mph (noticeable even as low as 18 mph). There is one outlier where the hourly PM_{10} concentration, above 2000 $\mu g/m^3$, is the highest it had been over the two years, yet the windspeed, less than 5 mph, is not elevated. This value is believed to be related to a short-lived local disturbance at the site. Upon review of hourly PM_{10} data, the high value occurred at 12:00 Mountain Standard Time (MST) on April 1, 2019, with slightly elevated values also recorded at 11:00 MST and 13:00 MST. All other monitored, hourly concentrations on this date at this site were normal. A review of the operator log at this site for this date shows that a technician was performing maintenance at the site during the period of elevated hourly PM_{10} concentrations. It is possible that this activity generated the spike in hourly PM_{10} concentrations at this monitor. Additionally, there was no spike in $PM_{2.5}$ concentrations at this monitor on this day when the PM_{10} concentrations spiked. This fact provides further evidence that this outlier PM_{10} hourly value was a result of technician maintenance activity at the site.

Figure 2-7: *El Paso UTEP (C12) Hourly Average Carbon Monoxide Concentrations versus El Paso UTEP (C12) Hourly Wind Speeds for 2019 and 2020* shows the impact to concentrations of more localized pollutants that begin to occur at higher wind speeds. Figure 2-7 is provided for comparison with Figure 2-6. The difference in the relationship with hourly wind speeds between PM_{10} and carbon monoxide is pronounced at higher wind speeds. Instead of tailing off to incoming background levels from the effects of dilution as with carbon monoxide, PM_{10} concentrations increase with higher wind speeds, indicating an impact from windblown dust at wind speeds above approximately 18 mph, with the clearest influence at speeds above 20 mph.

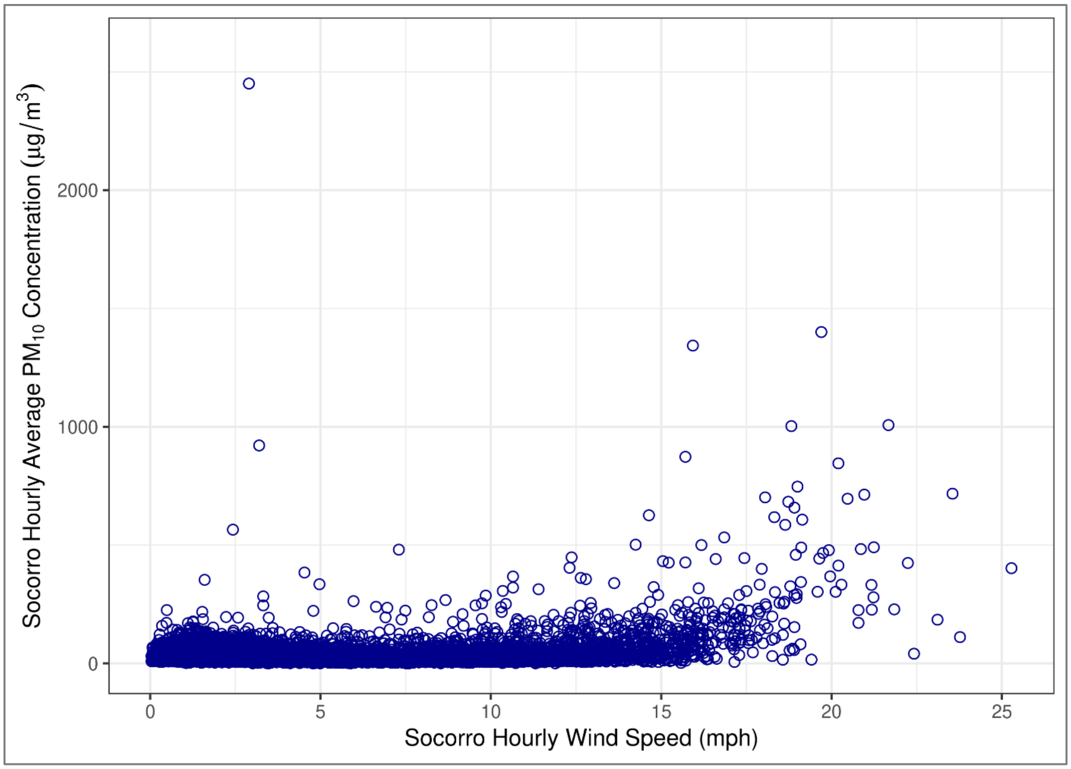

Figure 2-6: Socorro Hueco (C49) Hourly Average Continuous PM_{10} Concentration versus Hourly Wind Speed for 2019 and 2020

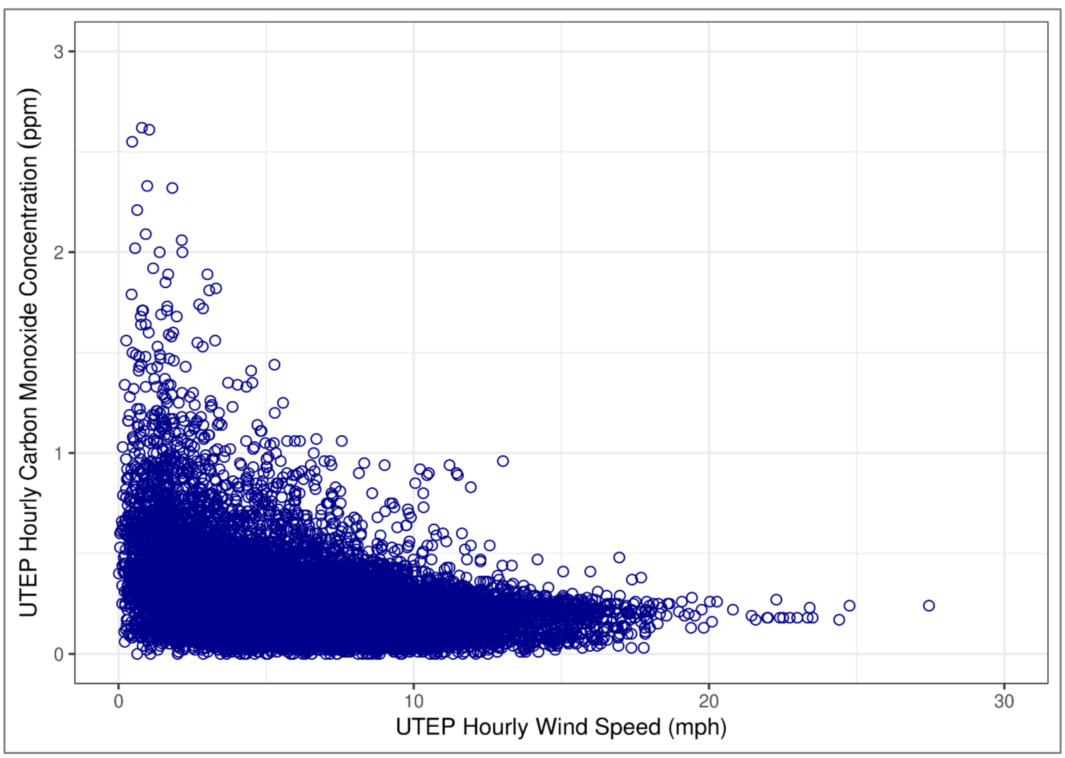

Figure 2-7: El Paso UTEP (C12) Hourly Average Carbon Monoxide Concentrations versus El Paso UTEP (C12) Hourly Wind Speeds for 2019 and 2020

2.3 EVENT DAY SUMMARY INFORMATION

The event day, December 23, 2020, is characterized by a cold front passing through El Paso County. Strong northerly and westerly winds were present along and behind the frontal boundary. Peak sustained wind speeds of 35 mph along with peak gusts of 47 mph were recorded on the event day, as measured at the NWS weather station KELP. These winds carried high levels of particulate matter associated with blowing dust into El Paso County. Evidence to support the impact of the dust event provided in this analysis includes webcam images, satellite imagery, backward-in-time air parcel trajectories, continuous particulate matter data, and wind speed data. An event day analysis is provided in the text of this document and in Appendix B: *Event Analysis for December 23, 2020*.

2.3.1 Wind and Particulate Measurements

A list of the PM_{10} concentration and wind measurements on the event day is provided in Table 2-1: *El Paso Area Wind Measurements and PM_{10} concentrations at the Socorro Hueco and Riverside/El Paso Mimosa Monitors*. The event day had peak sustained winds measured in excess of the suggested 25 mph threshold for blowing dust cited in the EPA's guidance (EPA, 2019). Wind directions associated with peak sustained winds during the event were initially from the west and shifted to the north in the early afternoon. This shift is consistent with backward trajectory models for air parcels arriving at the time of peak particulate matter hourly measurements. Satellite imagery, only available at 10:25 MST prior to the highest winds still shows an indication of dust plumes originating from west of El Paso.

Table 2-1: El Paso Area Wind Measurements and PM_{10} concentrations at the Socorro Hueco and Riverside/El Paso Mimosa Monitors

Date	Socorro Hueco (C49) FRM PM_{10} (µg/m^3)	Riverside/ El Paso Mimosa (C9996) FRM PM_{10} (µg/m^3)	Peak KELP Wind Gust (mph)	Peak KELP 2-min Wind Speed (mph)	Peak Area 5-min Wind Speed (mph)	Peak Area Hourly Wind Speed (mph)	Peak Socorro Hueco (C49) Hourly Wind Speed (mph)	Wind Direction at Peak 2-min Speed (degrees)
December 23, 2020	194	320	47	35	31	28	20	10

Note: Only the flagged particulate matter concentrations at the Socorro Hueco (C49) and Riverside/El Paso Mimosa monitor (C9996) on December 23, 2020 are listed in this table. See Table 2-2: *El Paso County Particulate Matter Measurements on the Exceptional Event Day* for all available particulate matter measurements on this day. Wind measurements are from the NWS El Paso International Airport weather station (KELP) and from El Paso area air quality monitoring stations, including the Socorro Hueco (C49) site. The Riverside/El Paso Mimosa monitor (C9996) does not record wind information. The peak wind speeds depicted include sustained two-minute averages (2-min Wind Speed), five-minute averages (5-min Wind Speed), and hourly averages (Hourly Wind Speed). The associated peak wind directions are in degrees clockwise from true north and indicate the direction from which the wind was blowing at the time of peak sustained two-minute wind speed.

The EPA's high winds guidance (EPA, 2019) suggests a minimum sustained wind speed of 25 mph for western states including Texas, or development of an alternate area-specific high wind threshold at which a dust event could occur. The December 23, 2020 event meets the strictest definition of this threshold with peak area hourly wind speeds greater than 25 mph and sustained wind speeds at shorter averaging periods of five and two minutes reaching 31 and 35 mph, respectively. The high winds were in the local as well as the regional area, indicating that PM_{10} concentrations recorded were influenced by regional transport.

The TCEQ used NOAA Air Resources Laboratory (ARL) meteorological model results to determine wind speeds in the source areas. Specifically, the TCEQ used the 12-kilometer (km) North American Model (NAM) hourly wind speeds and wind vectors at a 10-meter height. Figure 2-8: *NOAA ARL Model Wind Field in El Paso County at 14:00 MST on December 23, 2020* illustrates the predicted wind speeds in the dust source areas for the flagged event day. This model supports the occurrence of windblown dust from the source areas at wind speed averages in the 15 through 25 nautical miles per hour, or 17 through 29 mph, range.

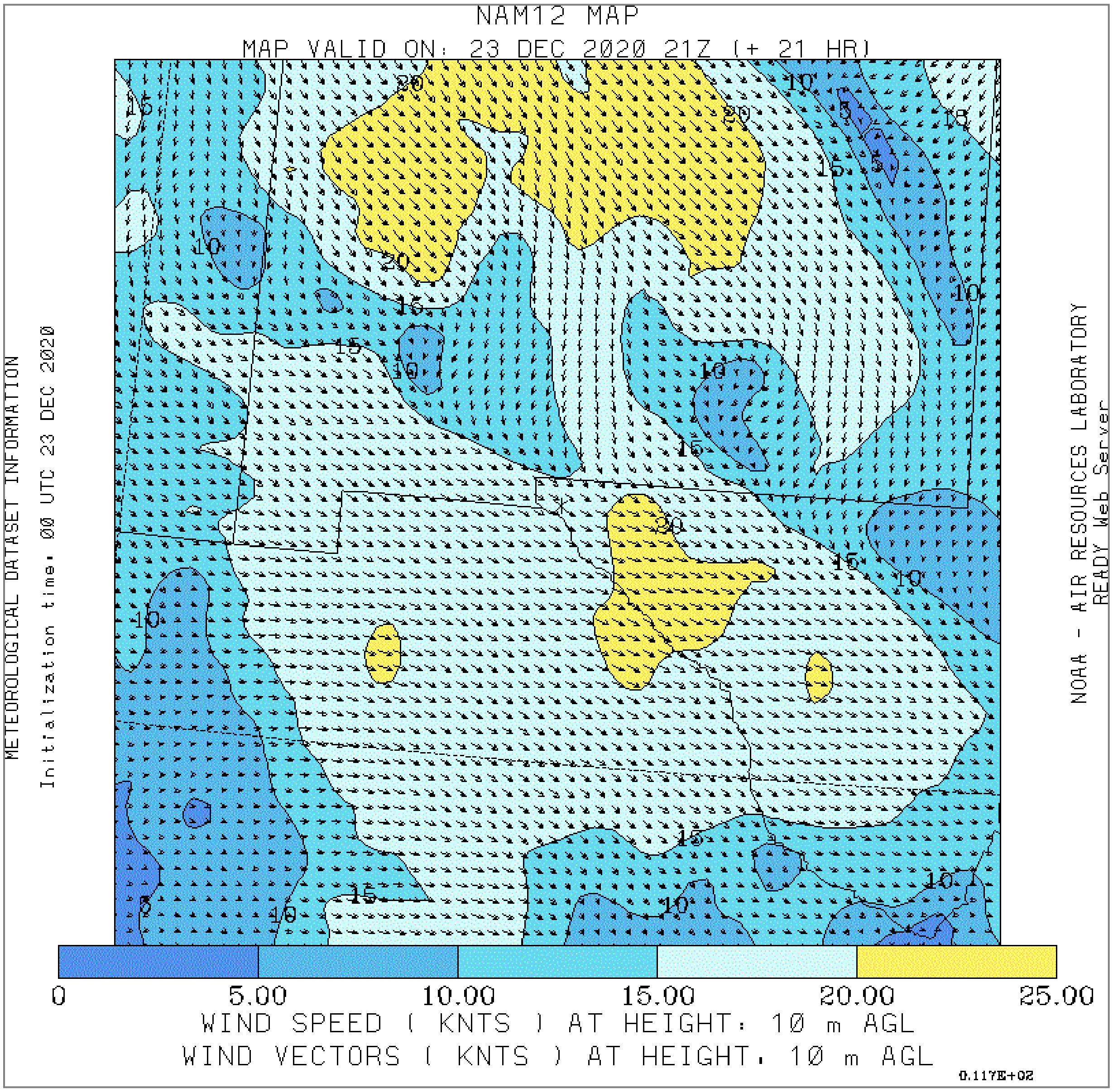

Figure 2-8: NOAA ARL Model Wind Field in El Paso County at 14:00 MST on December 23, 2020

As depicted in Figure 2-8, the event on December 23, 2020 was characterized by high winds over a very large area, not just in the immediate El Paso area. As documented by Prospero et al. (2002), Gill et al. (2007), Rivera Rivera (2006), and Novlan et al. (2007), natural sources just south of the U.S.-Mexico border have been found to contribute to dust storm events in El Paso. Additionally, as documented by Gill et al. (2012), the White Sands area in New Mexico, is one of the most intense and frequent source areas of blowing dust in North America. On December 23, 2020, high winds from the west, prior to rapidly shifting north, traveled over both dust-source areas (White Sands, New Mexico and the area just south of the U.S.-Mexico border) prior to arriving at the Socorro Hueco monitoring site.

Measurements from El Paso area monitoring sites help confirm the large-scale nature of the high winds and characterize the event impacts on a localized scale immediately surrounding the monitoring sites. Additionally, the wind field depicted in Figure 2-8 shows the presence of high winds in locations outside of El Paso County.

The contribution of Chihuahuan Desert sources, in the primarily unpopulated areas of northern Chihuahua, Mexico, to dust events that impact El Paso has been well established in peer-reviewed literature. A study conducted by Novlan et al. (2007) of over 1,000 significant dust events in El Paso from 1932 through 2005 observed that transport of blowing dust into El Paso County can occur at wind speeds of approximately 10 to 20 miles per hour. Rivera (2006) examined nine dust events from 2002 and 2003 with the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model and noted that source area wind speeds for periods associated with dust events were at least 10 meters per second (m/s) (22 mph) compared to 4 m/s (9 mph) during non-dust events. These studies indicate windblown dust can impact El Paso County at wind speeds below 25 mph. Furthermore, as documented by Gill et al. (2012), the White Sands area in New Mexico is one of the most intense and frequent source areas of blowing dust in North America, and northerly winds above the thresholds found in the literature discussed above were recorded on December 23, 2020.

All available continuous and non-continuous El Paso area daily average particulate measurements from December 23, 2020 are provided in Table 2-2: *El Paso County Particulate Matter Measurements on the Exceptional Event Day*.

Table 2-2: El Paso County Particulate Matter Measurements on the Exceptional Event Day

Site	Type	Method	Concentration ($\mu g/m^3$)
Ivanhoe (C414)	PM_{10}	FRM	142
El Paso UTEP (C12)	PM_{10}	C	55
Riverside/El Paso Mimosa (C9996)	PM_{10}	FRM	320*
Socorro Hueco (C49)	PM_{10}	FRM	194*
Socorro Hueco (C49)	PM_{10}	FRQ	No data
Socorro Hueco (C49)	PM_{10}	C	140
Van Buren (C693)	PM_{10}	FRM	63
Ojo de Agua (C1021)	PM_{10}	FRM	46
Ojo de Agua (C1021)	PM_{10}	FRQ	No data
El Paso UTEP (C12)	$PM_{2.5}$	FRM	7.6
El Paso UTEP (C12)	$PM_{2.5}$	C	8.7**
El Paso Chamizal (C41)	$PM_{2.5}$	FRM	9.6
El Paso Chamizal (C41)	$PM_{2.5}$	FRQ	12
El Paso Chamizal (C41)	$PM_{2.5}$	CSN	11.9
Socorro Hueco (C49)	$PM_{2.5}$	C	16.0
Ascarate Park SE (C37)	$PM_{2.5}$	C	21.3

Notes:
*Indicates the measurement is proposed as an exceptional event.
**Only 11 hours of data were available this day.
Abbreviations:
FRM Federal Reference Method non-continuous monitor
FRQ Federal Reference Method non-continuous quality control (collocated) monitor
C continuous monitor
CSN Reconstructed $PM_{2.5}$ mass from speciated non-continuous monitor

$PM_{2.5}$ Chemical Speciation Network (CSN) speciation data were available from the El Paso Chamizal (C41) site for the event day. A summary of the El Paso Chamizal (C41) speciation data on December 23, 2020, is provided in Table 2-3: *El Paso Chamizal (C41) $PM_{2.5}$ Speciation Summary for the Exceptional Event Day*, including averages for the period from 2018 through 2020 for comparison. The speciation data show a predominance of the Interagency Monitoring of Protected Visual Environments (IMPROVE) soil component on the proposed exceptional event day indicating transported dust from high winds. Additionally, although they all have multiple sources and cannot be entirely attributed to one cause, calcium, sulfur, and strontium provide evidence of gypsum, which in its pure form is a hydrate of calcium sulfate ($CaSO_4 \cdot 2H_2O$) (White, et al., 2014). These indicators of the presence of gypsum in samples on December 23, 2020, are relevant because gypsum is the characteristic mineral of the White Sands region in New Mexico. It is likely that dust from this region was transported as far south as El Paso County on the event day due to strong northerly winds over the White Sands area. This belief is reinforced by the information provided by Dr. Thomas E. Gill, Ph.D., P.G., F.R.F.S., professor, in comments on this proposal package, in which he references the prospect of gypsum from White Sands blowing into the east side of El Paso on December 23, 2020 (Gill 2020a) and the meteorological conditions present that advect blowing dust from White Sands into parts of El Paso (Gill 2020b).

Table 2-3: El Paso Chamizal (C41) $PM_{2.5}$ Speciation Summary for the Exceptional Event Day

Species	2018 through 2020*	December 23, 2020	Difference	Percent Change	Percent Difference
FRM	8.787	9.6	0.813	9.3	8.8
RM	5.745**	4.597**	-1.148**	-20.0**	22.4**
Soil	0.300	0.426	0.126	42.0	34.7
AS	1.49	1.974	0.484	32.5	27.9
AN	0.522**	0.273**	-0.249**	-47.7**	62.6**
OC	3.249**	2.070**	-1.179**	-36.3**	44.3**
Si	0.378	0.689	0.311	82.3	58.3
Al	0.136	0.194	0.058	42.6	35.2
Fe	0.124	0.142	0.018	14.5	13.5
Ca	0.318	0.700	0.382	120.1	75.0
S	0.224	0.331	0.107	47.8	38.6
Sr	0.002	0.032	0.030	1500	176

Notes:
All units are in $\mu g/m^3$.
*Average for 2018 through 2020 including December 23, 2020.
**Average for 2018 through 2020 was greater than the value recorded on December 23, 2020.
Abbreviations:
FRM Federal Reference Method $PM_{2.5}$ concentration
RM IMPROVE reconstructed $PM_{2.5}$ mass concentration calculated from speciation data
Soil IMPROVE soil concentration calculated from speciation data
AS IMPROVE ammonium sulfate concentration calculated from speciation data
AN IMPROVE ammonium nitrate concentration calculated from speciation data
OC IMPROVE organic carbon concentration calculated from speciation data
Si silicon speciation concentration
Al aluminum speciation concentration
Fe iron speciation concentration
Ca calcium speciation concentration
S sulfur speciation concentration
Sr strontium speciation concentration

2.3.2 Synoptic Weather Maps

Weather maps are helpful for displaying large-scale observation-based weather features. Figure 2-9: *Regional Weather Map for December 23, 2020, at 14:00 MST* depicts a cold front passing through El Paso County. As shown in that figure, strong northerly and westerly winds were present along and behind the frontal boundary.

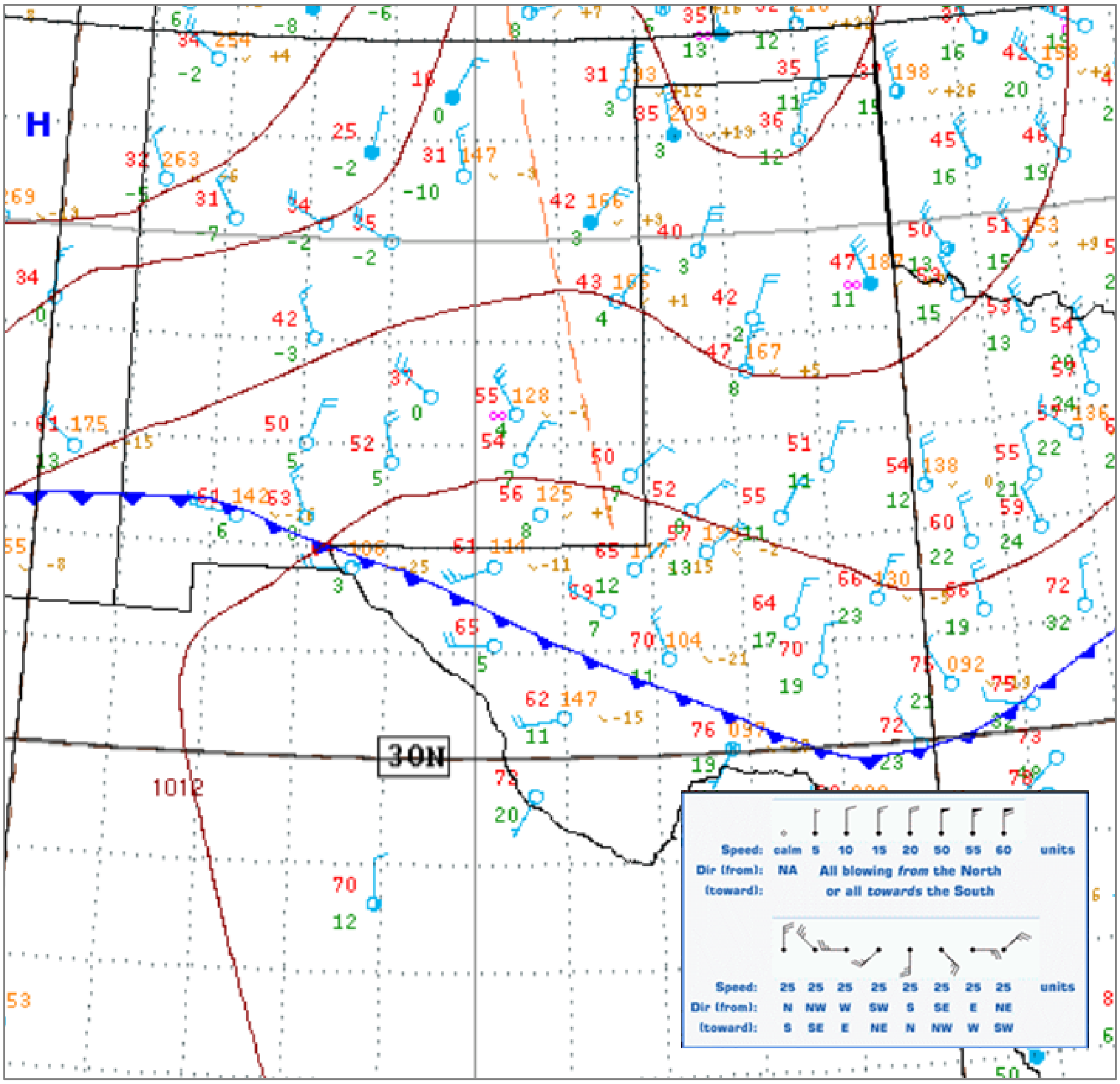

Figure 2-9: Regional Weather Map for December 23, 2020, at 14:00 MST

2.3.3 Webcam Images

Webcam imagery can help illustrate the large-scale nature of a high wind blowing dust event. If dust was coming primarily from local sources, only local dust plumes emanating from local sources would be visible in images. Instead, the webcam image shows a decrease in wide-spread visibility associated with this event, consistent with the large-scale nature of regional dust plumes. Visibility in this context is defined as the distance one can see as determined by light and weather conditions. Figure 2-10: *Texas Tech University Health Sciences Center Webcam Location* shows where the camera is located within the city, and Figure 2-11: *Texas Tech University Health Sciences Center Webcam Images* shows a view from this location with the camera facing a northerly direction. In the webcam images, the top frame shows visibility on December 25, 2020, and the bottom frame shows diminished visibility on December 23, 2020. The times of day these images were taken were not provided by the website; therefore, the time of peak PM_{10} concentrations was not able to be isolated for the

December 23, 2020 picture. Despite this limitation, these images provide an indication of the transported regional blowing dust associated with this event.

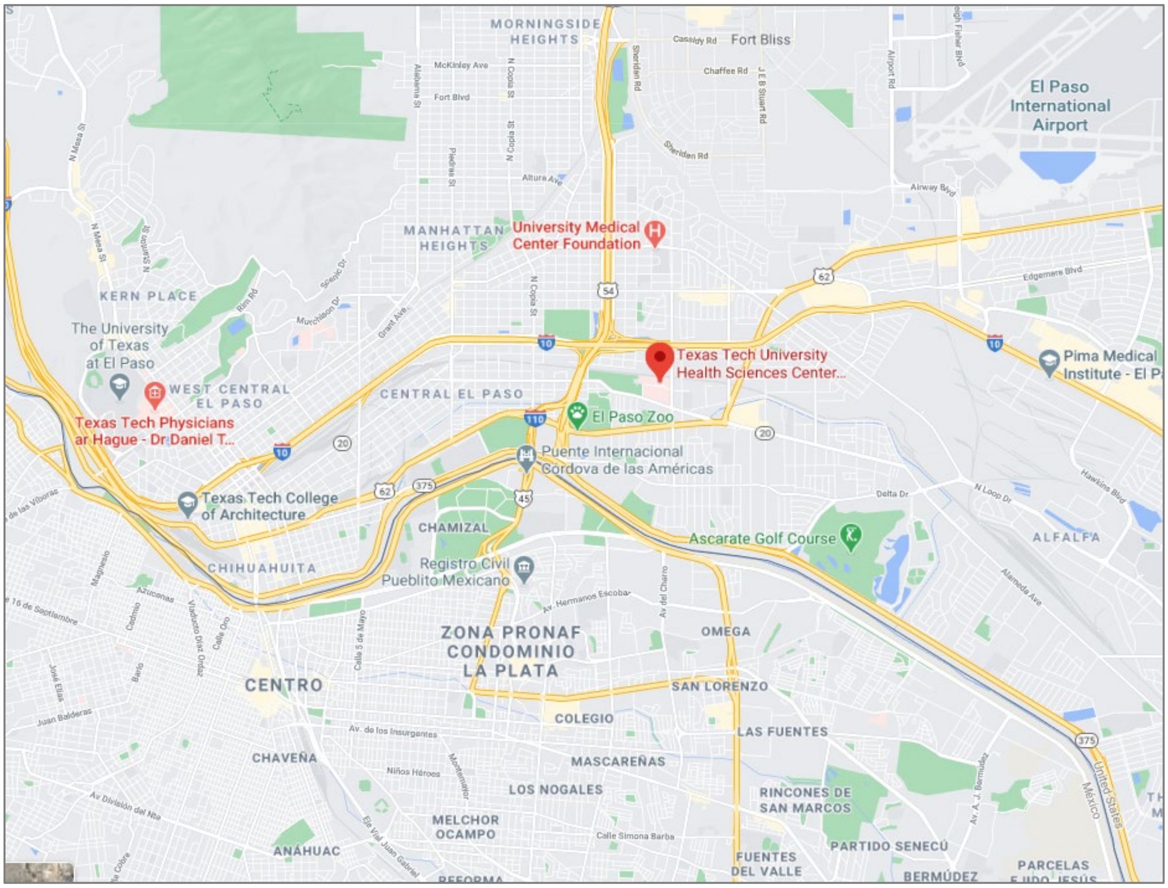

Figure 2-10:**Texas Tech University Health Sciences Center Webcam Location**

Figure 2-11: Texas Tech University Health Sciences Center Webcam Images

2.3.4 Satellite Images

Satellite imagery from NOAA provides additional evidence that the dust on the exceptional event day was caused primarily by transport from sources outside of El Paso County. High-resolution true color images show indications of dust plumes originating from exposed soil areas in the desert of northern Mexico. Although satellite imagery was not able to be located for later in the day on December 23, 2020, winds shifted to the north in the early afternoon, and it is believed that dust from as far as the White Sands region in New Mexico may have impacted PM_{10} levels in El Paso County.

Figure 2-12: *Terra MODIS Satellite Images* compares views with minimal dust on December 17, 2020, to views with dust plumes from the December 23, 2020 event. The satellite image on December 23, 2020 shows widespread dust emanating from northern Mexico into the El Paso area, contributing to the observed high particulate concentrations. On these satellite images, clouds appear bright white and usually have distinct edges, whereas dust plumes are characterized by grayish to brownish streaks that do not appear on clear sky images where dust is not present.

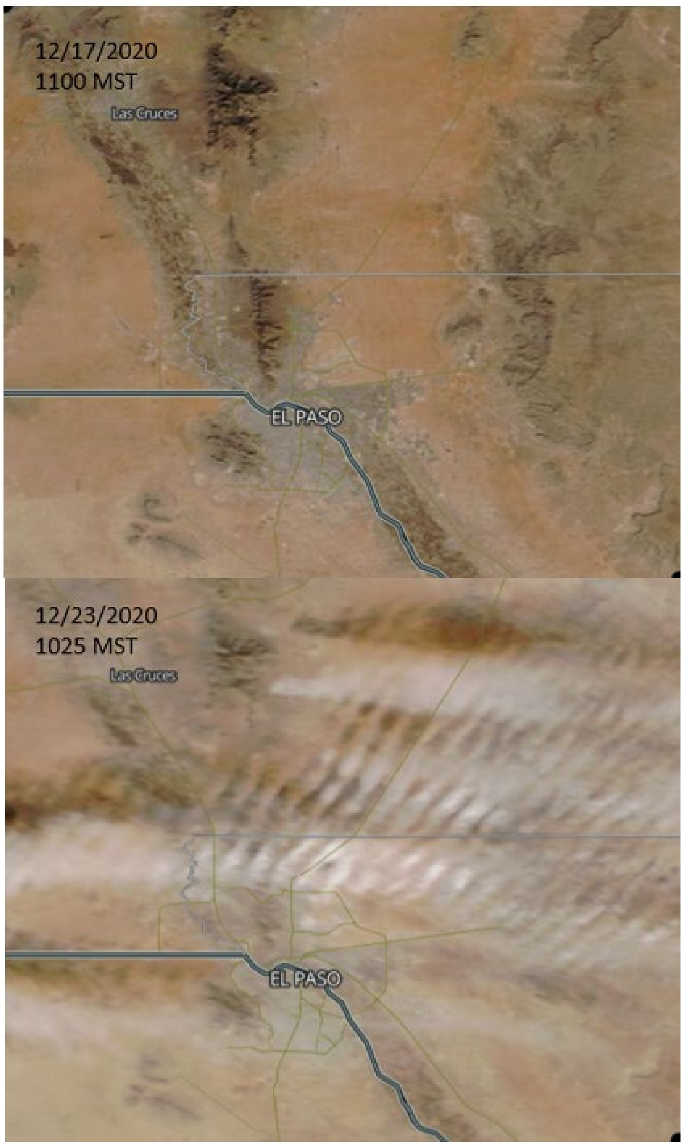

Figure 2-12: Terra MODIS Satellite Images

2.3.5 Backward-in-Time Air Trajectories

Backward-in-time air parcel trajectories were produced using the NOAA HYSPLIT model for December 23, 2020. The images in Figure 2-13: *HYSPLIT Backward*

Trajectories (12:00 and 22:00 MST) at 10, 100, and 1,000 m AGL display trajectories that track the air arriving at the time detailed on the event day and follow the air backward-in-time for 12 hours to demonstrate both the origin and path of the air parcels. The left image in Figure 2-13 shows winds from the west in the early part of the day. The time of 12:00 MST was selected as it corresponds with the highest hourly PM_{10} concentration recorded on December 23, 2020 when winds were from the west. The PM_{10} value at the Socorro Hueco (C49) monitor at 12:00 MST was 255 µg/m^3. The right image in Figure 2-13 shows winds from the north arriving at the time of the highest hourly PM_{10} concentration observed at the Socorro Hueco (C49) monitor site on the event day at 22:00 MST. The value at the Socorro Hueco (C49) monitor at 22:00 MST was 445 µg/m^3. In both images, the three colors assigned to each trajectory represent air arriving at the Socorro Hueco (C49) monitor at 10 meters (m) (red), 100 m (blue), and 1,000 m (green) above ground level (AGL).

Similarly, Figure 2-14: *HYSPLIT Backward Trajectories (11:00 through 22:00 MST) at 100 m AGL* shows backward trajectories for each hour from 11:00 through 22:00 MST on December 23, 2020. These hours were chosen because they correspond with the hours when PM_{10} concentrations were most elevated on the event date. Trajectories pictured in Figure 2-14 are 72-hour backward trajectories, initiated at 100 m height above ground, using the NAM reanalysis product at 12-kilometer (km) resolution.

Trajectories in Figure 2-14 can be seen in two distinct clusters. The first cluster of trajectories from the west arrives at the Socorro Hueco (C49) monitor site during the time range of 11:00 MST through 16:00 MST. The second cluster, consisting of trajectories from 17:00 MST through 22:00 MST, illustrates how rapidly wind shifted to the north and continued from that direction through the latter portion of the day. This cluster also shows how wind traveled directly over the White Sands region in New Mexico and continued over primarily vacant desert land prior to arriving at the Socorro Hueco (C49) monitor in El Paso County. The Riverside/El Paso Mimosa (C9996) monitor is located approximately seven miles northwest of the Socorro Hueco (C49) monitor. As such, the trajectories presented in Figures 2-13 and 2-14 are also applicable to the Riverside/El Paso Mimosa (C9996) monitor.

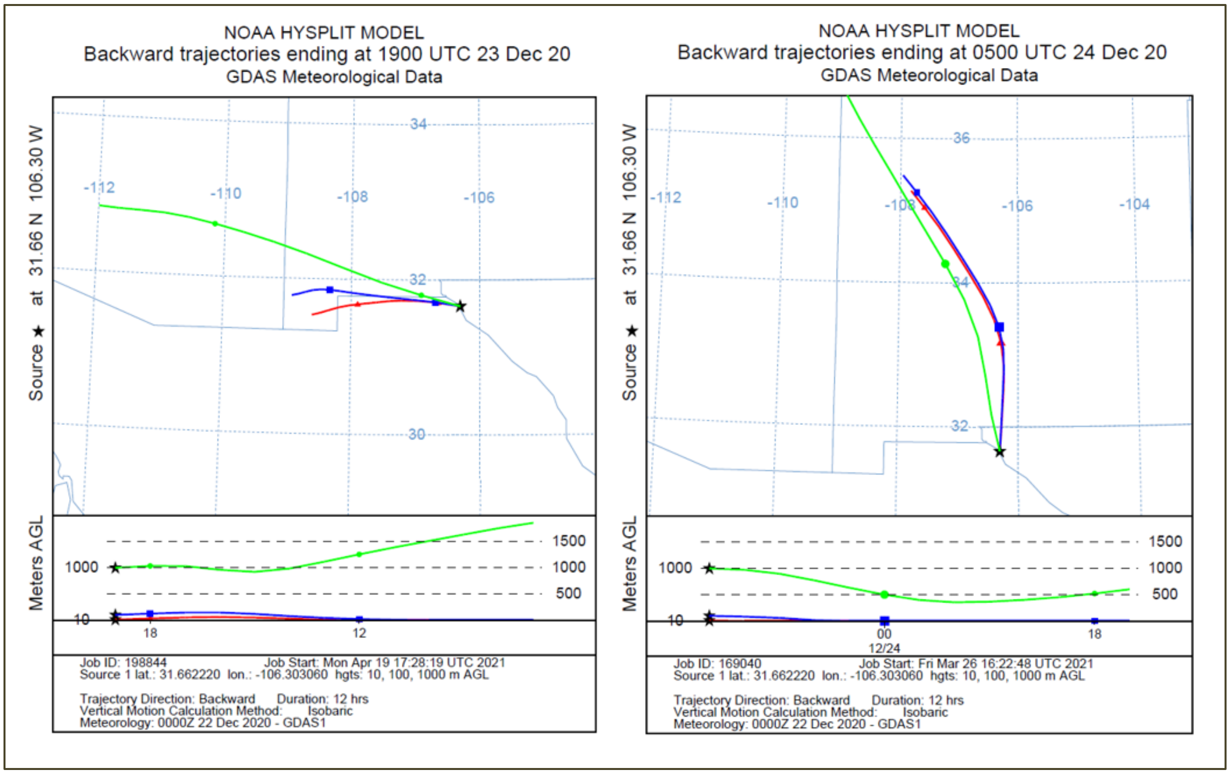

Figure 2-13: HYSPLIT Backward Trajectories (12:00 and 22:00 MST) at 10, 100, and 1,000 m AGL

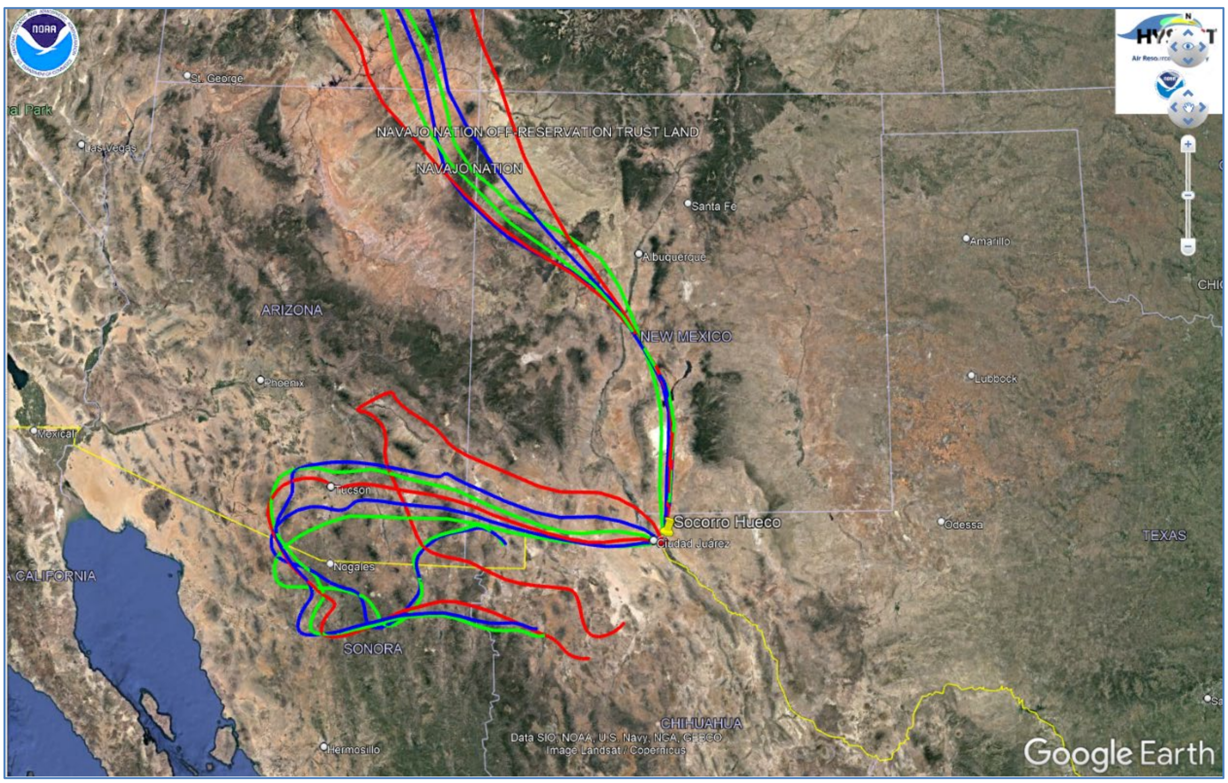

Figure 2-14: HYSPLIT Backward Trajectories (11:00 through 22:00 MST) at 100 m AGL

2.3.6 Maps of Daily Average Particulate Matter

Maps of the daily average PM_{10} and $PM_{2.5}$ concentrations show the spatial distribution of measurements on the event day, with the flagged measurements identified by their site names. PM_{10} concentrations are shown in Figure 2-15: *Daily Average PM_{10} Measurements (µg/m^3) on December 23, 2020*, and $PM_{2.5}$ concentrations are shown in Figure 2-16: *Daily Average $PM_{2.5}$ Measurements (µg/m^3) on December 23, 2020*. As shown in Figure 2-15, the highest measured PM_{10} values occurred in the eastern portion of the county.

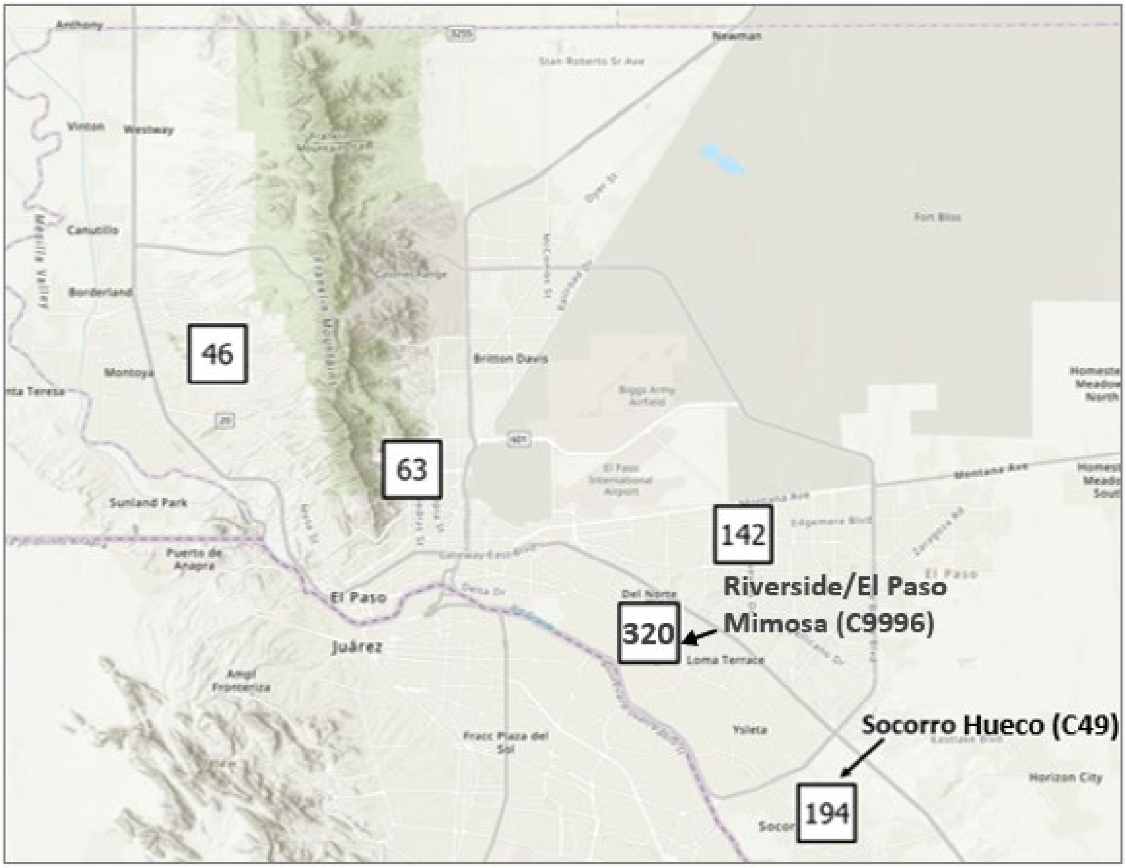

Figure 2-15: Daily Average PM_{10} Measurements (µg/m^3) on December 23, 2020

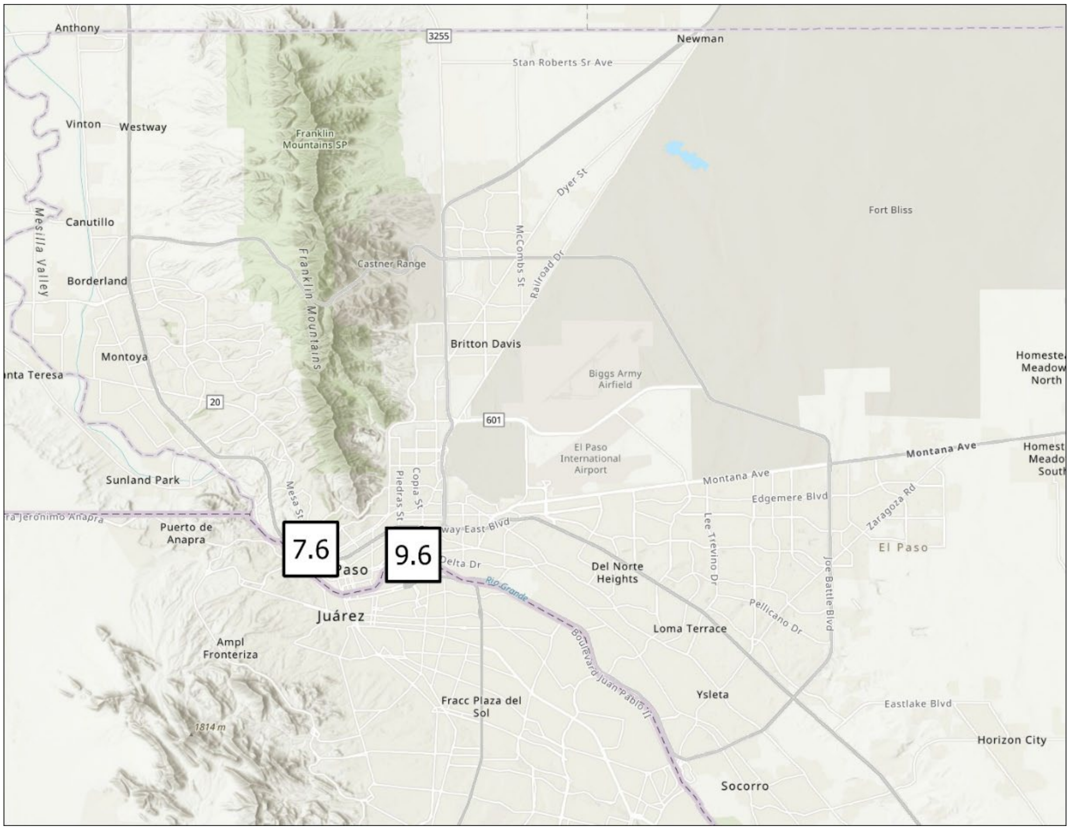

Figure 2-16: Daily Average $PM_{2.5}$ Measurements ($\mu g/m^3$) on December 23, 2020

2.3.7 Continuous Data Time Series Graphs

Time series graphs with continuous particulate measurements plotted against wind speed measurements illustrate the nature of dust events by showing that particulate concentrations increase following sustained high wind speeds. Figure 2-17: *Continuous Five-Minute PM_{10} and Peak Area Five-Minute Sustained Wind Speed Measurements on December 23, 2020* demonstrates that peak sustained wind speed measurements on December 23, 2020 reached 20 to 25 mph from 00:00 MST through 04:00 MST. After wind speeds dropped for the remainder of the morning, they rose again to 20 to 25 mph just before 11:00 MST and remained consistently close to this level until 23:00 MST. Despite high wind speeds earlier in the day, the corresponding rise in particulate matter measurements began after 12:00 MST, indicative of a dust source some distance from the monitors. At such high wind speeds, a dust source nearer the monitor locations would have resulted in the measurement of high levels of particulate matter within minutes after the high wind speeds began.

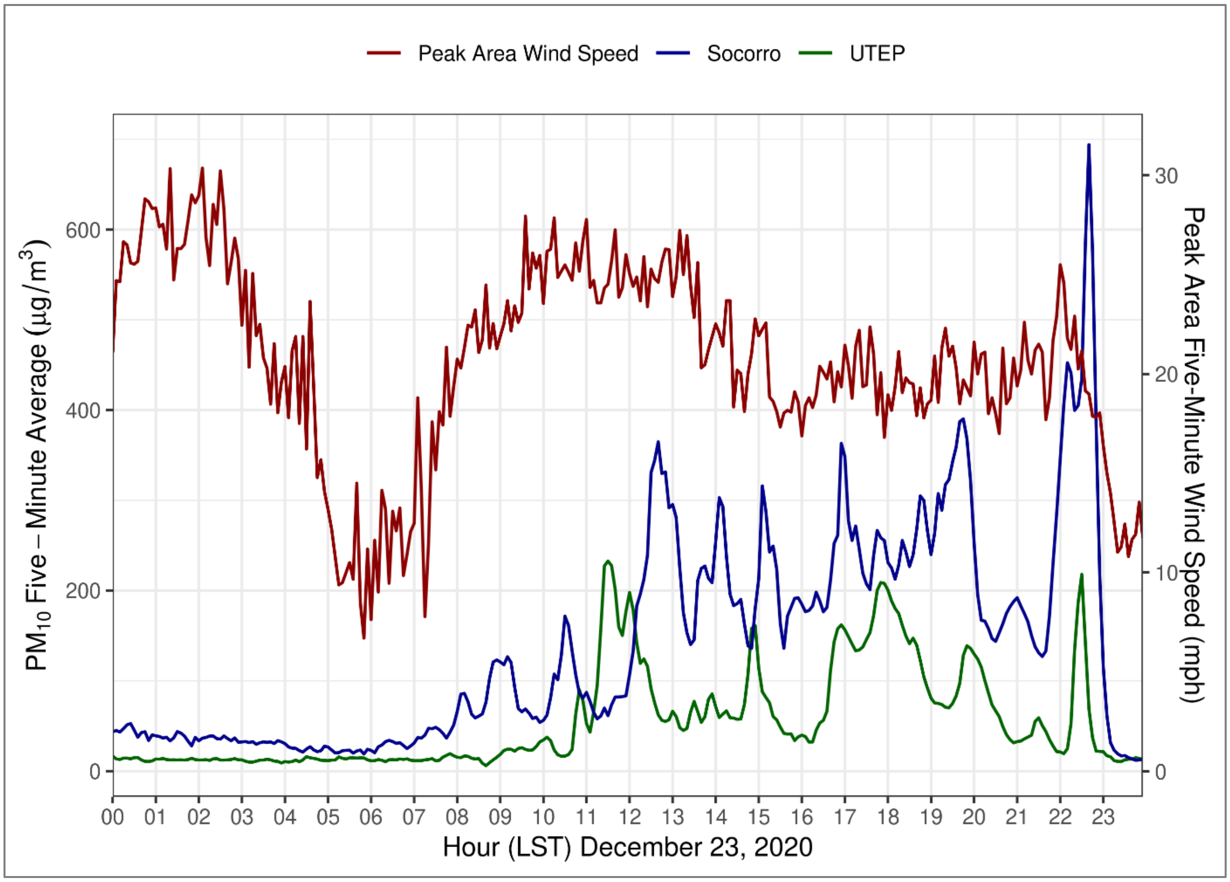

Figure 2-17: Continuous Five-Minute PM_{10} and Peak Area Five-Minute Sustained Wind Speed Measurements on December 23, 2020

CHAPTER 3: NOT REASONABLY CONTROLLABLE OR PREVENTABLE

The 2016 Exceptional Event Rule, 40 Code of Federal Regulations (CFR) §50.14(c)(3)(iv)(D), requires states to demonstrate that the event was both not reasonably controllable and not reasonably preventable. However, under 40 CFR §50.14(b)(5)(iv), states are not required to provide a case-specific justification for a high wind dust event to address the not reasonably preventable criterion. Therefore, only evidence to meet the not reasonably controllable criterion is presented here.

3.1 NATURAL AND ANTHROPOGENIC SOURCE CONTRIBUTIONS

A study of blowing dust plume origins in the Chihuahua Desert area surrounding El Paso County, based on satellite imagery for 26 episodes from 2001 through 2009, indicated that origin locations were primarily in northern Mexico and southwestern New Mexico (Baddock et al., 2011). Additionally, Gill et al. (2007) investigated dust sources for multiple dust storm events from 2002 through 2006. Their work found that a large playa complex within the Lake Palomas region of northern Chihuahua, Mexico frequently contributed to concentrated plumes of particulate matter that spread into the El Paso/Ciudad Juarez area. Particle size analyses of surface sediment samples from these playas revealed very fine clays and silts with grain sizes in the particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) and particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) ranges, including particles as small as 0.2 micron.

As documented by Gill et al. (2012), the White Sands area in New Mexico is one of the most intense and frequent source areas for blowing dust in North America. On December 23, 2020, high winds from the west, prior to rapidly shifting north, traveled over both dust-source areas prior to arriving at the Riverside/El Paso Mimosa (C9996) and Socorro Hueco (C49) monitoring sites.

El Paso and the Mexican city of Ciudad Juarez are located in a bowl-shaped valley where particulate matter gets trapped by strong temperature inversions (a layer in the atmosphere in which air temperature increases with height) and down-sloping winds from surrounding mountains during air stagnation events (periods of low wind speeds). Anthropogenic sources that contribute to elevated particulate matter concentrations during these episodes often include local industrial facilities, automobiles, and fires. Ciudad Juarez has minimal controls on burning of wood, tires, scrap plastics, and construction debris. Automobiles in Ciudad Juarez are on average older than those in El Paso and can have greater particulate matter emissions. El Paso and nearby Sunland Park, New Mexico have comparatively strict controls on pollution sources from various combustion types that are considered reasonably available control technology (RACT) or reasonably available control measures (RACM) (TCEQ1, 2007).

Evaluation of the El Paso County particulate matter emissions inventory (EI) reveals the most significant contributions of anthropogenic particulate emissions are from unpaved roads, commercial construction, paved roads, and road construction, which are sources that do not typically have potential for an emission event or large increases in emissions on a single day. Table 3-1: *El Paso County Particulate Matter Emissions Inventory in Tons per Year* shows the 2017 area source and mobile source particulate matter EI for El Paso County as reported for the 2017 National Emissions

Inventory, as well as the 2016 through 2019 point-source EI. These emissions inventories are representative of the entire county and not specific to just those areas upwind of area monitors on the event days. Given the proximity of the Socorro Hueco (C49) monitor to the international border and the wind direction on the flagged event day, impacts from major road construction or commercial construction projects are unlikely to have been a major contributor to measured concentration values. Although a road construction project involving disturbed soil was occurring in the vicinity of the Riverside/El Paso Mimosa (C9996) monitor on event day, the high winds were sufficient to generate the exceedance, as was the case at the Socorro Hueco (C49) monitor. The greater concentration of PM_{10} at Riverside/El Paso Mimosa (C9996) relative to that recorded at Socorro Hueco (C49) appears to be related to the construction in the area of the El Paso Mimosa (C9996) monitor.

Table 3-1: El Paso County Particulate Matter Emissions Inventory in Tons per Year

Year	Source Type	Source Category	PM_{10}	$PM_{2.5}$
2017	Area	Road Construction	925.42	92.54
2017	Area	Unpaved Roads	10,715.33	1067.16
2017	Area	Commercial Construction	4,022.62	402.26
2017	Area	Paved Roads	1490.55	372.64
2017	Area	Agricultural Tilling	615.30	123.06
2017	Area	Residential Construction	324.06	32.41
2017	Area	Mining and Quarrying	446.20	55.77
2017	Area	Remaining Area Sources	574.19	365.25
2017	Mobile	On-road	518.20	236.66
2017	Mobile	Non-road	166.32	159.08
2016	Point	Point Sources	346.30	284.97
2017	Point	Point Sources	304.88	196.00
2018	Point	Point Sources	306.24	218.29
2019	Point	Point Sources	288.65	199.76

Figure 3-1: *El Paso County Significant PM_{10} Point Source Locations* displays locations of point sources in the El Paso area reporting 2019 particulate matter emissions of five tons per year or greater. On the event day, wind was infrequently from the direction of these sources relative to the Riverside/El Paso Mimosa (C9996) and Socorro Hueco (C49) monitors. The number plotted inside each point source circle is the PM_{10} annual emission rate in tons per year from the 2019 Texas Commission on Environmental Quality (TCEQ) emissions inventory. Blue shading in each point source circle indicates the fraction of the total PM_{10} emitted as $PM_{2.5}$ based on the 2019 $PM_{2.5}$ annual emission rate.

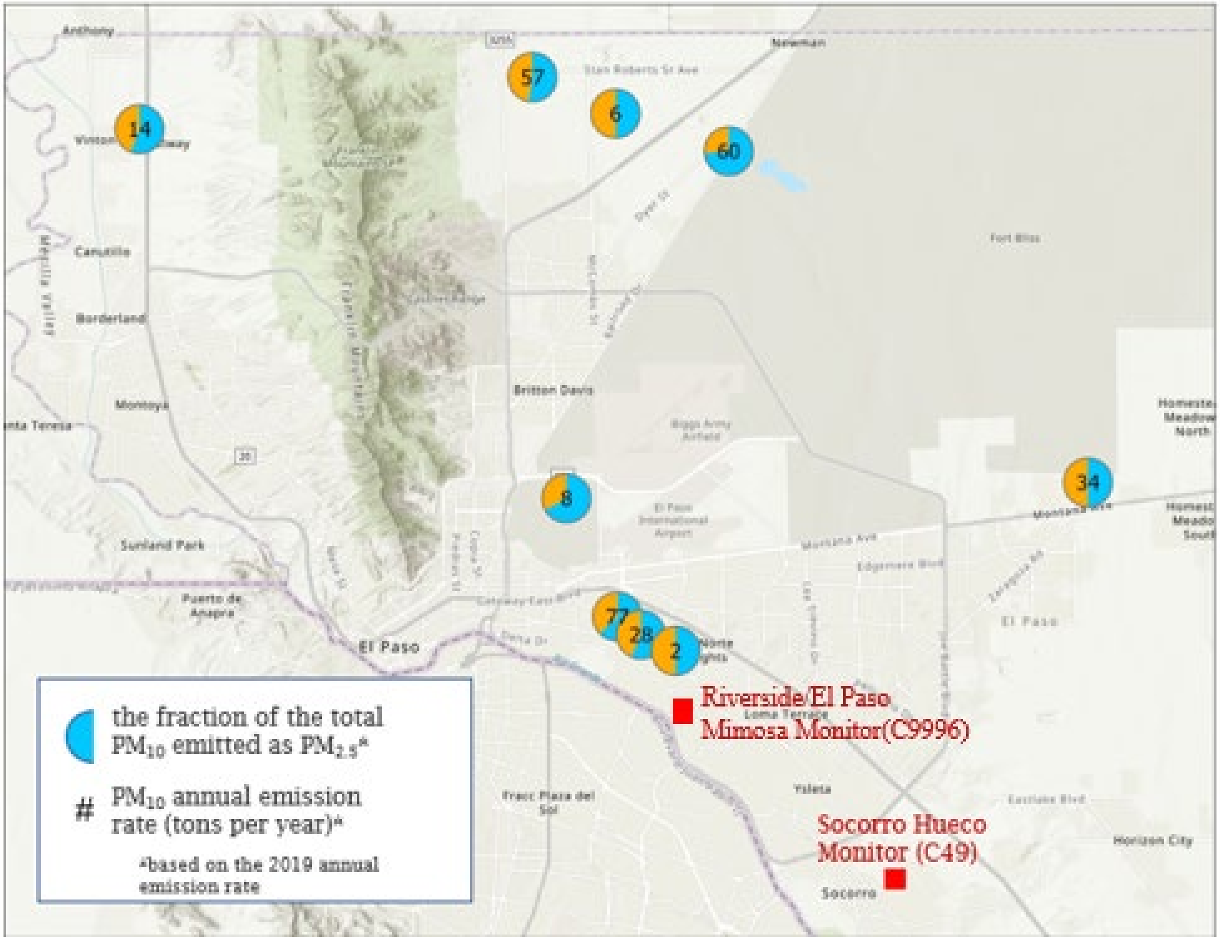

Figure 3-1: El Paso County Significant PM_{10} Point Source Locations

As expected, local source contributions to measured particulate matter concentrations in El Paso County are highest under air stagnation conditions, which allow particles to drop out of the air after relatively short timeframes. The most severe air stagnation conditions occur with light winds and clear skies on winter nights when strong temperature inversions develop and trap locally emitted air pollution in a thin layer near the ground. Since non-continuous measurements are based on the calendar day from midnight-to-midnight local standard time, the highest calendar day local source impacts occur with two stagnant air nights in a row. These conditions occur most frequently from November through February when inversions are strongest because of colder and drier conditions. Since 2008, there have been no Federal Reference Method (FRM) exceedances of the 24-hour $PM_{2.5}$ or PM_{10} standards from air stagnation conditions at the El Paso Chamizal (C41), El Paso UTEP (C12), and Socorro Hueco (C49) sites, although local source contributions on these days do impact annual $PM_{2.5}$ averages.

The Chamizal speciation data show that the Interagency Monitoring of Protected Visual Environments (IMPROVE) organic carbon component is highest with light winds, as would be expected with local contribution during air stagnation. Alternatively, the IMPROVE soil component is highest with high winds. Figure 3-2: *El Paso Chamizal (C41) $PM_{2.5}$ IMPROVE Organic Carbon Concentration versus El Paso Chamizal (C41) Daily Peak*

Hourly Wind Speed for 2018 through 2020 indicates, in general, that the highest local carbon related emission impacts on $PM_{2.5}$ occur with lower wind speeds. Figure 3-3: *El Paso Chamizal (C41) $PM_{2.5}$ IMPROVE Soil Concentration versus El Paso Chamizal (C41) Daily Peak Hourly Wind Speed for 2018 through 2020* demonstrates that the IMPROVE soil component is highest with high winds, as is the case for the $PM_{2.5}$ and PM_{10} concentrations previously shown in Figure 2-4: *El Paso Area Daily Peak PM_{10} Average for FRM Measurements versus El Paso Area Daily Peak Sustained Hourly Wind Speed for 2006 through 2020* and Figure 2-5: *El Paso Area Daily Peak $PM_{2.5}$ Average for FRM Measurements versus El Paso Area Daily Peak Sustained Hourly Wind Speed for 2006 through 2020.* Unlike $PM_{2.5}$ concentrations, the IMPROVE soil component does not increase significantly at lower wind speeds, indicating that local dust is not a major contributor to particulate concentrations without high winds. Figure 2-5 also illustrates the impact of local sources on $PM_{2.5}$ concentrations as evidenced by slightly elevated measurements when peak hourly wind speeds are lower, between 5 and 10 miles per hour (mph).

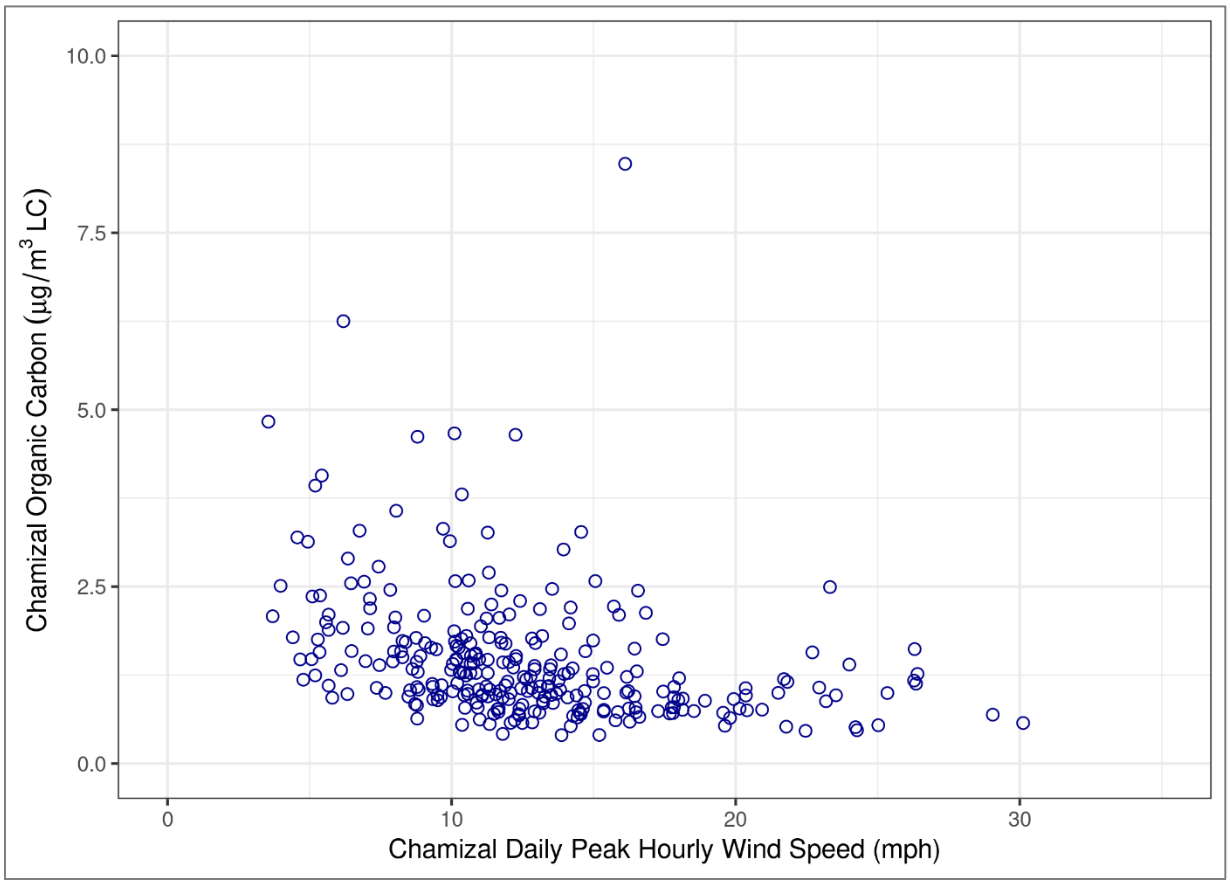

Figure 3-1: El Paso Chamizal (C41) $PM_{2.5}$ IMPROVE Organic Carbon Concentration versus El Paso Chamizal (C41) Daily Peak Hourly Wind Speed for 2018 through 2020

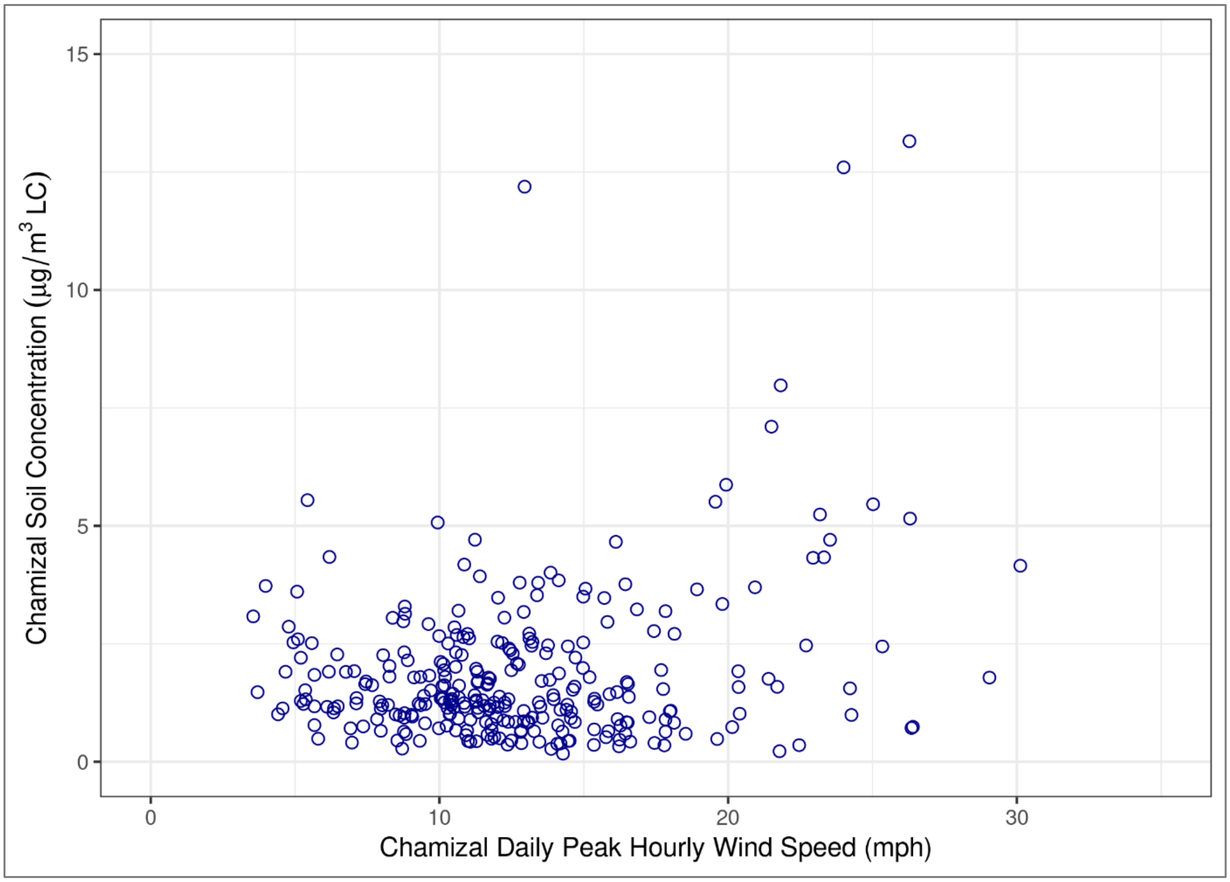

Figure 3-2: El Paso Chamizal (C41) $PM_{2.5}$ IMPROVE Soil Concentration versus El Paso Chamizal (C41) Daily Peak Hourly Wind Speed for 2018 through 2020

The El Paso UTEP (C12), Ascarate Park SE (C37), El Paso Chamizal (C41), Riverside/El Paso Mimosa (C9996), and Socorro Hueco (C49) sites are located near the Rio Grande River which forms the international border with Mexico. As such, particulate matter measurements at these monitors receive influence from sources in Mexico, which cannot be controlled by United States (U.S.) regulations, whenever winds are from the west, southwest, or south. During air stagnation events, winds are light and variable, allowing emissions from both the U.S. and Mexico to mix and thus affect all sites along the border. With stronger winds, the direction of the wind will more directly indicate the source of any air pollution present. Figure 3-4: *Wind Rose Plots for the El Paso UTEP (C12), Ascarate Park SE (C37), El Paso Chamizal (C41), and Socorro Hueco (C49) Monitors for 2018 through 2020* illustrates typical, overall wind patterns in El Paso County. Lengths of the wind rose bars indicate the frequency of hourly winds blowing from the direction of the bar toward a site. The width and color of the bars indicate the hourly wind speeds for the ranges shown in the key. When reviewing wind roses from a region with mountainous topography, the channeling effect of such topography must be considered relative to a monitor's location. Assistance with reading a wind rose can be found at the EPA's How to Read a Wind Rose webpage (https://www.epa.gov/sites/default/files/2019-01/documents/how_to_read_a_wind_rose.pdf).

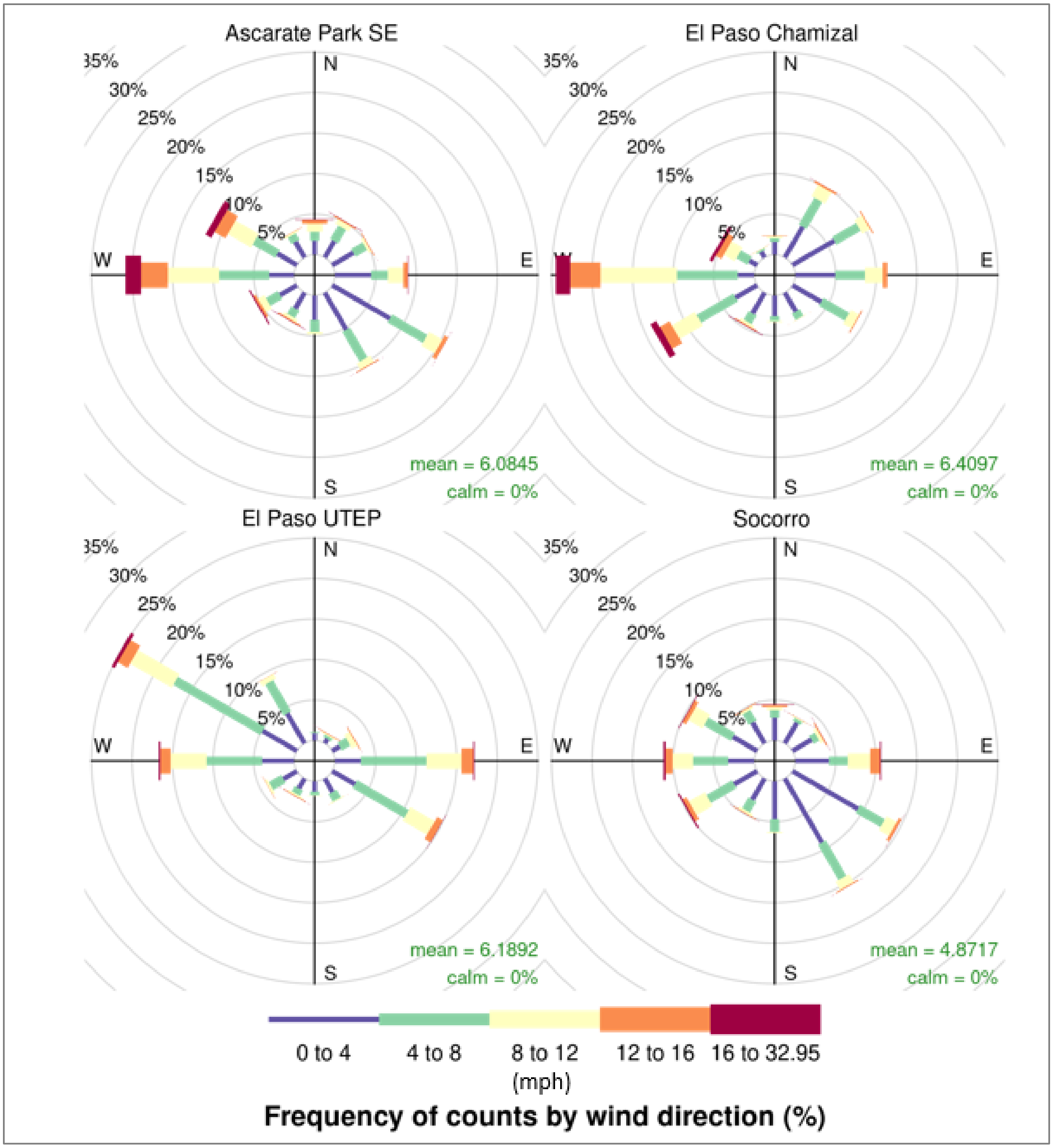

Figure 3-3: Wind Rose Plots for the El Paso UTEP (C12), Ascarate Park SE (C37), El Paso Chamizal (C41), and Socorro Hueco (C49) Monitors for 2018 through 2020

3.2 ATTAINMENT STATUS AND CONTROL MEASURES

The City of El Paso has been designated as nonattainment for the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS) since November 15, 1990 but has been designated as attainment for both the annual and 24-hour $PM_{2.5}$ NAAQS ever since $PM_{2.5}$ designations were first made on December 17, 2004. The State of Texas adopted state implementation plan (SIP) provisions in November 1991 that include regulations on PM_{10} sources in the El Paso area. The United States Environmental Protection Agency

(EPA) approved the El Paso PM_{10} SIP revision on February 17, 1994. The approved SIP revision incorporated all nonattainment requirements including RACT and RACM. Additionally, a Memorandum of Understanding (MOU) between the City of El Paso and the Texas Air Control Board (TACB), a predecessor agency of the TCEQ, was incorporated to define the division of responsibility and commitments to carry out provisions of the rules developed in the 1991 El Paso PM_{10} SIP revision.

On January 25, 2012, the TCEQ adopted a SIP revision to incorporate updates to the PM_{10} control measures and to incorporate a Memorandum of Agreement (MOA) between the TCEQ and the City of El Paso to reflect the updated control measures. This SIP revision was approved by the EPA on December 14, 2015. The regulations included in the SIP revision are summarized below:

- Title 30 Texas Administrative Code (TAC) §111.111(c) established conditions for the use of solid fuel heating devices during periods of atmospheric stagnation in the City of El Paso, including the Fort Bliss Military Reservation.
- Title 30 TAC §111.141 establishes that §111.143 (relating to Materials Handling), §111.145 (relating to Construction and Demolition), §111.147 (relating to Roads, Streets, and Alleys), and §111.149 (relating to Parking Lots), and associated dates of compliance, shall apply to the City of El Paso and portions of the Fort Bliss Military Reservation.
- Title 30 TAC §111.145 establishes measures to control dust emissions related to land clearing and construction, repair, alteration and demolition of structures, roads, streets, alleys, or parking areas of any size in the City of El Paso.
- Title 30 TAC §111.147 establishes measures to control dust emissions on public, industrial, commercial, or private roads, streets, or alleys including application of asphalt, water, or suitable oil or chemicals and mechanical street sweeping. Specific requirements are established for alleys and levee roads within the City of El Paso, including paving new alleys and disallowing use of unpaved existing alleys for residential garbage and recycling collection.

The following summarizes other existing regulations applicable to particulate matter control in the El Paso area:

- Title 30 TAC §111.143 establishes measures to control dust emissions related to the handling, transport, or storage of materials which can create airborne particulate matter including the application of water, chemicals, or coverings on materials stockpiles; use of hoods, fans, and filters to enclose, collect, and clean the emissions of dusty materials; and the covering of all open-bodied trucks, trailers, and railroad cars transporting materials in the City of El Paso.
- Title 30 TAC §111.149 establishes measures to control dust emissions, including appropriate application of asphalt, water, or suitable oil or chemicals for temporary parking lots, parking lots having more than five spaces, and paved parking lots having more than one-hundred spaces.
- City of El Paso Municipal Code Chapter 9.38, concerning wood burning, prohibits the operation of a solid fuel heating device within the City of El Paso during a no-burn period, unless an exemption has been obtained.
- City of El Paso Municipal Code Chapter 19.15.020, concerning subdivider responsibility, establishes standards for proposed roads serving new developments, including alleys.

- City of El Paso Municipal Code Chapter 19.15.160 establishes standards for the construction and improvement of alleys.
- City of El Paso Municipal Code Chapter 20.14 establishes standards for the provision of off-street parking, loading and storage, including standards for dust-free surfacing.

3.3 NOT REASONABLY CONTROLLABLE

As discussed above, the proposed event day was characterized by international and domestic transport of blowing dust not indicative of local sources. Satellite imagery and backward trajectories suggested the transport of large amounts of dust from uncontrollable sources outside of the U.S. and Texas. The transport of this dust was associated with regional high winds as described throughout this demonstration document.

3.4 NOT REASONABLY CONTROLLABLE OR PREVENTABLE

The documentation and analysis presented in this chapter demonstrate that all identified sources that caused or contributed to the exceedances were reasonably controlled and controls were effectively implemented and enforced at the time of the event; therefore, emissions associated with the high wind dust event were not reasonably controllable or preventable.

CHAPTER 4: NATURAL EVENT

The proposed exceptional event flag for December 23, 2020 is for a high wind blowing dust event generated entirely from natural undisturbed lands, which is a natural event. High wind blowing dust events, typically associated with large low-pressure systems, can impact El Paso County every year. Satellite imagery provided an indication of dust plumes from northern Mexico moving into El Paso County during this event as previously described. International dust source locations are consistent with a study of blowing dust origin locations in the Chihuahua Desert surrounding El Paso during the period 2001 through 2009 (Baddock et al., 2011). As the day progressed, winds shifted to the north where natural, undisturbed lands north of El Paso provided a source of dust for elevated dust levels to be recorded through 22:00 Mountain Standard Time (MST). As documented by Gill et al. (2012), the White Sands area in New Mexico, north of El Paso County, is a dust emission source that is one of the most intense and frequent source areas of blowing dust in North America.

On the event day, the Interagency Monitoring of Protected Visual Environments (IMPROVE) soil component also provided evidence that elevated particulate concentrations were from natural sources. The El Paso Chamizal (C41) IMPROVE soil component shown previously in Table 2-3: *El Paso Chamizal (C41) $PM_{2.5}$ Speciation Summary for the Exceptional Event Day* exceeded the 2018 through 2020 average value as would be expected with natural events caused by blowing dust associated with high winds.

Based on the documentation provided in this demonstration, the event qualifies as a natural event. The exceedance associated with the event meets the regulatory definition of a natural event at 40 Code of Federal Regulations §50.14(b)(5)(ii). The event transported windblown dust from natural undisturbed lands as documented throughout this demonstration, and accordingly, Texas Commission on Environmental Quality (TCEQ) has demonstrated that the event was a natural event and may be considered for treatment as an exceptional event.

CHAPTER 5: CLEAR CAUSAL RELATIONSHIP

Abundant evidence, including wind information, particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) speciation data, backward-in-time air parcel trajectories, satellite imagery, and webcam imagery, provides proof that the elevated particulate concentrations on the event day were caused by blowing dust generated by high winds. As previously presented in Figure 2-6: *Socorro Hueco (C49) Hourly Average Continuous PM_{10} Concentration versus Hourly Wind Speed for 2019 and 2020*, an analysis of particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) measurements at Socorro Hueco (C49) from 2019 and 2020 show that the highest concentrations occurred when peak hourly wind speeds approached 20 miles per hour (mph). Continuous PM_{10} sampling is not conducted at the Riverside/El Paso Mimosa (C9996) monitor, but the results from Socorro Hueco (C49) are representative of conditions at the Riverside/El Paso Mimosa (C9996) monitor.

The highest Interagency Monitoring of Protected Visual Environments (IMPROVE) calculated $PM_{2.5}$ soil component values occurred with similar peak hourly wind speeds, as demonstrated in Figure 3-3: *El Paso Chamizal (C41) $PM_{2.5}$ IMPROVE Soil Concentration versus El Paso Chamizal (C41) Daily Peak Hourly Wind Speed for 2018 through 2020*. A comparison of the chemical speciation data from the Chamizal site, presented in Table 2-3: *El Paso Chamizal (C41) $PM_{2.5}$ Speciation Summary for the Exceptional Event Day*, confirmed that for the event days the IMPROVE soil component was higher than the average IMPROVE soil component for 2018 through 2020.

Satellite imagery, previously presented in Figure 2-12: *Terra MODIS Satellite Images*, provides evidence of the relationship between these high wind dust plumes and measured PM_{10} concentrations. Satellite images show dust generated over northern Mexico that is transported toward El Paso in an easterly orientation. Backward-in-time air trajectories (NOAA ARL, 2021) corroborate visual evidence from satellite images and confirm that air arriving during the early portion of the event day came from northern Mexico. Backward-in-time air trajectories arriving at the hour of the peak particulate concentration for the event demonstrate that air arriving at this time was from the north. Winds from this direction, relative to the Socorro Hueco (C49) and Riverside/El Paso Mimosa (C9996) monitoring sites, align with White Sands National Park in New Mexico and traverse the vast expanse of vacant desert land between that point and El Paso County.

5.1 OCCURRENCE AND GEOGRAPHIC EXTENT OF THE EVENT

In addition to descriptions of weather conditions, photographic webcam images of the area, satellite imagery, and maps of particulate matter concentrations presented in the narrative conceptual model, special weather statements and media coverage information are provided in Figure 5-1: *Hazardous Weather Outlook Message Issued by the National Weather Service El Paso Office on December 23, 2020*, and Figure 5-2: *Media Report on High-Wind Conditions, December 23, 2020*. These items contribute additional supporting documentation establishing the occurrence and geographical extent of this event.

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HWOEPZ

Hazardous Weather Outlook
National Weather Service El Paso TX/Santa Teresa NM
613 AM MST Wed Dec 23 2020

NMZ401>417-TXZ418>424-241315-
Upper Gila River Valley-Southern Gila Highlands/Black Range-
Southern Gila Foothills/Mimbres Valley-
Southwest Desert/Lower Gila River Valley-Lowlands of the Bootheel-
Uplands of the Bootheel-Southwest Desert/Mimbres Basin-
Eastern Black Range Foothills-Sierra County Lakes-
Northern Dona Ana County-Southern Dona Ana County/Mesilla Valley-
Central Tularosa Basin-Southern Tularosa Basin-
West Slopes Sacramento Mountains Below 7500 Feet-
Sacramento Mountains Above 7500 Feet-
East Slopes Sacramento Mountains Below 7500 Feet-Otero Mesa-
Western El Paso County-Eastern/Central El Paso County-
Northern Hudspeth Highlands/Hueco Mountains-Salt Basin-
Southern Hudspeth Highlands-
Rio Grande Valley of Eastern El Paso/Western Hudspeth Counties-
Rio Grande Valley of Eastern Hudspeth County-
613 AM MST Wed Dec 23 2020

This Hazardous Weather Outlook is for portions of south central
New Mexico, southwest New Mexico, and southwest Texas.

.DAY ONE...Today and Tonight

North winds 15-25 mph with higher gusts will spread southward
behind a cold front starting midday. The strongest winds will be
in the north-south oriented basins, and will peak this evening.

.DAYS TWO THROUGH SEVEN...Thursday through Tuesday

Much cooler temperatures Thursday, and a slight chance of light
showers over the mountains on Christmas Day. Another chance of
showers on Tuesday.

.SPOTTER INFORMATION STATEMENT...

$$

Fausett
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Figure 5-1: Hazardous Weather Outlook Message Issued by the National Weather Service El Paso Office on December 23, 2020

https://kvia.com/weather/forecast/2020/12/23/stormtrack-weather-cold-front-brings-gusty-winds-and-cooler-temps/

Forecast

By Nichole Gomez

December 23, 2020 12:30 PM Published December 23, 2020 7:13 AM

StormTRACK Weather: A blast of cold air just in time for Christmas Eve

A cold front will drop south Wednesday and increase winds around 35 mph. The colder air will allow temperatures to dip into the 20s and teens across the region tonight. A second push of cold air will drop high temperatures into the low 50s and upper 40s by Thursday afternoon.

Figure 5-2: Media Report on High-Wind Conditions, December 23, 2020

5.1.1 Transport of Event Emissions to the Relevant Particulate Matter Monitor

Evidence to demonstrate that the high wind blowing dust event transported particulate matter to the Socorro Hueco (C49) and Riverside/El Paso Mimosa (C9996) monitors, including analysis of continuous particulate matter and meteorological data, Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) backward trajectories, satellite imagery, and maps of particulate matter concentrations, are provided in the narrative conceptual model in the text of the document and in Appendix B.

5.1.2 Spatial Relationship Between the Event, Particulate Matter Sources, Transport of Emissions, and Recorded Concentrations

Information to help establish relevant spatial relationships during the event, including area maps, wind direction, anthropogenic/natural particulate matter source locations, monitor locations, and measured particulate matter concentrations are discussed throughout the demonstration document.

5.1.3 Temporal Relationship Between the High Wind and Elevated Particulate Matter Concentrations

The continuous data time series plots in the narrative conceptual model establish the concurrent relationship between high winds and elevated particulate matter concentrations for the event.

5.1.4 Speciation Data: Chemical Composition and/or Size Distribution

Speciation data profiles shown in Table 2-3: *El Paso Chamizal (C41) $PM_{2.5}$ Speciation Summary for the Exceptional Event Day* provide supporting evidence that the particulate compositions were different than normal compositions on the event day. Specifically, a greater-than-average portion of particulate matter on the event day was composed of crustal material that included components consistent with natural soils.

5.1.5 Comparison of Event-Affected Days to Other High Wind Days without Elevated Concentrations

To illustrate the impact a windblown dust event has on El Paso County versus local anthropogenic dust, the Texas Commission on Environmental Quality (TCEQ) conducted an analysis comparing the event day to other high wind days without elevated PM_{10} concentrations in 2020. Specifically, this comparative analysis focused on identifying days with wind speed and, to a lesser extent, wind direction measurements comparable to the event day but without elevated PM_{10} values. PM_{10} data used in this study were primarily collected via a tapered element oscillating microbalance (TEOM) sampler. Due to the once-every-six-days sampling schedule for Federal Reference Method (FRM) PM_{10} results, these data were not available on many of the days that met the wind criteria. Days with peak area hourly wind speeds of at least 25 mph were selected for this study. These days were further narrowed by selecting those with relatively similar resultant wind directions.

Table 5-1: *Socorro Hueco (C49) Particulate Matter and El Paso Area Wind Measurements on the Event Day and Days with High Winds but Low Particulate Matter Concentrations* provides five representative days where wind speed and wind direction are comparable to the event day. On each of the identified days, daily average PM_{10} measurements were significantly less than the flagged event day when windblown dust plumes were advecting out of northern Mexico and ultimately areas north of El Paso. This analysis provides additional supporting evidence that measured concentrations on the flagged event day were not the result of local anthropogenic sources but were instead caused by transport of widespread dust from Mexico in the west and vacant land areas north of El Paso.

Table 5-1: Socorro Hueco (C49) Particulate Matter and El Paso Area Wind Measurements on the Event Day and Days with High Winds but Low Particulate Matter Concentrations

Day	$PM_{10}C$	PkWnd	WDR	StDev	Pk1Hr$PM_{10}C$	Time	PM_{10} FRM
12/23/2020	139	40	215	124	444	2200	194
2/20/2020	24	39	91	22	49	0900	NA
4/21/2020	28	25	238	86	56	0700	25
8/16/2020	35	38	127	61	87	1600	NA
10/28/2020	18	27	223	75	29	1900	NA
11/20/2020	36	29	182	92	83	1800	NA

Abbreviations:
$PM_{10}C$ continuous daily average in µg/m^3 at Socorro Hueco
PkWnd peak area one-hour average wind speed in mph
WDR daily wind direction resultant in degrees from north at Socorro Hueco
StDev wind direction standard deviation at Socorro Hueco
Pk1Hr$PM_{10}C$ peak continuous hourly PM_{10} measurement at Socorro Hueco
Time Time in Mountain Standard Time (MST) of peak continuous hourly PM_{10} measurement
PM_{10} FRM non-continuous FRM daily average in µg/m^3 at Socorro Hueco

5.1.6 Assessment of Possible Alternative Causes for the Relevant PM Exceedances or Violations

Figure 3-1: *El Paso County Significant PM_{10} Point Source Locations* in Section 3.1: *Natural and Anthropogenic Source Contributions* located in Chapter 3: *Not Reasonably Controllable or Preventable* shows that the significant non-event PM sources were upwind of the Riverside/El Paso Mimosa (C9996) and Socorro Hueco (C49) monitors for only a small portion of the event day. This is evident when reviewing backward trajectories in Figure 2-13: *HYSPLIT Backward Trajectories (12:00 and 22:00 MST) at 10, 100, and 1,000 m AGL* of Section 2.3: *Event Day Summary Information* located in Chapter 2: *Narrative Conceptional Model of Event*. Additionally, the not reasonably preventable analysis describes implementation and enforcement of high wind dust control measures that were in place at the time of the events. Collectively, this evidence establishes the unlikelihood of potential anthropogenic causes of the relevant PM_{10} exceedances at Socorro Hueco (C49).

When considering the El Paso Mimosa (C9996) monitor, the same rationale referenced in the previous paragraph applies to this monitor. Although there was construction in the area of this monitor and this fact is believed to be responsible for the higher PM_{10} concentration at this monitor on the event day relative to that at the Socorro Hueco monitor, the wind data and PM_{10} concentrations at the Socorro Hueco monitor provide additional confirmation that the natural event alone was sufficient to cause PM_{10} exceedances on December 23, 2020 at both monitors.

5.2 COMPARISON OF EVENT-RELATED CONCENTRATIONS TO HISTORICAL CONCENTRATIONS

The 2016 Exceptional Event Rule requires that states compare the event-related concentration to historical concentrations. This section was prepared in accordance with the United States Environmental Protection Agency (EPA) High Wind Dust Event Guidance document (EPA, 2019). The information also serves as an important basis for the clear causal relationship criteria.

5.2.1 Comparison of Concentrations on the Claimed Event Days with Past Historical Data

Figure 5-3: *Socorro Hueco (C49) FRM PM_{10} Daily Measurements from 2016 through 2020* shows the valid daily measurements of PM_{10} at Socorro Hueco (C49) along with the level of the PM_{10} 24-hour National Ambient Air Quality Standard (NAAQS). EPA-approved 2017 and 2018 exceptional event days are circled in red, and the proposed exceptional event day for December 23, 2020 is circled in blue. This figure demonstrates that flagged measurements on each event day were outside of normal historical fluctuations in measured particulate concentrations for El Paso County.

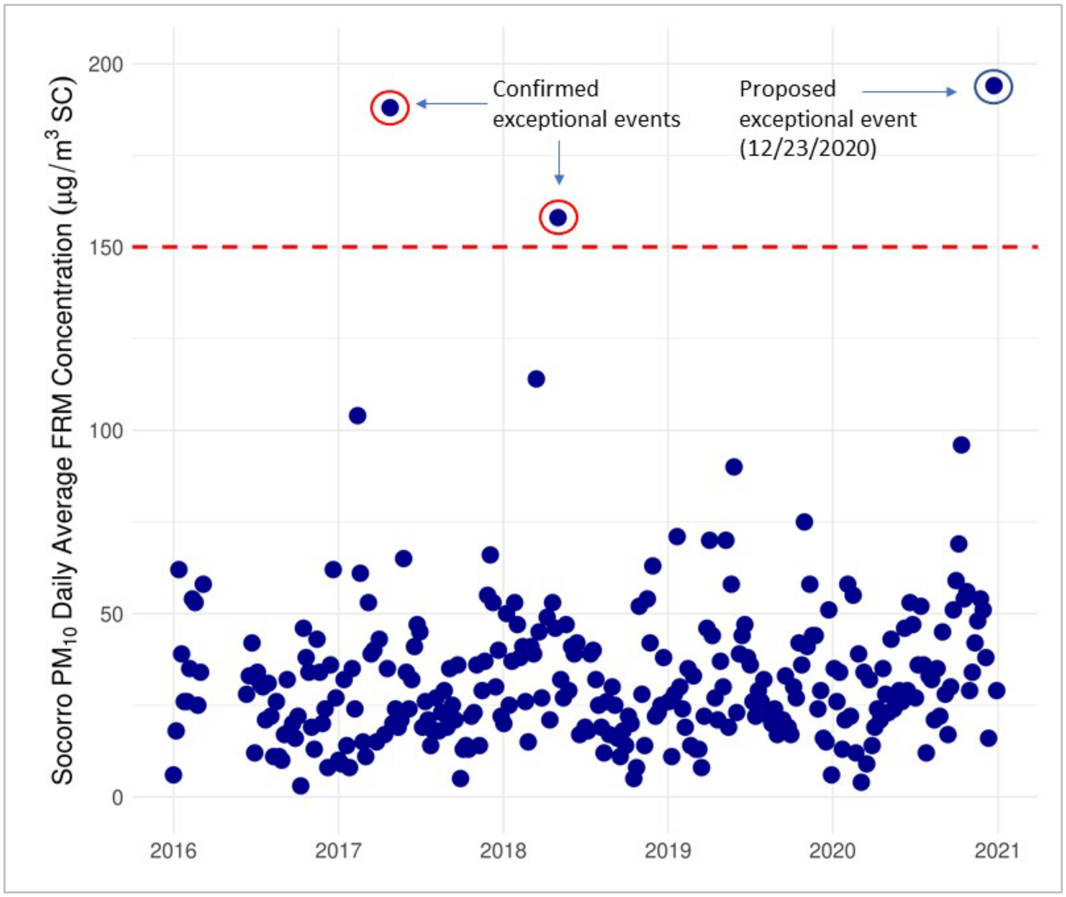

Figure 5-3: Socorro Hueco (C49) FRM PM_{10} Daily Measurements from 2016 through 2020

Figure 5-4: *Riverside/El Paso Mimosa (C9996) FRM PM_{10} Daily Measurements from 2016 through 2020* shows the valid daily measurements of PM_{10} at Riverside/El Paso Mimosa (C9996) along with the level of the PM_{10} 24-hour NAAQS. The proposed exceptional event day for December 23, 2020 is circled in blue. The increase in daily averages beginning in the early portion of 2020 is due to a construction project that began in March 2020 and continued through the remainder of the year. The figure demonstrates that the flagged measurements on the event day was outside of normal historical fluctuations in measured particulate concentrations for El Paso County.

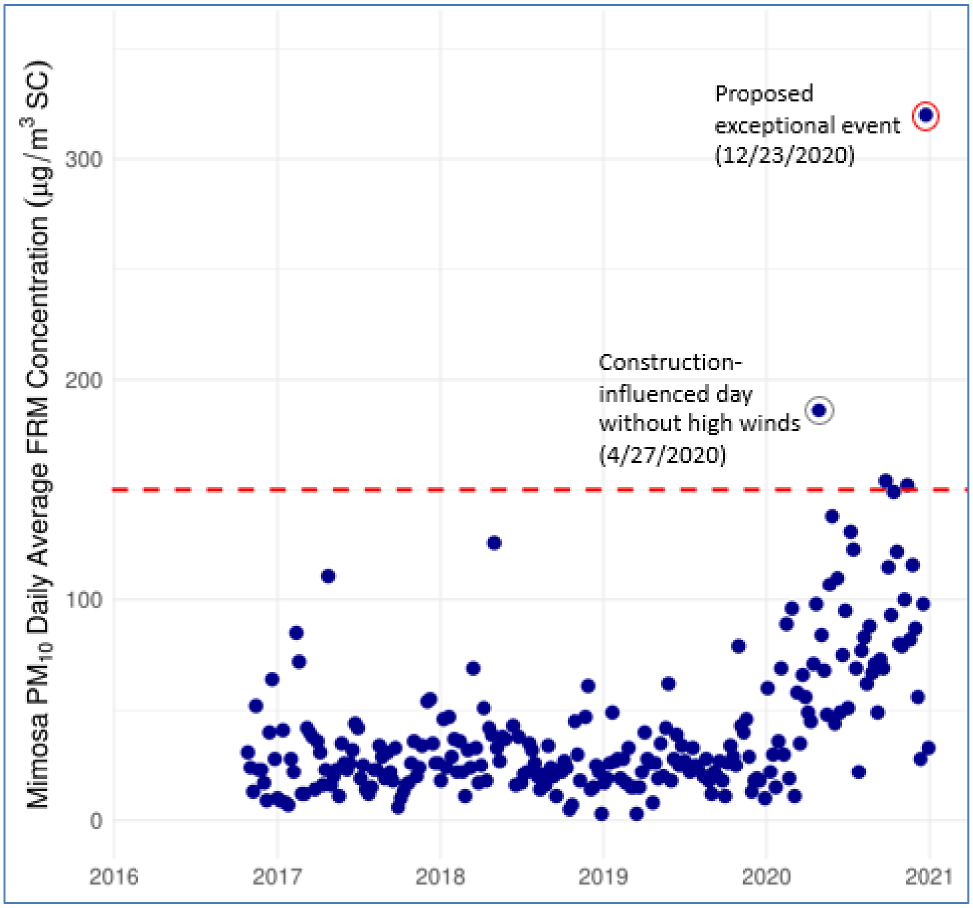

Figure 5-4: Riverside/El Paso Mimosa (C9996) FRM PM_{10} Daily Measurements from 2016 through 2020

5.2.2 Spatial and Temporal Variability of PM_{10} in El Paso County

PM_{10} data across El Paso County are presented in Table 5-2: *El Paso County PM_{10} Daily Measurements (µg/m³) before and after December 23, 2020*. This information highlights the impact of the windblown dust event on the flagged event day and demonstrates spatial and temporal variability of PM_{10} in El Paso County.

Table 5-2: El Paso County PM_{10} Daily Measurements (µg/m^3) before and after December 23, 2020

Date	Socorro Hueco (C49) FRM	Socorro Hueco (C49) C	Ivanhoe (C414) FRM	El Paso UTEP (C12) C	Riverside/El Paso Mimosa (C9996) FRM	Van Buren (C693) FRM	Ojo de Agua (C1021) FRM
12/17/2020	46	39	37	33	98	24	29
12/18/2020	--	36	--	28	--	--	--
12/19/2020	--	39	--	20	--	--	--
12/20/2020	--	49	--	20	--	--	--
12/21/2020	--	61	--	30	--	--	--
12/22/2020	--	65	--	24	--	--	--
12/23/2020*	194*	135*	142*	54*	320*	63*	46*
12/24/2020	--	34	--	20	--	--	--
12/25/2020	--	34	--	32	--	--	--
12/26/2020	--	43	--	20	--	--	--
12/27/2020	--	30	--	25	--	--	--
12/28/2020	--	28	--	46	--	--	--
12/29/2020	22	29	19	26	33	15	13

Notes:
* indicates proposed exceptional event day measurements.
-- sample collection was not scheduled for listed day.
Abbreviations:
FRM Federal Reference Method monitor PM_{10} concentration (µg/m^3)
C continuous monitor PM_{10} concentration (µg/m^3)
NA valid data were not recorded on these scheduled sample days

5.2.3 Percentile Ranking

The flagged PM_{10} concentrations on the proposed exceptional event day were the highest measurements during the five-year period from 2016 through 2020. During this period there were 582 valid daily measurements at the Socorro Hueco (C49) monitor and 249 at Riverside/El Paso Mimosa (C9996), which places the exceptional event day above the 99th percentile at both monitors and demonstrates that the measurements were well above normal historical fluctuations.

5.3 CLEAR CAUSAL RELATIONSHIP DETERMINATION

On December 23, 2020, a high wind dust event occurred that generated PM_{10} and resulted in elevated concentrations at the Socorro Hueco (C49) and Riverside/El Paso Mimosa (C9996) monitoring sites in El Paso County. The monitored PM_{10} concentration of 194 micrograms per cubic meter (µg/m^3) at Socorro Hueco (C49) and that of 320 µg/m^3 at the Riverside/El Paso Mimosa (C9996) monitor were the highest measurements, respectively, at each monitor during the five-year period from 2016 through 2020. The elevated concentrations were the result of widespread blowing dust transported from northern Mexico and other vacant areas north of El Paso County associated with high winds generated by a cold front on the event day. At the Riverside/El Paso Mimosa (C9996) monitor, local construction was believed to have contributed to some of the elevated PM_{10} concentration, but the contribution from the widespread blowing dust event was believed sufficient to exceed the PM_{10} standard.

The comparisons and analyses, provided in both the narrative conceptual model and clear causal relationship sections of this demonstration, support the TCEQ's position that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored PM_{10} exceedances at the Socorro Hueco (C49) and Riverside/El Paso Mimosa (C9996) monitoring sites on December 23, 2020 and thus satisfies the clear causal relationship criterion.

CHAPTER 6: MITIGATION OF EXCEPTIONAL EVENTS

Title 40 Code of Federal Regulations (CFR) § 51.930(a) requires that "A State requesting to exclude air quality data due to exceptional events must take appropriate and reasonable actions to protect public health from exceedances or violations of the national ambient air quality standards." Three specific requirements are described in this regulation and are addressed individually below. Examples of each of the webpages identified below can be found in Appendix D: *Event Analysis for December 23, 2020*.

6.1 PROMPT PUBLIC NOTIFICATION

The first requirement, 40 CFR §51.930(a)(1), is to "provide for prompt public notification whenever air quality concentrations exceed or are expected to exceed an applicable ambient air quality standard." The Texas Commission on Environmental Quality (TCEQ) provides the United States Environmental Protection Agency (EPA) Air Quality Index (AQI) forecasts for the current day and the next three to four days for 17 areas in Texas, including the El Paso area, for ozone, particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$), and particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}). These forecasts are available to the public on the Today's Texas Air Quality Forecast webpage (http://www.tceq.texas.gov/airquality/monops/forecast_today.html) (TCEQ2, 2021) and on the EPA AIRNOW website (http://airnow.gov/) (EPA3, 2021). These notifications are forecasts, and the PM_{10} levels anticipated did not match what ultimately occurred. The Today's Texas Air Quality webpage forecast discussion for the event day is quoted below:

> "Wednesday 12/23/2020
>
> Increased fine particulate background levels (consisting primarily of light amounts of smoke from isolated agricultural and industrial burning in South Texas and northern Mexico) may continue building up ahead of an advancing cold front and could be enough to raise the daily $PM_{2.5}$ AQI to the lower to middle end of the "Moderate" range in parts of the Brownsville-McAllen area.
>
> Elevated afternoon winds could generate and transport very light amounts of localized blowing dust into and through portions of Far West Texas and the Upper Panhandle, though the intensity and duration of any dust is not expected to be enough to raise the daily PM_{10} AQI beyond the "Good" range throughout most of the impacted region, which includes parts of the Amarillo and El Paso areas.
>
> Otherwise and elsewhere in the state, moderate to strong winds, cooler temperatures, and/or lower incoming background levels should help keep air quality in the "Good" range in most spots."

The TCEQ also provides near real-time hourly PM_{10} and $PM_{2.5}$ measurements from monitors across the state, including the El Paso area, that are available to the public on the Airborne Particulates webpage (https://www.tceq.texas.gov/cgi-bin/compliance/monops/particulates.pl) (TCEQ3, 2021) of the TCEQ website. Finally, the TCEQ publishes an AQI Report on the Air Quality Index Report webpage (https://www.tceq.texas.gov/cgi-bin/compliance/monops/aqi_rpt.pl) (TCEQ4, 2021) that displays the latest and historical daily AQI measurements. These items allow the public to assess forecast, current, and past PM_{10} and $PM_{2.5}$ air quality levels.

6.2 PUBLIC EDUCATION

The second requirement, 40 CFR §51.930(a)(2), is to "provide for public education concerning actions that individuals may take to reduce exposures to unhealthy levels of air quality during and following an exceptional event." Links to TCEQ and EPA webpages describing recommended actions for individuals to reduce exposure to particulate matter whenever it is high (EPA2, 2021) are included on TCEQ web displays of forecast and measured AQI levels, including TCEQ's Air Pollution from Particulate Matter webpage (http://www.tceq.texas.gov/airquality/sip/criteria-pollutants/sip-pm) and EPA's Air Quality Index (AQI) Basics webpage (https://www.airnow.gov/aqi/aqi-basics/). The EPA also provides similar links on the AIRNOW webpages where TCEQ forecasts and current data are displayed.

The TCEQ also pursues outreach and educational opportunities in the El Paso area through work with the Paso Del Norte Joint Advisory Committee (https://www.cccjac.org/) and through public informational meetings. The Joint Advisory Committee holds meetings that are open to the public and are attended by TCEQ staff.

6.3 IMPLEMENT MEASURES TO PROTECT PUBLIC HEALTH

The third requirement, 40 CFR §51.930(a)(3), is to "provide for the implementation of appropriate measures to protect public health from exceedances or violations of ambient air quality standards caused by exceptional events." Since 1991, the TCEQ and the City of El Paso have implemented dust control measures as part of the state implementation plan (SIP) and its revisions for the El Paso PM_{10} nonattainment area as previously described in more detail under Section 3.2: *Attainment Status and Control Measures*, Chapter 3: *Not Reasonably Controllable or Preventable*.

6.4 TCEQ MITIGATION PLAN

On December 28, 2018, the EPA determined that the TCEQ had met the requirement to develop a Mitigation Plan (https://www.tceq.texas.gov/downloads/air-quality/modeling/exceptional/texas-ee-mitigation-plan-final.pdf) for El Paso County for $PM_{2.5}$ due to historic recurrences of exceptional events due to high winds. See Treatment of Data Influenced by Exceptional Events, 81 Fed. Reg. 68216, 68272-73 (Oct. 3, 2016) for a list of areas required to develop Mitigation Plans. While development of this Mitigation Plan was required specifically due to recurrent $PM_{2.5}$ exceptional events, the items included also pertain to PM_{10}. The Mitigation Plan outlines the following components that apply to El Paso County:

- 40 CFR §51.930(a)(1-3) and §51.930(b)(2)(i): Public notification and education programs for affected or potentially affected communities;
- 40 CFR §51.930(b)(2)(ii): Steps to identify, study and implement mitigating measures; and
- 40 CFR §51.930(b)(2)(iii): Provisions for review and evaluation of the mitigation plan and its implementation and effectiveness by the air agency and all interested stakeholders (e.g., public and private land owners/managers, air quality, agriculture and forestry agencies, the public).

CHAPTER 7: CONCLUSION

The information provided in this document demonstrates that the proposed exceptional event flags for particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) data at the Riverside/El Paso Mimosa (C9996) and Socorro Hueco (C49) sites for December 23, 2020 meet all of the requirements for an exceptional event. As indicated by satellite imagery, backward trajectories, webcam imagery, and measurement statistics, high winds blowing transported dust clearly caused exceedances of the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS) on December 23, 2020. Elevated levels of PM_{10} were caused by regional high winds, were not reasonably controllable or preventable, and were due to natural events. Measured PM_{10} concentrations on this day were well above the 99th percentile of historical measurements and thus affected air quality in excess of normal historical fluctuations. The Texas Commission on Environmental Quality therefore requests the United States Environmental Protection Agency's concurrence on this exceptional event flag and to have the associated measurement removed from consideration when making compliance determinations for the 24-hour PM_{10} NAAQS.

CHAPTER 8: REFERENCES

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APPENDIX A

PROPOSED EL PASO COUNTY PM_{10} EXCEPTIONAL EVENT FLAGS AND INITIAL NOTIFICATION

EL PASO COUNTY EXCEPTIONAL EVENT DEMONSTRATION FOR PARTICULATE MATTER OF 10 MICRONS OR LESS IN AERODYNAMIC DIAMETER (PM_{10}) FOR THE SOCORRO HUECO AND EL PASO MIMOSA MONITORS ON DECEMBER 23, 2020

EL PASO 1987 PM_{10} STANDARD

A.1 INITIAL NOTIFICATION PROCESS

The Texas Commission on Environmental Quality submitted an initial notification to the United States Environmental Protection Agency (EPA) Region 6 and engaged in discussions with its EPA Regional office regarding the demonstration prior to formal submittal. Copies of the initial notification letter and EPA's response are provided below in Figure A-1: *Initial Notification Letter to the EPA Region 6*.

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 17, 2022

Jeff Robinson
Branch Chief, Air Permitting, Monitoring, and Grants
U.S. Environmental Protection Agency – Region 6
1201 Elm Street, Suite 500 (MC 6ARP)
Dallas, TX 75270

Subject: Initial Notification of a Potential Exceptional Event

Dear Mr. Robinson:

This letter serves as formal notification that the Texas Commission on Environmental Quality (TCEQ) will develop and submit a demonstration to exclude 2020 PM_{10} air monitoring data influenced by an exceptional event pursuant to 40 CFR Parts 50 and 51. This demonstration will address the following high-wind dust event which occurred on December 23, 2020 at sites 481410057 (Socorro Hueco) and 481410038 (El Paso Mimosa) for parameter 81102 (PM_{10}):

Date	Monitor	Type of Event	AQS Flag*	Exceedance Concentration
December 23, 2020	481410057	High Winds	RJ	194.0 µg/m³
December 23, 2020	481410038	High Winds	RJ	320.0 µg/m³

**currently entered in AQS as Informational Flag 'IJ – High Winds'*

The data requested for exclusion have regulatory significance and affect the regulatory determination concerning the portions of El Paso County in which the air monitoring sites are located. The Socorro Hueco monitoring site falls outside the area officially designated as Nonattainment by the EPA for the 1987 PM_{10} National Ambient Air Quality Standard. The El Paso Mimosa site is located within this area. The TCEQ looks forward to working with EPA Region 6 to establish a time frame for the demonstration.

If you need any additional information, please contact Daphne McMurrer at Daphne.McMurrer@tceq.texas.gov.

Sincerely,

Donna F. Huff, Deputy Director
Air Quality Division

cc: Frances Verhalen, P.E., EPA R6 Air Monitoring & Grants Section Chief

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Figure A-1: Initial Notification Letter to the EPA Region 6

A.2 PROPOSED EL PASO COUNTY PM_{10} EXCEPTIONAL EVENT FLAGS

Table A-1: Proposed 2020 El Paso Area PM_{10} Exceptional Event Flags

Date	Site ID	Site Name	POC	PM_{10}	Flag	Flag Description
12/23/2020	481410057	Socorro Hueco (C49)	1	194	RJ	High winds – regional blowing dust
12/23/2020	481410038	Riverside/El Paso Mimosa (C9996)	1	320	RJ	High winds – regional blowing dust

Abbreviations:
Site ID EPA site identification number
POC EPA Parameter Occurrence Code
PM_{10} daily average concentration in micrograms per cubic meter standard conditions (µg/m^3 SC)

APPENDIX B

EVENT ANALYSIS FOR DECEMBER 23, 2020

EL PASO EXCEPTIONAL EVENT DEMONSTRATION FOR PARTICULATE MATTER OF 10 MICRONS OR LESS IN AERODYNAMIC DIAMETER (PM_{10}) FOR THE SOCORRO HUECO AND EL PASO MIMOSA MONITORS ON DECEMBER 23, 2020

EL PASO 1987 PM_{10} STANDARD

B.1 EVENT SUMMARY

A cold front passing through El Paso County brought strong northerly and westerly winds along and behind the frontal boundary, which is consistent with the orientation of dust sources oriented west and north of El Paso. Figure B-1: *Regional Weather Map for December 23, 2020, at 14:00 MST* provides a weather map from the event day.

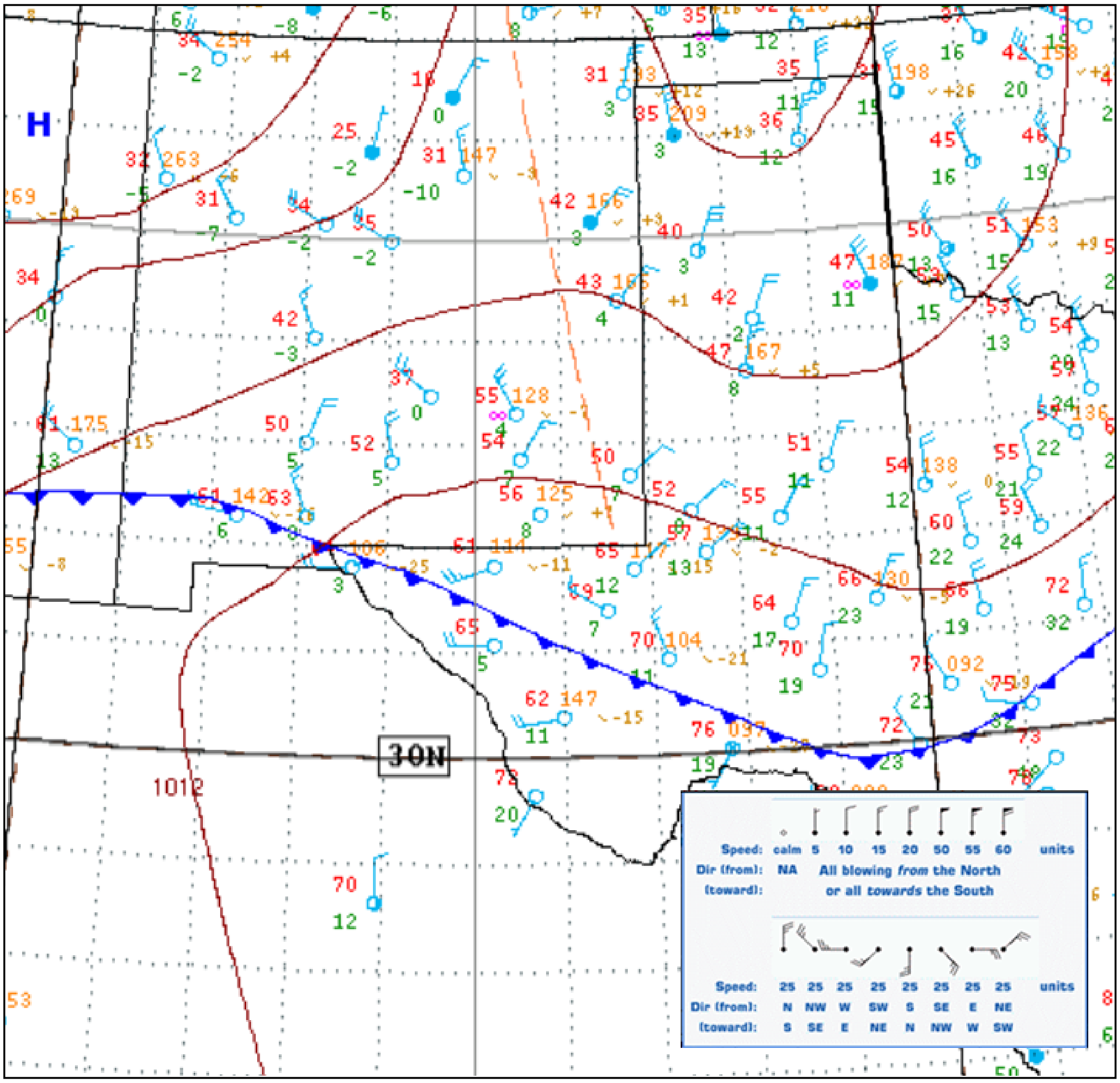


Figure B-1: Regional Weather Map for December 23, 2020, at 14:00 MST

On the weather map, winds are shown in blue with wind blowing along the line toward each weather station indicated by a circle. Barbs at the end of each wind vector indicate the wind speed with a full barb for 10 nautical miles per hour (knots) and a half barb for 5 knots and the wind speed is the sum of the values shown with the individual barbs.

High winds associated with the cold front generated an area of blowing dust initially in northern Mexico that began impacting El Paso County around 12:00 Mountain Standard

Time (MST). As wind shifted to the north throughout the remainder of the day, the contribution from Mexico and blowing dust from where natural, undisturbed lands north of El Paso up to and including the White Sands area of New Mexico were believed to contribute to elevated hourly particulate matter of 10 microns or less in aerodynamic diameter (PM_{10}) concentrations that peaked at 22:00 MST. High particulate matter concentrations were measured across the area from noon to 22:00 MST. Area peak wind gusts reached 47 miles per hour (mph), peak two-minute sustained winds at the El Paso International Airport reached 35 mph, peak area five-minute sustained winds at Texas Commission on Environmental Quality air monitoring sites reached 31 mph, and peak area hourly sustained winds reached 28 mph.

An exceptional event flag is proposed for the Socorro Hueco (C49) Federal Reference Method (FRM) PM_{10} measurement of 194 micrograms per cubic meter ($\mu g/m^3$) on December 23, 2020. The collocated continuous PM_{10} monitor measured a daily average of 140 $\mu g/m^3$ and a peak one-hour average of 445 $\mu g/m^3$ for the hour beginning 22:00 MST. The hourly average PM_{10} concentration was above the 24-hour National Ambient Air Quality Standard of 150 $\mu g/m^3$ for 11 consecutive hours beginning with the 12:00 MST hour. The peak measured wind gust at Socorro Hueco (C49) was 38.9 mph and the highest hourly wind speed was 20 mph.

Additionally, an exceptional event flag is proposed for the Riverside/El Paso Mimosa (C9996) FRM PM_{10} measurement of 320 $\mu g/m^3$ on December 23, 2020. A collocated continuous PM_{10} sampler is not present at this site.

B.2 WEBCAM IMAGES

The Texas Tech University Health Sciences Center webcam provided visual images of the dust impacting El Paso County on December 23, 2020. A map of the webcam locations was previously presented in Figure 2-11: *Texas Tech University Health Sciences Center Webcam Images*.

Figure B-2: *Texas Tech University Health Sciences Center Webcam Images* shows a view from this location with the camera facing a northerly direction. In the webcam images, the top frame shows visibility on December 25, 2020, and the bottom frame shows diminished visibility on December 23, 2020. The times of day these images were taken were not provided by the website; therefore, the time of peak PM_{10} concentrations was not able to be isolated in the picture from December 23, 2020. Despite this limitation, these images provide an indication of the transported regional blowing dust associated with this event.

Figure B-2: Texas Tech University Health Sciences Center Webcam Images

B.3 SATELLITE IMAGES

Satellite imagery from the National Oceanic and Atmospheric Administration (NOAA) provides additional evidence that the dust on the exceptional event day was caused primarily by transport from sources outside of El Paso County. High-resolution true color images show indications of dust plumes originating from exposed soil areas in the desert of northern Mexico. Although satellite imagery was unavailable for later in the day on December 23, 2020, winds shifted to the north in the early afternoon, and it is believed that dust from as far as the White Sands region in New Mexico may have impacted PM_{10} levels in El Paso County.

Figure B-3: *Terra MODIS Satellite Images* compare views with minimal dust on December 17, 2020, to views with dust plumes from the December 23, 2020, event. The satellite image on December 23, 2020, shows widespread dust emanating from northern Mexico into the El Paso area, contributing to the observed high particulate concentrations. On these satellite images, clouds appear bright white and usually have distinct edges, whereas dust plumes are characterized by grayish to brownish streaks that do not appear on clear sky images where dust is not present.

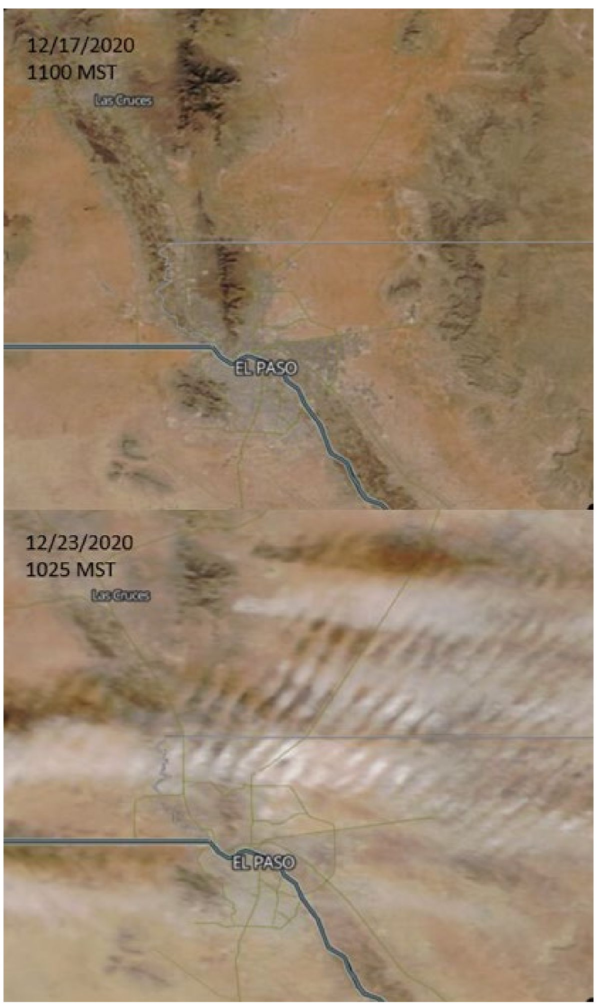


Figure B-3: Terra MODIS Satellite Images

B.4 BACKWARD TRAJECTORIES

Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) backward trajectory paths plotted for air arriving at 10 meters (m), 100 m, and 1,000 m above ground level (AGL), going backward in time 12 hours showing the approximate path for air arriving at the Socorro Hueco (C49) site at two separate times of day, are displayed in Figure B-4: *HYSPLIT Backward Trajectories (12:00 and 22:00 MST) at 10, 100, and 1,000 m AGL*. The left image in Figure 2-13 shows winds from the west in the early part of the day. The time of 12:00 MST was selected as it corresponds with the highest hourly PM_{10} concentration recorded on December 23, 2020 when winds were from the west. The value at the Socorro Hueco (C49) monitor at 12:00 MST was 255 µg/m^3. The right image in Figure 2-13 shows winds from the north arriving at the time of the highest hourly PM_{10} concentration observed at the Socorro Hueco (C49) monitor site on the event day at 22:00 MST. The value at the Socorro Hueco (C49) monitor at 22:00 MST was 445 µg/m^3. In both images, the three colors assigned to each trajectory represent air arriving at the Socorro Hueco (C49) monitor at 10 meters (m) (red), 100 m (blue), and 1,000 m (green) above ground level (AGL). These trajectories provide evidence that the air arriving at the Socorro Hueco (C49) site at the times of elevated PM_{10} levels on December 23, 2020, initially originated from northern Mexico and transitioned to areas north of El Paso.

Similarly, Figure B-5: *HYSPLIT Backward Trajectories (11:00 through 22:00 MST) at 100 m AGL* shows backward trajectories for each hour from 11:00 through 22:00 on December 23, 2020. These hours were chosen because they correspond with the hours when PM_{10} concentrations were most elevated on the event date. The trajectories pictured in Figure B-5 are 72-hour backward trajectories, initiated at 100 m height AGL, using the North American Mesoscale Forecast System (NAM) reanalysis product at 12-kilometer (km) resolution as the meteorological data source.

Trajectories in Figure B-5 can be seen in two distinct clusters. The first cluster of trajectories from the west arrive at the Socorro Hueco (C49) monitor site during the time range of 11:00 MST through 16:00 MST. The second cluster, consisting of trajectories from 17:00 MST through 22:00 MST, illustrates how rapidly wind shifted to the north and continued from that direction through the latter portion of the day. This cluster also shows how wind traveled directly over the White Sands region in New Mexico and continued over primarily vacant desert land prior to arriving at the Socorro Hueco (C49) monitor in El Paso County. The Riverside/El Paso Mimosa (C9996) monitor is located approximately seven miles northwest of the Socorro Hueco (C49) monitor. As such, the trajectories presented in Figures 2-13 and 2-14 are also applicable to the Riverside/El Paso Mimosa (C9996) monitor.

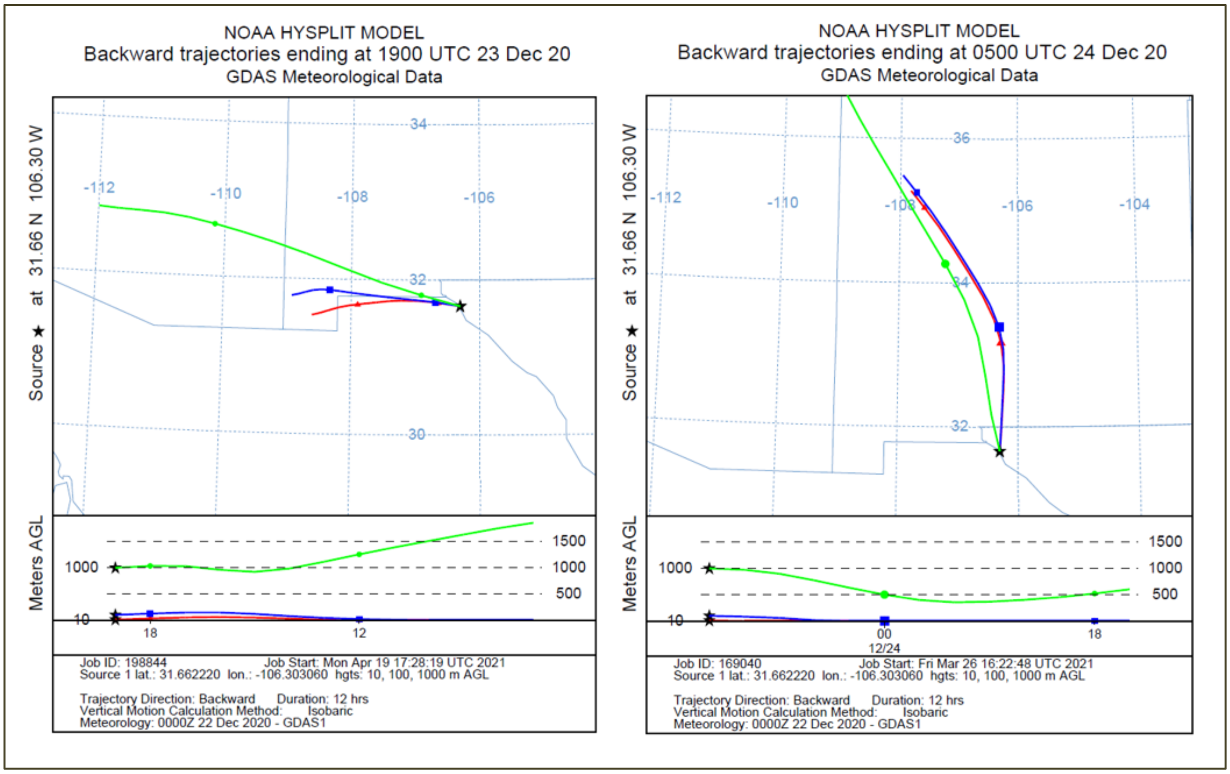


Figure B-4: HYSPLIT Backward Trajectories (12:00 and 22:00 MST) at 10, 100, and 1,000 m AGL

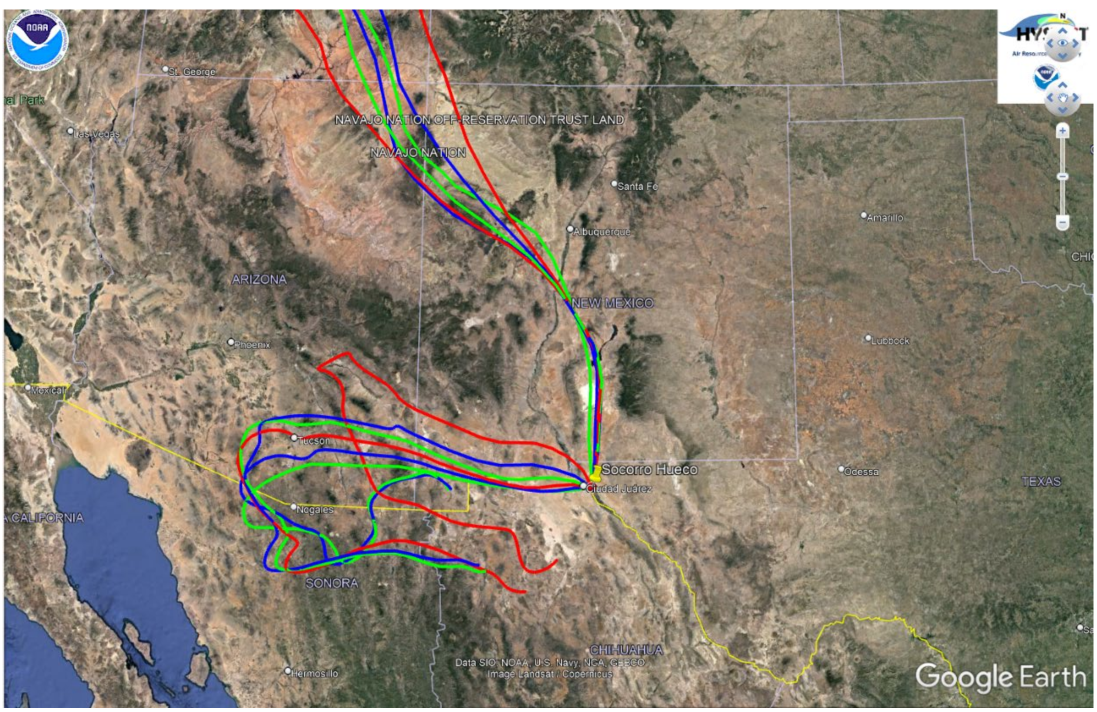


Figure B-5: HYSPLIT Backward Trajectories (11:00 through 22:00 MST) at 100 m AGL

B.5 MAP PLOTS OF DAILY PARTICULATE MATTER DATA

The following maps display daily average PM_{10} and particulate matter of 2.5 microns or less in aerodynamic diameter ($PM_{2.5}$) measurements from the December 23, 2020, event. Maps of the daily average PM_{10} and $PM_{2.5}$ concentrations show the spatial distribution of measurements on the event day, with the flagged measurement identified by its site name. PM_{10} concentrations are shown in Figure B-6: *Daily Average PM_{10} Measurements (µg/m³) on December 23, 2020*, and $PM_{2.5}$ concentrations are shown in Figure B-7: *Daily Average $PM_{2.5}$ Measurements (µg/m³) on December 23, 2020*. As shown in Figure B-6, the highest measured PM_{10} values occurred in the eastern portion of the county.

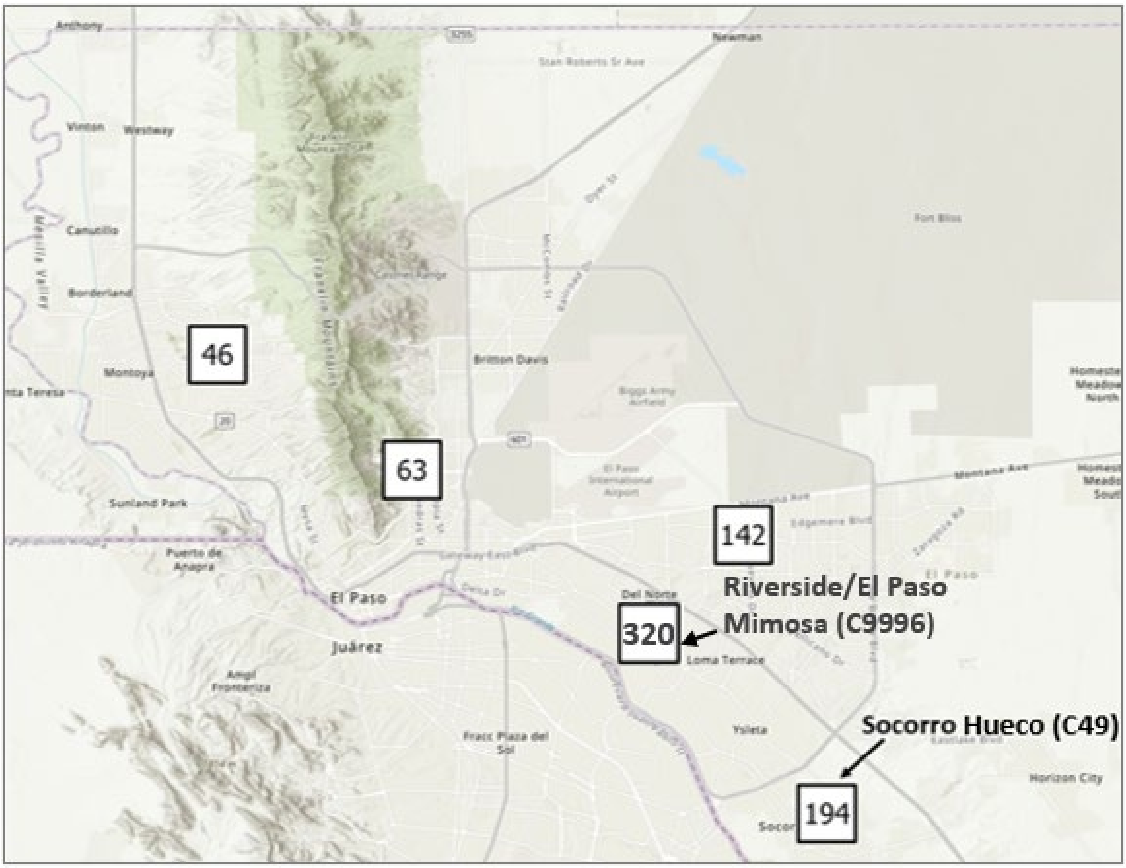


Figure B-6: Daily Average PM_{10} Measurements (µg/m³) on December 23, 2020

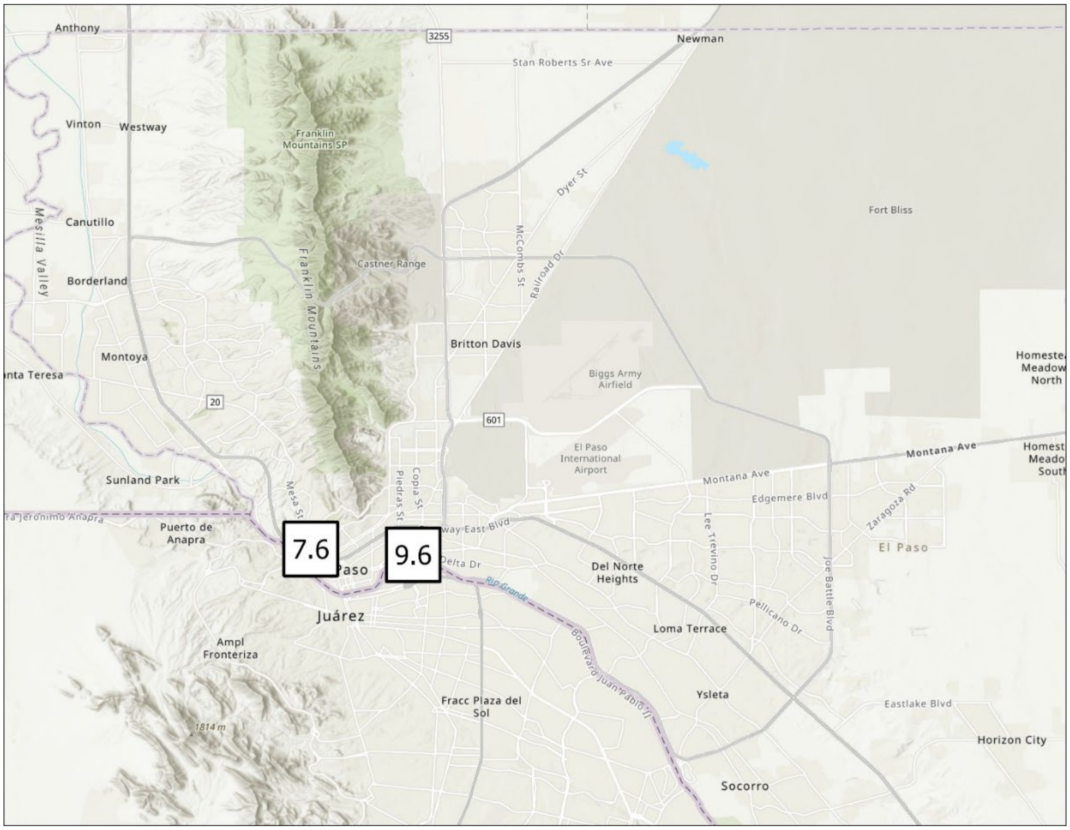


Figure B-7: Daily Average $PM_{2.5}$ Measurements (µg/m^3) on December 23, 2020

B.6 CONTINUOUS PARTICULATE MATTER AND WIND GRAPHS

Time series graphs, plotting continuous particulate measurements against wind speed measurements, illustrate the nature of dust events with particulate concentrations rising following sustained, high wind speeds. Figure B-8: *Continuous Five-Minute PM_{10} and Peak Area Five-Minute Sustained Wind Speed Measurements on December 23, 2020* demonstrates that peak sustained wind speed measurements on December 23, 2020, reached 20 to 25 mph from 00:00 MST through 04:00 MST. After wind speeds dropped for the remainder of the morning, they rose again to 20 to 25 mph just before 11:00 MST and remained consistently close to this level until 23:00 MST. Despite high wind speeds earlier in the day, the corresponding rise in particulate matter measurements began after 12:00 MST, indicative of a dust source some distance from the monitors. At such high wind speeds, a dust source nearer the monitor locations would have resulted in measurement of high levels of particulate matter within minutes after the high wind speeds began.

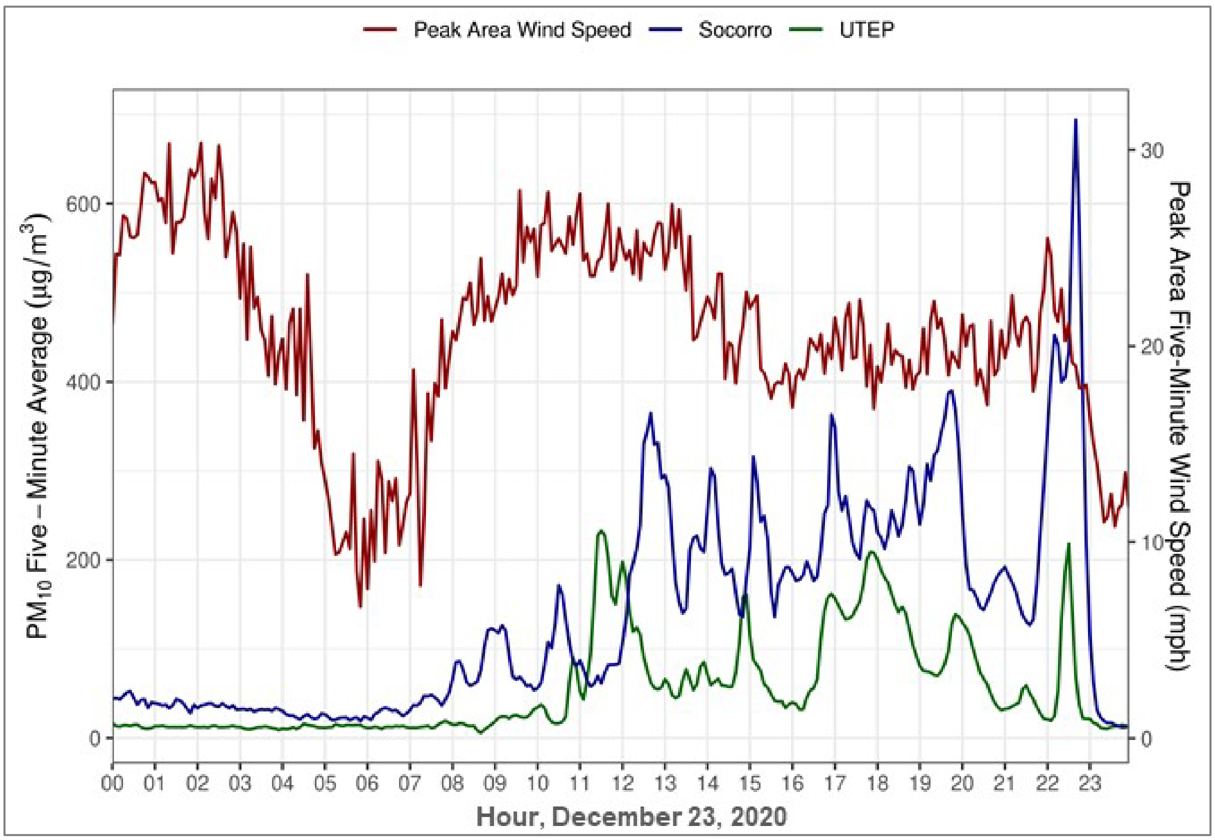


Figure B-8: Continuous Five-Minute PM_{10} and Peak Area Five-Minute Sustained Wind Speed Measurements on December 23, 2020

APPENDIX C

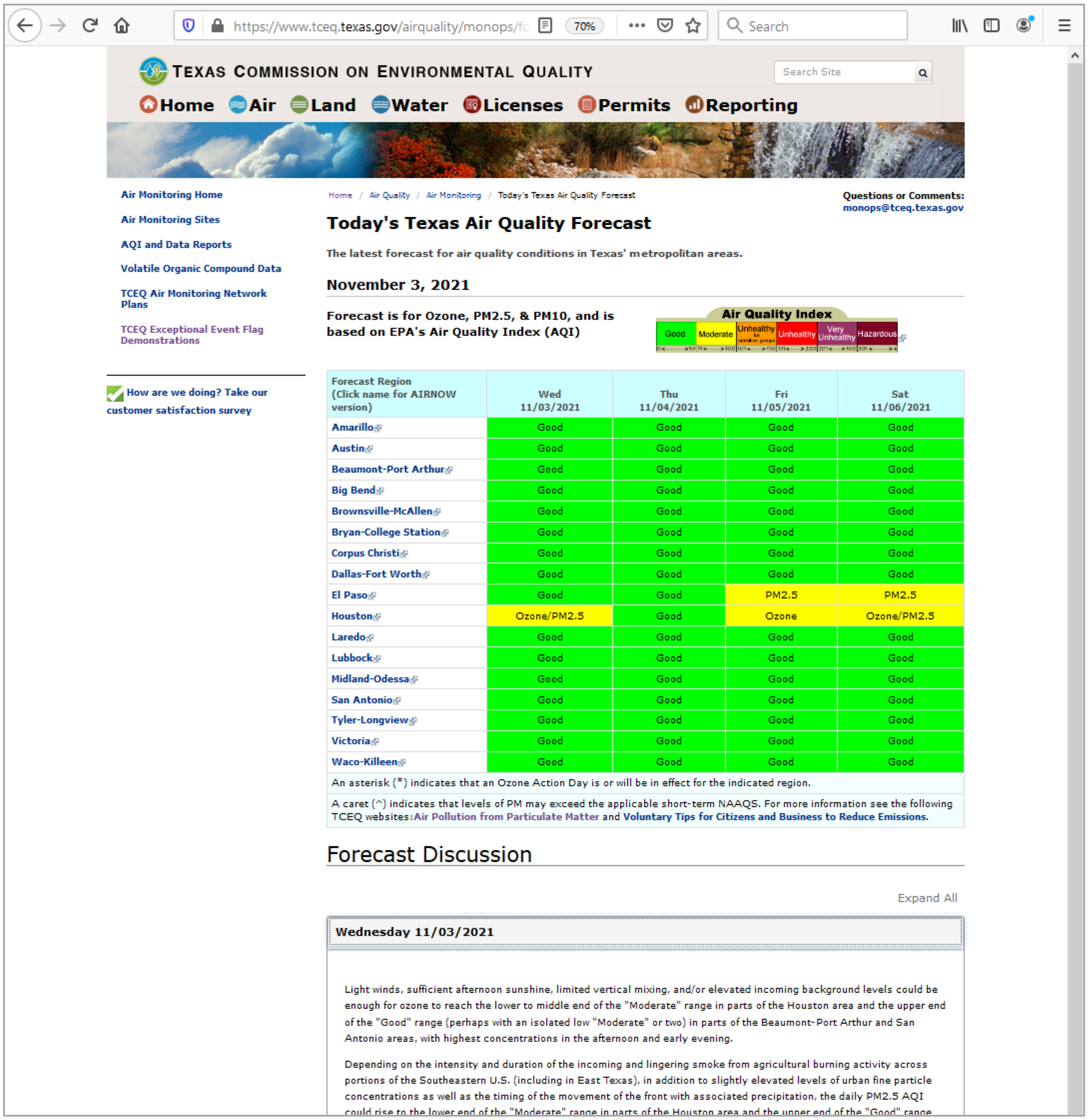
WEBPAGE EXAMPLES

EL PASO EXCEPTIONAL EVENT DEMONSTRATION FOR PARTICULATE MATTER OF 10 MICRONS OR LESS IN AERODYNAMIC DIAMETER (PM_{10}) FOR THE SOCORRO HUECO AND EL PASO MIMOSA MONITORS ON DECEMBER 23, 2020

EL PASO 1987 PM_{10} STANDARD

C.1 WEBPAGE EXAMPLES

Figures C-1 through C-6 show examples of webpages cited by links in Chapter 6: *Mitigation of Exceptional Events*.


https://www.tceq.texas.gov/airquality/monops/fo

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Today's Texas Air Quality Forecast

The latest forecast for air quality conditions in Texas' metropolitan areas.

November 3, 2021

Forecast is for Ozone, PM2.5, & PM10, and is based on EPA's Air Quality Index (AQI)

Air Quality Index: Good | Moderate | Unhealthy for sensitive groups | Unhealthy | Very Unhealthy | Hazardous

Forecast Region (Click name for AIRNOW version)	Wed 11/03/2021	Thu 11/04/2021	Fri 11/05/2021	Sat 11/06/2021
Amarillo	Good	Good	Good	Good
Austin	Good	Good	Good	Good
Beaumont-Port Arthur	Good	Good	Good	Good
Big Bend	Good	Good	Good	Good
Brownsville-McAllen	Good	Good	Good	Good
Bryan-College Station	Good	Good	Good	Good
Corpus Christi	Good	Good	Good	Good
Dallas-Fort Worth	Good	Good	Good	Good
El Paso	Good	Good	PM2.5	PM2.5
Houston	Ozone/PM2.5	Good	Ozone	Ozone/PM2.5
Laredo	Good	Good	Good	Good
Lubbock	Good	Good	Good	Good
Midland-Odessa	Good	Good	Good	Good
San Antonio	Good	Good	Good	Good
Tyler-Longview	Good	Good	Good	Good
Victoria	Good	Good	Good	Good
Waco-Killeen	Good	Good	Good	Good

An asterisk (*) indicates that an Ozone Action Day is or will be in effect for the indicated region.

A caret (^) indicates that levels of PM may exceed the applicable short-term NAAQS. For more information see the following TCEQ websites: Air Pollution from Particulate Matter and Voluntary Tips for Citizens and Business to Reduce Emissions.

Forecast Discussion

Expand All

Wednesday 11/03/2021

Light winds, sufficient afternoon sunshine, limited vertical mixing, and/or elevated incoming background levels could be enough for ozone to reach the lower to middle end of the "Moderate" range in parts of the Houston area and the upper end of the "Good" range (perhaps with an isolated low "Moderate" or two) in parts of the Beaumont-Port Arthur and San Antonio areas, with highest concentrations in the afternoon and early evening.

Depending on the intensity and duration of the incoming and lingering smoke from agricultural burning activity across portions of the Southeastern U.S. (including in East Texas), in addition to slightly elevated levels of urban fine particle concentrations as well as the timing of the movement of the front with associated precipitation, the daily PM2.5 AQI could rise to the lower end of the "Moderate" range in parts of the Houston area and the upper end of the "Good" range

Figure C-1: Sample of a Portion of the TCEQ Today's Texas Air Quality Forecast Webpage

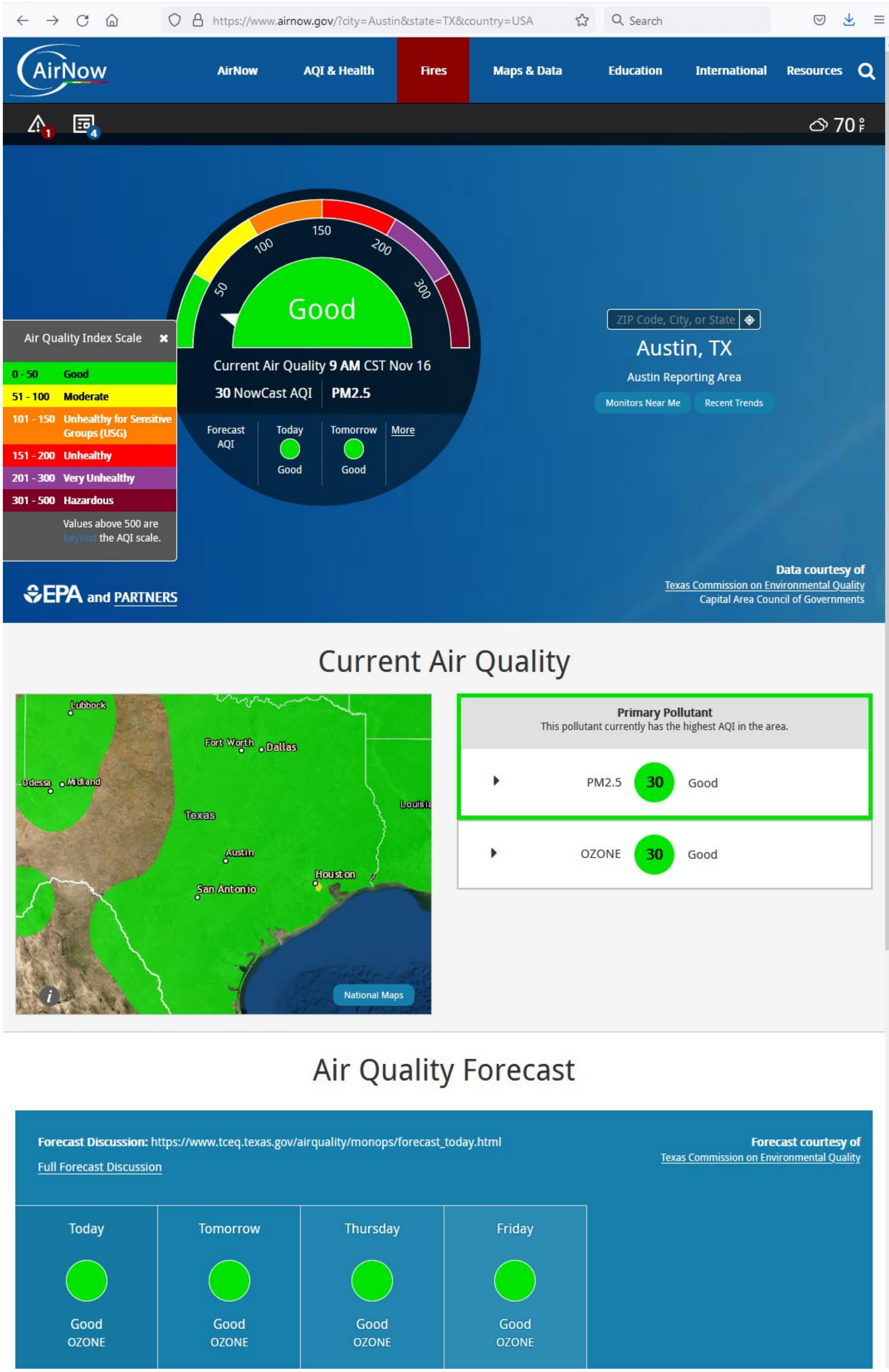
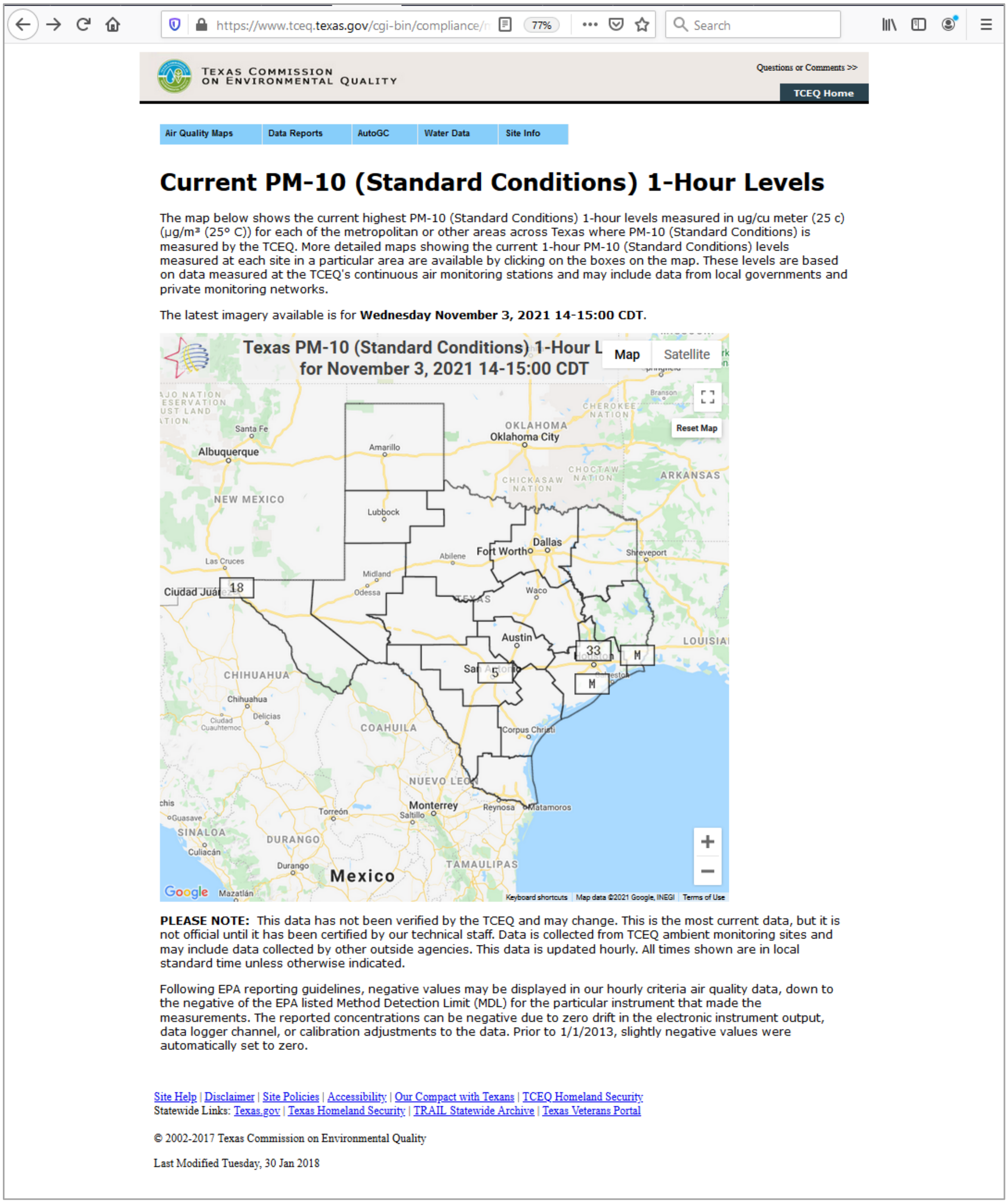


Figure C-2: Sample of the EPA AIRNOW Webpage



https://www.tceq.texas.gov/cgi-bin/compliance/

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Questions or Comments >>

TCEQ Home

Air Quality Maps | Data Reports | AutoGC | Water Data | Site Info

Current PM-10 (Standard Conditions) 1-Hour Levels

The map below shows the current highest PM-10 (Standard Conditions) 1-hour levels measured in ug/cu meter (25 c) (µg/m³ (25° C)) for each of the metropolitan or other areas across Texas where PM-10 (Standard Conditions) is measured by the TCEQ. More detailed maps showing the current 1-hour PM-10 (Standard Conditions) levels measured at each site in a particular area are available by clicking on the boxes on the map. These levels are based on data measured at the TCEQ's continuous air monitoring stations and may include data from local governments and private monitoring networks.

The latest imagery available is for **Wednesday November 3, 2021 14-15:00 CDT**.

PLEASE NOTE: This data has not been verified by the TCEQ and may change. This is the most current data, but it is not official until it has been certified by our technical staff. Data is collected from TCEQ ambient monitoring sites and may include data collected by other outside agencies. This data is updated hourly. All times shown are in local standard time unless otherwise indicated.

Following EPA reporting guidelines, negative values may be displayed in our hourly criteria air quality data, down to the negative of the EPA listed Method Detection Limit (MDL) for the particular instrument that made the measurements. The reported concentrations can be negative due to zero drift in the electronic instrument output, data logger channel, or calibration adjustments to the data. Prior to 1/1/2013, slightly negative values were automatically set to zero.

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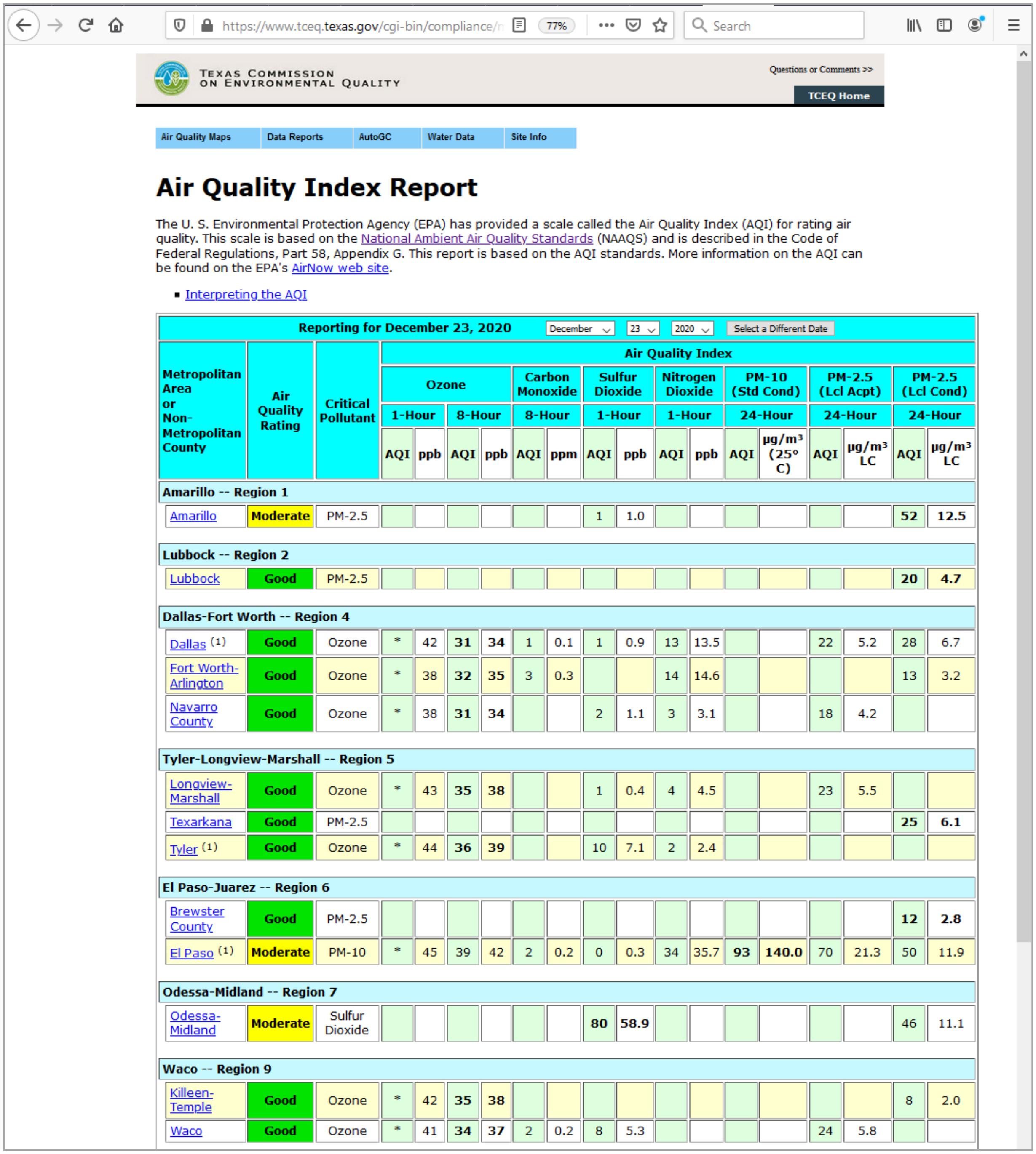
Last Modified Tuesday, 30 Jan 2018

Figure C-3: Sample of the TCEQ Map of Current PM_{10} Levels



Air Quality Index Report

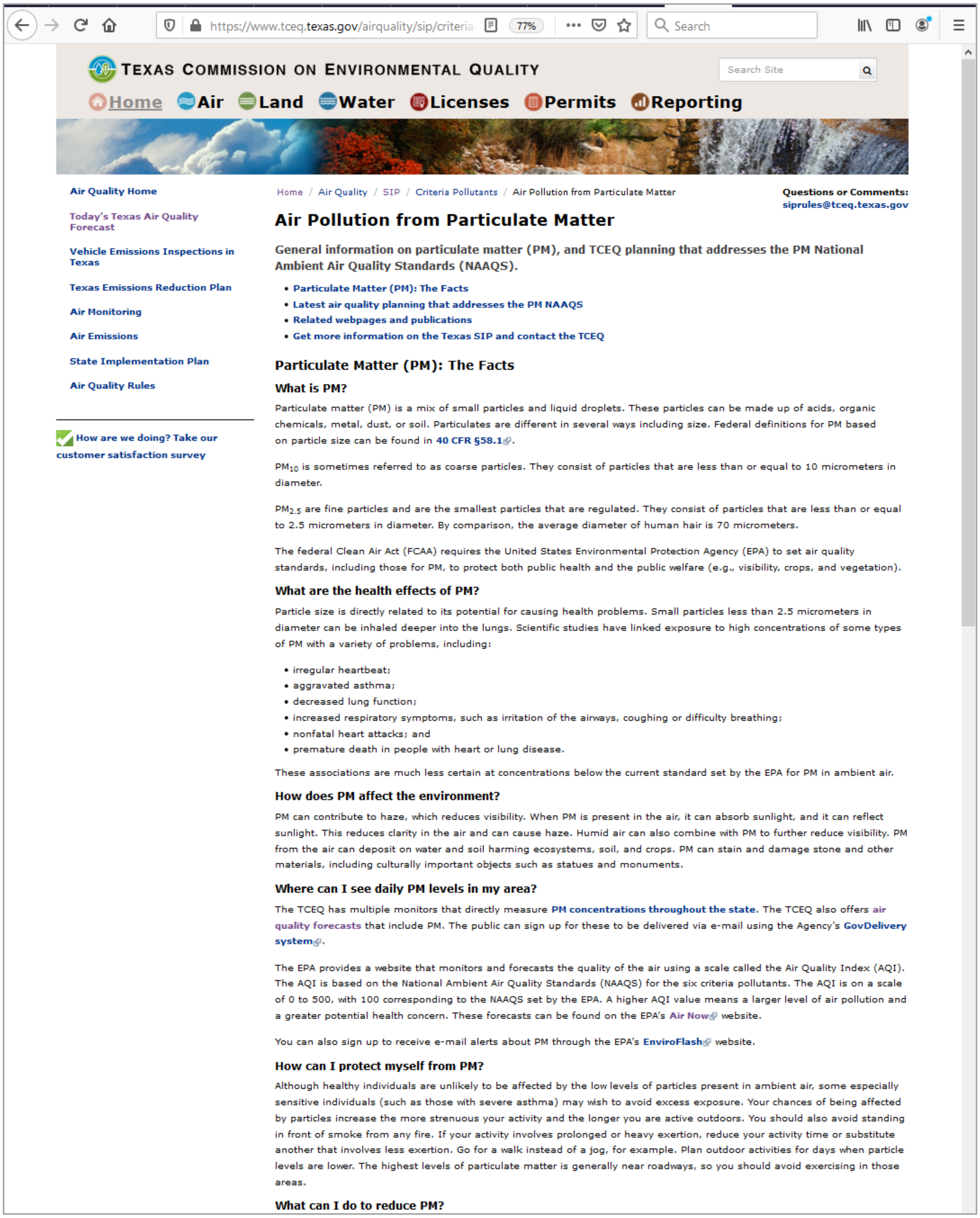
The U. S. Environmental Protection Agency (EPA) has provided a scale called the Air Quality Index (AQI) for rating air quality. This scale is based on the National Ambient Air Quality Standards (NAAQS) and is described in the Code of Federal Regulations, Part 58, Appendix G. This report is based on the AQI standards. More information on the AQI can be found on the EPA's AirNow web site.

- Interpreting the AQI

Reporting for December 23, 2020 — December 23 2020 Select a Different Date

Metropolitan Area or Non-Metropolitan County	Air Quality Rating	Critical Pollutant	Air Quality Index: Ozone 1-Hour AQI	Ozone 1-Hour ppb	Ozone 8-Hour AQI	Ozone 8-Hour ppb	Carbon Monoxide 8-Hour AQI	Carbon Monoxide 8-Hour ppm	Sulfur Dioxide 1-Hour AQI	Sulfur Dioxide 1-Hour ppb	Nitrogen Dioxide 1-Hour AQI	Nitrogen Dioxide 1-Hour ppb	PM-10 (Std Cond) 24-Hour AQI	PM-10 (Std Cond) 24-Hour µg/m³ (25° C)	PM-2.5 (Lcl Acpt) 24-Hour AQI	PM-2.5 (Lcl Acpt) 24-Hour µg/m³ LC	PM-2.5 (Lcl Cond) 24-Hour AQI	PM-2.5 (Lcl Cond) 24-Hour µg/m³ LC
Amarillo -- Region 1																		
Amarillo	Moderate	PM-2.5							1	1.0							**52**	**12.5**
Lubbock -- Region 2																		
Lubbock	Good	PM-2.5															**20**	**4.7**
Dallas-Fort Worth -- Region 4																		
Dallas (1)	Good	Ozone	*	42	**31**	**34**	1	0.1	1	0.9	13	13.5			22	5.2	28	6.7
Fort Worth-Arlington	Good	Ozone	*	38	**32**	**35**	3	0.3			14	14.6					13	3.2
Navarro County	Good	Ozone	*	38	**31**	**34**			2	1.1	3	3.1			18	4.2		
Tyler-Longview-Marshall -- Region 5																		
Longview-Marshall	Good	Ozone	*	43	**35**	**38**			1	0.4	4	4.5			23	5.5		
Texarkana	Good	PM-2.5															**25**	**6.1**
Tyler (1)	Good	Ozone	*	44	**36**	**39**			10	7.1	2	2.4						
El Paso-Juarez -- Region 6																		
Brewster County	Good	PM-2.5															**12**	**2.8**
El Paso (1)	Moderate	PM-10	*	45	39	42	2	0.2	0	0.3	34	35.7	**93**	**140.0**	70	21.3	50	11.9
Odessa-Midland -- Region 7																		
Odessa-Midland	Moderate	Sulfur Dioxide							**80**	**58.9**							46	11.1
Waco -- Region 9																		
Killeen-Temple	Good	Ozone	*	42	**35**	**38**											8	2.0
Waco	Good	Ozone	*	41	**34**	**37**	2	0.2	8	5.3					24	5.8		

Figure C-4: Sample of a Portion of the TCEQ Air Quality Index Report



https://www.tceq.texas.gov/airquality/sip/criteria 77% Search

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Questions or Comments:
siprules@tceq.texas.gov

Air Pollution from Particulate Matter

General information on particulate matter (PM), and TCEQ planning that addresses the PM National Ambient Air Quality Standards (NAAQS).

- Particulate Matter (PM): The Facts
- Latest air quality planning that addresses the PM NAAQS
- Related webpages and publications
- Get more information on the Texas SIP and contact the TCEQ

Particulate Matter (PM): The Facts

What is PM?

Particulate matter (PM) is a mix of small particles and liquid droplets. These particles can be made up of acids, organic chemicals, metal, dust, or soil. Particulates are different in several ways including size. Federal definitions for PM based on particle size can be found in 40 CFR §58.1.

PM_{10} is sometimes referred to as coarse particles. They consist of particles that are less than or equal to 10 micrometers in diameter.

$PM_{2.5}$ are fine particles and are the smallest particles that are regulated. They consist of particles that are less than or equal to 2.5 micrometers in diameter. By comparison, the average diameter of human hair is 70 micrometers.

The federal Clean Air Act (FCAA) requires the United States Environmental Protection Agency (EPA) to set air quality standards, including those for PM, to protect both public health and the public welfare (e.g., visibility, crops, and vegetation).

What are the health effects of PM?

Particle size is directly related to its potential for causing health problems. Small particles less than 2.5 micrometers in diameter can be inhaled deeper into the lungs. Scientific studies have linked exposure to high concentrations of some types of PM with a variety of problems, including:

- irregular heartbeat;
- aggravated asthma;
- decreased lung function;
- increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing;
- nonfatal heart attacks; and
- premature death in people with heart or lung disease.

These associations are much less certain at concentrations below the current standard set by the EPA for PM in ambient air.

How does PM affect the environment?

PM can contribute to haze, which reduces visibility. When PM is present in the air, it can absorb sunlight, and it can reflect sunlight. This reduces clarity in the air and can cause haze. Humid air can also combine with PM to further reduce visibility. PM from the air can deposit on water and soil harming ecosystems, soil, and crops. PM can stain and damage stone and other materials, including culturally important objects such as statues and monuments.

Where can I see daily PM levels in my area?

The TCEQ has multiple monitors that directly measure PM concentrations throughout the state. The TCEQ also offers air quality forecasts that include PM. The public can sign up for these to be delivered via e-mail using the Agency's GovDelivery system.

The EPA provides a website that monitors and forecasts the quality of the air using a scale called the Air Quality Index (AQI). The AQI is based on the National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants. The AQI is on a scale of 0 to 500, with 100 corresponding to the NAAQS set by the EPA. A higher AQI value means a larger level of air pollution and a greater potential health concern. These forecasts can be found on the EPA's Air Now website.

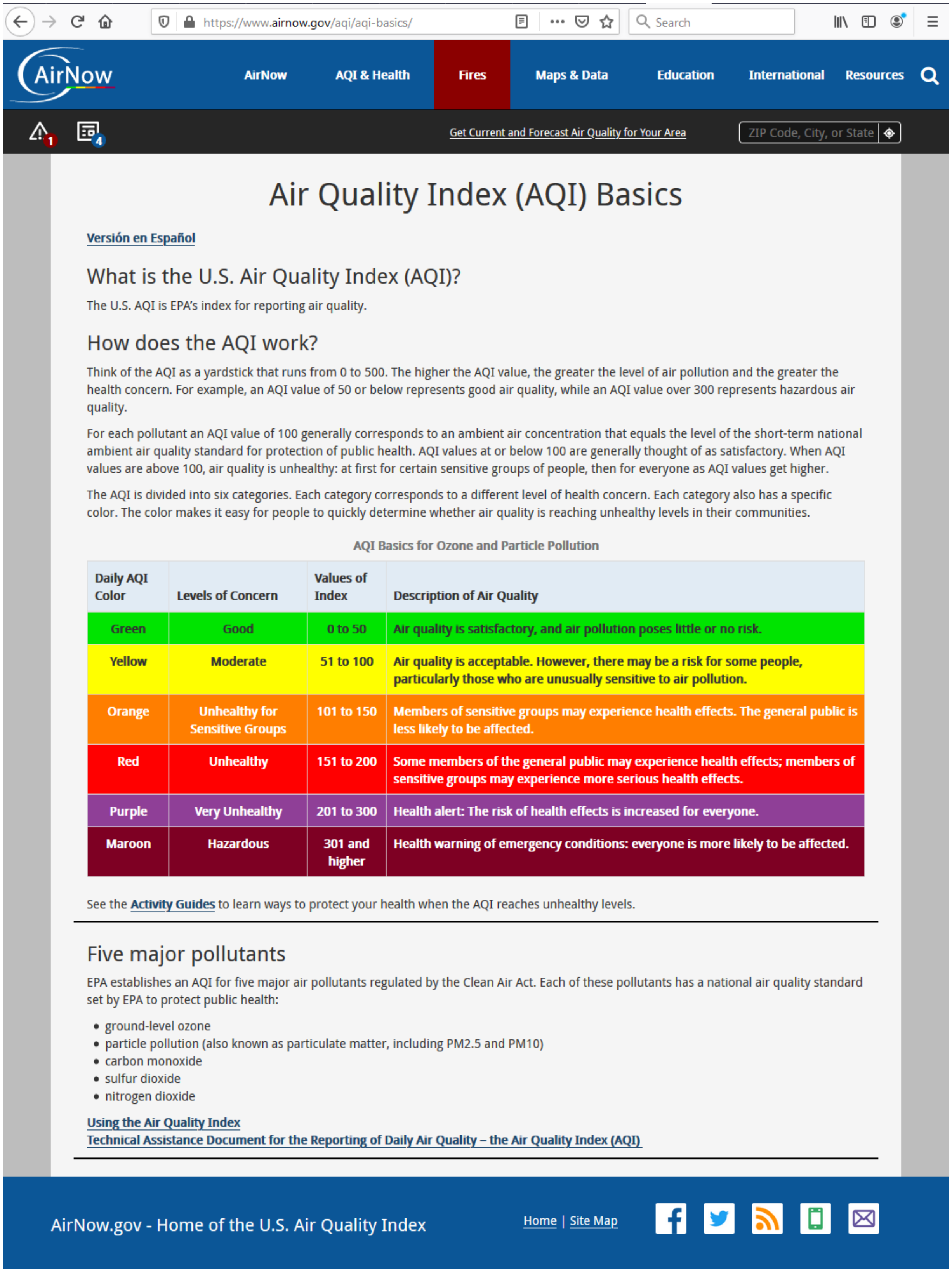
You can also sign up to receive e-mail alerts about PM through the EPA's EnviroFlash website.

How can I protect myself from PM?

Although healthy individuals are unlikely to be affected by the low levels of particles present in ambient air, some especially sensitive individuals (such as those with severe asthma) may wish to avoid excess exposure. Your chances of being affected by particles increase the more strenuous your activity and the longer you are active outdoors. You should also avoid standing in front of smoke from any fire. If your activity involves prolonged or heavy exertion, reduce your activity time or substitute another that involves less exertion. Go for a walk instead of a jog, for example. Plan outdoor activities for days when particle levels are lower. The highest levels of particulate matter is generally near roadways, so you should avoid exercising in those areas.

What can I do to reduce PM?

Figure C-5: Sample of a Portion of the TCEQ Particulate Matter Webpage



https://www.airnow.gov/aqi/aqi-basics/

AirNow | AQI & Health | Fires | Maps & Data | Education | International | Resources

Get Current and Forecast Air Quality for Your Area

ZIP Code, City, or State

Air Quality Index (AQI) Basics

Versión en Español

What is the U.S. Air Quality Index (AQI)?

The U.S. AQI is EPA's index for reporting air quality.

How does the AQI work?

Think of the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 or below represents good air quality, while an AQI value over 300 represents hazardous air quality.

For each pollutant an AQI value of 100 generally corresponds to an ambient air concentration that equals the level of the short-term national ambient air quality standard for protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is unhealthy: at first for certain sensitive groups of people, then for everyone as AQI values get higher.

The AQI is divided into six categories. Each category corresponds to a different level of health concern. Each category also has a specific color. The color makes it easy for people to quickly determine whether air quality is reaching unhealthy levels in their communities.

AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

See the Activity Guides to learn ways to protect your health when the AQI reaches unhealthy levels.

Five major pollutants

EPA establishes an AQI for five major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health:

- ground-level ozone
- particle pollution (also known as particulate matter, including PM2.5 and PM10)
- carbon monoxide
- sulfur dioxide
- nitrogen dioxide

Using the Air Quality Index
Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index (AQI)

AirNow.gov - Home of the U.S. Air Quality Index

Home | Site Map

Figure C-6: Sample of a Portion of the EPA Air Quality Index Guide