



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

July 13, 2021

Michael Benjamin, Division Chief
Air Quality Planning and Science Division
California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, California 95812

Dear Division Chief Benjamin:

The U.S. Environmental Protection Agency (EPA or “Agency”) concurs with the State’s request to exclude data showing exceedances of the 1997 24-hour PM_{2.5} National Ambient Air Quality Standards (NAAQS) on August 20-24, 2020, at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites in the San Joaquin Valley, CA nonattainment area, pursuant to the Exceptional Events Rule (EER).

The submittal from California Air Resources Board (CARB) and San Joaquin Valley Air Pollution Control District (SJVAPCD), dated May 14, 2021, included documentation that the August 20-24, 2020 exceedances were caused by exceptional events due to wildfire emissions. After thoroughly reviewing the information you provided, we agree that the State’s submittal meets the demonstration criteria and the schedule and procedural requirements in the EER. The basis for our concurrence is set forth in the enclosed technical support document. My staff will enter concurrence flags for these data into the EPA’s Air Quality System database.

The EPA’s concurrence is a preliminary step in the regulatory process for actions that may rely on these data and does not constitute final Agency action. If the EPA completes a notice-and-comment rulemaking for an action that is influenced by the exclusion of the PM_{2.5} data specified in this concurrence, the EPA’s concurrence letter and accompanying technical support document would be included in the record as part of the technical basis for the proposed action. If we receive comments, we must consider and respond to those comments before taking final regulatory action. When the EPA issues that regulatory action, it is a final Agency action subject to judicial review.

We appreciate the robust technical analysis and collaborative approach used to develop these submittals. If you have any questions or wish to discuss this matter further, please contact me at (415) 972-3183, or Meredith Kurpius at (415) 947-4534.

Sincerely,

A handwritten signature in black ink that reads "Elizabeth J. Adams". The signature is written in a cursive style with a large initial "E" and a long, sweeping underline.

Elizabeth J. Adams
Director, Air and Radiation Division

Enclosure

cc (via email): Edie Chang, CARB
Sylvia Vanderspek, CARB
Theresa Najita, CARB
Alicia Adams, CARB
Laura Carr, CARB
Samir Sheikh, SJVAPCD
Sheraz Gill, SJVAPCD
Jon Klassen, SJVAPCD
Jessica Olsen, SJVAPCD
Robert Gilles, SJVAPCD

ENCLOSURE: TECHNICAL SUPPORT DOCUMENT FOR EPA CONCURRENCE ON PM_{2.5} EXCEEDANCES MEASURED IN THE SAN JOAQUIN VALLEY PM_{2.5} NONATTAINMENT AREA ON AUGUST 20-24, 2020 AS AN EXCEPTIONAL EVENT

On May 14, 2021, the California Air Resources Board (CARB) submitted an exceptional events demonstration prepared by the San Joaquin Valley Air Pollution Control District (SJVAPCD or “District”) for exceedances of the 1997 24-hour particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM_{2.5}) National Ambient Air Quality Standards (NAAQS) that occurred at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites on August 20-24, 2020.¹ The May 14, 2021 transmittal letter from CARB indicated that the public review period for the demonstration would begin on May 14, 2021 and would be completed by June 15, 2021.² CARB also indicated that any comments received during the public comment period, as well as responses by the District, would be submitted to the EPA at the earliest possible date. By letter dated June 30, 2021, CARB indicated that the 30-day public comment period had closed on June 15, 2021 and that no comments had been received.³

The demonstration submitted by CARB and SJVAPCD stated that the exceedances measured on August 20-24, 2020, were caused by multiple wildfires burning in California during the 2020 August Lightning Siege, including the Lake Napa Unit (LNU) Complex, Santa Clara Unit (SCU) Complex, Santa Cruz Unit (CZU) Complex, Woodward, River, Carmel, and Dolan fires.⁴ Under the Exceptional Events Rule, air agencies can request the exclusion of event-influenced data, and the EPA can agree to exclude these data, from the data set used for certain regulatory decisions if the agencies demonstrate that the event meets the rule criteria and requirements. The remainder of this document summarizes the Exceptional Events Rule requirements, the event and the EPA’s review process.

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the Exceptional Events Rule in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. In 2016, the EPA finalized revisions to the Exceptional Events Rule. The 2007 Exceptional Events Rule and 2016 Exceptional Events Rule revisions added sections 40 CFR §50.1(j)-(r); §50.14; and §51.930 to title 40 of the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements, and requirements for air agency demonstrations. The EPA reviews the information and analyses in the air agency's demonstration package using a weight of evidence approach and decides to concur or not concur. The demonstration must satisfy all of the Exceptional Events Rule criteria for the EPA to concur with excluding the air quality data from regulatory decisions.

Under 40 CFR §50.14(c)(3)(iv), the air agency demonstration to justify exclusion of data must include:

¹ “San Joaquin Valley Air Pollution Control District Exceptional Event Demonstration for August 2020 PM_{2.5} Exceedances due to Wildfires,” (May 11, 2021) (“demonstration”).

² See letter from Michael Benjamin, CARB, to Elizabeth Adams, EPA Region 9, dated May 14, 2021.

³ See letter from Michael Benjamin, CARB, to Elizabeth Adams, EPA Region 9, dated June 30, 2021.

⁴ See demonstration, p. 3-5.

- A. “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);”
- B. “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;”
- C. “Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times” to support requirement (B) above;
- D. “A demonstration that the event was both not reasonably controllable and not reasonably preventable;” and
- E. “A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.”⁵

In addition, the air agency must meet several procedural requirements, including:

1. submission of an Initial Notification of Potential Exceptional Event and flagging of the affected data in the EPA's Air Quality System (AQS) as described in 40 CFR §50.14(c)(2)(i),
2. completion and documentation of the public comment process described in 40 CFR §50.14(c)(3)(v), and
3. implementation of any relevant mitigation requirements as described in 40 CFR §51.930.

For data influenced by exceptional events to be excluded from use in initial area designations, air agencies must also meet the initial notification and demonstration submission deadlines specified in Table 2 to 40 CFR §50.14. We include below a summary of the Exceptional Events Rule criteria, including those identified in 40 CFR §50.14(c)(3)(iv).

Regulatory Significance

The 2016 Exceptional Events Rule includes regulatory language that applies the provisions of CAA section 319 to a specific set of regulatory actions. As identified in 40 CFR §50.14(a)(1)(i), these regulatory actions include initial area designations and redesignations; area classifications; attainment determinations (including clean data determinations); attainment date extensions; findings of State Implementation Plan (SIP) inadequacy leading to a SIP call; and other actions on a case-by-case basis as determined by the Administrator. Air agencies and the EPA should discuss the regulatory significance of an exceptional events demonstration during the Initial

⁵ A natural event is further described in 40 CFR 50.1(k) as “an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.”

Notification of Potential Exceptional Event prior to the air agency submitting a demonstration for the EPA's review.

Narrative Conceptual Model

The 2016 Exceptional Events Rule directs air agencies to submit, as part of the demonstration, a narrative conceptual model of the event that describes and summarizes the event in question and provides context for analyzing the required statutory and regulatory technical criteria. Air agencies may support the narrative conceptual model with summary tables or maps. For wildfire PM_{2.5} events, the EPA recommends that the narrative conceptual model also discuss the interaction of emissions, meteorology, and PM_{2.5} concentrations in the area during the event, and, under 40 CFR §50.14(a)(1)(i), must describe the regulatory significance of the proposed data exclusion.

Clear Causal Relationship and Supporting Analyses

The EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between a specific event and the monitored exceedance or violation. For wildfire PM_{2.5} events, air agencies should compare the PM_{2.5} data requested for exclusion with seasonal and annual historical concentrations at the air quality monitor to establish a clear causal relationship between the event and monitored data. In addition to providing this information on the historical context for the event-influenced data, air agencies should further support the clear causal relationship criterion by demonstrating that the wildfire's emissions were transported to the monitor, that the emissions from the wildfire influenced the monitored concentrations, and, in some cases, air agencies may need to provide evidence of the contribution of the wildfire's emissions to the monitored PM_{2.5} exceedance or violation.

Not Reasonably Controllable or Preventable

The Exceptional Events Rule requires that air agencies establish that the event be both not reasonably controllable and not reasonably preventable at the time the event occurred. This requirement applies to both natural events and events caused by human activities; however, it is presumed that wildfires on wildland will satisfy both factors of the "not reasonably controllable or preventable" element unless evidence in the record clearly demonstrates otherwise.⁶

Natural Event

According to the CAA and the Exceptional Events Rule, an exceptional event must be "an event caused by human activity that is unlikely to recur at a particular location *or* a natural event" (emphasis added). The 2016 Exceptional Events Rule includes in the definition of wildfire that "[a] wildfire that predominantly occurs on wildland is a natural event." Once an agency provides evidence that a wildfire on wildland occurred and demonstrates that there is a clear causal relationship between the measurement under consideration and the event, the EPA expects

⁶ A wildfire is defined in 40 CFR 50.1(n) as "any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event." Wildland is defined in 40 CFR 50.1(o) as "an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered."

minimal documentation to satisfy the “human activity that is unlikely to recur at a particular location or a natural event” element. The EPA will address wildfires on other lands on a case-by-case basis.

EPA REVIEW OF EXCEPTIONAL EVENTS DEMONSTRATION

On April 12, 2021, CARB submitted an Initial Notification of Potential Exceptional Events prepared by SJVAPCD for numerous exceedances of the 1997 24-hour PM_{2.5} NAAQS that occurred at monitoring sites within the San Joaquin Valley (SJV) 1997 24-hour PM_{2.5} nonattainment area between August 20, 2020, and October 5, 2020.⁷ On May 14, 2021, CARB submitted an exceptional event demonstration prepared by SJVAPCD for 30 exceedances of the 1997 24-hour PM_{2.5} NAAQS that occurred at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites within the SJV 1997 24-hour PM_{2.5} nonattainment area on August 20-24, 2020.⁸

Regulatory Significance

The EPA determined that data exclusion of some of the exceedances referenced in the Initial Notification may have a regulatory significance for approval of the State Implementation Plan (SIP) and a determination of attainment by the applicable attainment date for the 1997 24-hour PM_{2.5} NAAQS, and worked with CARB and SJVAPCD to identify the relevant exceedances and monitoring sites affected.⁹ Table 1 summarizes the exceedances that SJVAPCD included in the demonstration.

Table 1: 1997 24-hour PM_{2.5} NAAQS Exceedance Summary^a

Exceedance Date	Monitoring Site Name	AQS ID	1997 24-hour Avg. (micrograms per cubic meter (µg/m ³))
August 20, 2020	Turlock	06-099-0006	108.0
August 20, 2020	Modesto-14 th Street	06-099-0005	102.2
August 20, 2020	Manteca	06-077-2010	102.0
August 20, 2020	Stockton-Hazelton	06-077-1002	88.8
August 20, 2020	Fresno-Foundry	06-019-2016	74.9
August 21, 2020	Turlock	06-099-0006	96.5
August 21, 2020	Modesto-14 th Street	06-099-0005	90.1
August 21, 2020	Manteca	06-077-2010	100.8
August 21, 2020	Hanford-Irwin	06-031-1004	135.1
August 21, 2020	Corcoran-Patterson	06-031-0004	115.2
August 21, 2020	Stockton-Hazelton	06-077-1002	76.3
August 21, 2020	Fresno-Foundry	06-019-2016	128.3

⁷ SJVAPCD, EE Initial Notification Summary Information – 24-Hour PM_{2.5} (“01 2020 EE Initial Notification_PM25_SJVUAPCD.docx”), April 7, 2021, with spreadsheet attachment (“02 2020 EE Initial Notification_Section A_PM25 24HR_SJVUAPCD.xlsx”), submitted via the EPA Exceptional Events Submission and Tracking System.

⁸ See letter from Michael Benjamin, CARB, to Elizabeth Adams, EPA Region 9, dated May 14, 2021.

⁹ See letter from Elizabeth Adams, EPA Region 9, to Sylvia Vanderspek, CARB, dated April 21, 2021.

Exceedance Date	Monitoring Site Name	AQS ID	1997 24-hour Avg. (micrograms per cubic meter ($\mu\text{g}/\text{m}^3$))
August 22, 2020	Turlock	06-099-0006	97.2
August 22, 2020	Modesto-14 th Street	06-099-0005	68.0
August 22, 2020	Hanford-Irwin	06-031-1004	147.0
August 22, 2020	Corcoran-Patterson	06-031-0004	140.1
August 22, 2020	Fresno-Foundry	06-019-2016	153.5
August 22, 2020	Bakersfield-Planz	06-029-0016	158.6
August 23, 2020	Hanford-Irwin	06-031-1004	116.7
August 23, 2020	Corcoran-Patterson	06-031-0004	93.2
August 23, 2020	Manteca	06-077-2010	79.3
August 23, 2020	Modesto-14 th Street	06-099-0005	67.6
August 23, 2020	Fresno-Foundry	06-019-2016	100.5
August 24, 2020	Turlock	06-099-0006	99.1
August 24, 2020	Modesto-14 th Street	06-099-0005	84.7
August 24, 2020	Stockton-Hazelton	06-077-1002	78.2
August 24, 2020	Manteca	06-077-2010	87.6
August 24, 2020	Hanford-Irwin	06-031-1004	107.0
August 24, 2020	Fresno-Foundry	06-019-2016	99.4
August 24, 2020	Corcoran-Patterson	06-031-0004	89.8

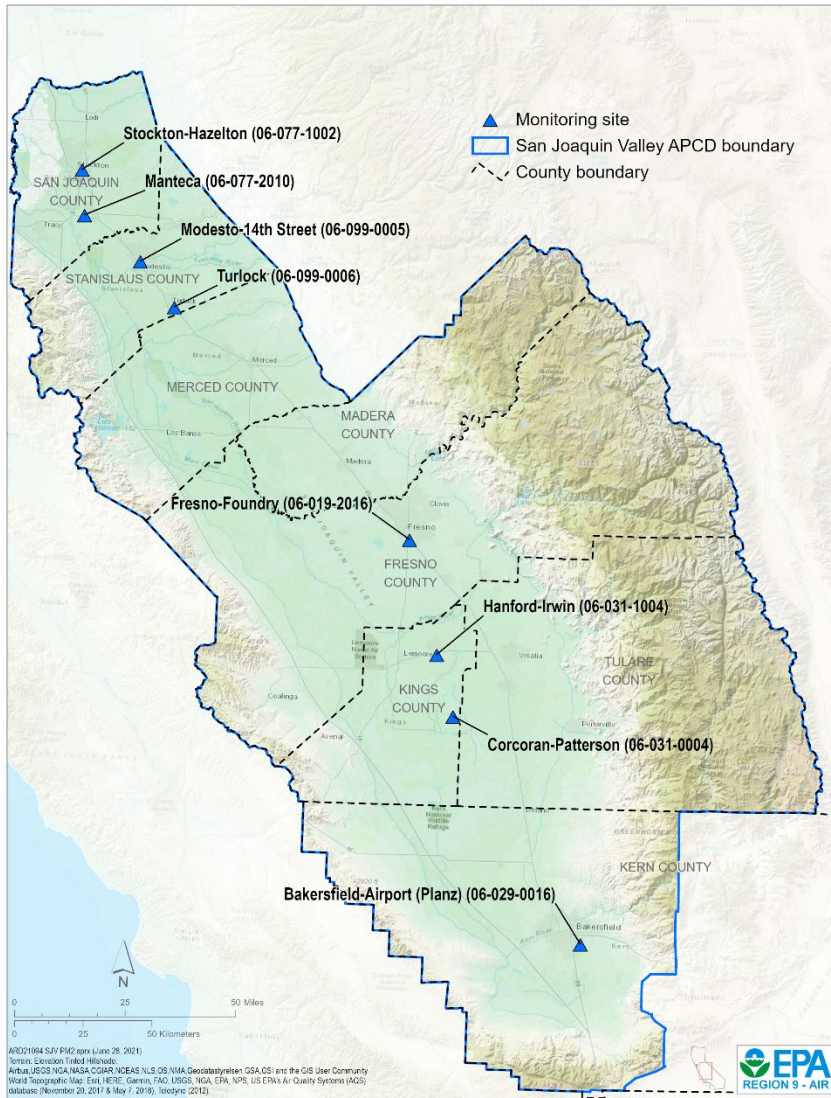
^a All PM_{2.5} data calculations for the 1997 24-hour PM_{2.5} NAAQS are implemented on a site-level basis in accordance with 40 CFR 50 Appendix N. The 24-hour averages in Table 1 represent site-level PM_{2.5} concentration data for each of the monitoring sites. Certain sites may have multiple monitors that measured exceedances on a given event day. For the purpose of this exceptional event determination, all regulatory PM_{2.5} monitoring data measured at a site were considered as part of the request for exclusion and this evaluation.

Narrative Conceptual Model

The demonstration submitted by CARB and SJVAPCD provided a narrative conceptual model in Sections II and III to describe how emissions from the California 2020 August Lightning Siege fires, including the LNU Complex, SCU Complex, CZU Complex, Woodward, River, Carmel, and Dolan fires, caused the PM_{2.5} exceedances at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites (Figure 1). The narrative conceptual model included a description of the 2020 August Lightning Siege wildland fires and their evolution over time, general meteorological conditions in the affected area, and information regarding how the PM_{2.5} concentrations measured during this period compared to normal conditions across the San Joaquin Valley. Section II also included a description of the ambient PM_{2.5} monitoring network in the SJVAPCD.¹⁰

¹⁰ See demonstration, p. II-6 – II-8.

Figure 1: Map of PM_{2.5} monitoring sites in the San Joaquin Valley 1997 24-hour PM_{2.5} nonattainment area requested for data exclusion on August 20-24, 2020 and included in the exceptional events demonstration.



The demonstration included a summary of the event, stating that wildfires across California burned from August to November 2020 during “the worst wildfire season in California history,” and that following a severe dry lightning storm that resulted in over 15,000 lightning strikes across central and northern California, the wildfire emissions impacted the San Joaquin Valley nonattainment area on August 20-24, 2020. The demonstration specifically identified the LNU Complex, SCU Complex, CZU Complex, Woodward, River, Carmel, and Dolan fires as the primary fires that produced emissions leading to exceedances, and provided a map of all actively burning wildfires in California on August 19, 2020, with information on the wildland fires that impacted the San Joaquin Valley from August 20-24, 2020, such as the start/end date, total acres

burned and the fire perimeter boundary maps, along with a map of their locations. Taken together, the fires specifically identified in the demonstration consumed over 1,000,000 acres.¹¹

The demonstration also included a description of the general meteorological conditions that led to transport of wildfire emissions from the fires in California to the nonattainment area and provided National Oceanic and Atmospheric Administration (NOAA) national temperature and precipitation maps, a map of drought conditions across California on August 18, 2020, National Weather Service (NWS) Sacramento and San Francisco Bay Area Red Flag Warnings for August 15-17, 2020, NWS Forecast Discussion for August 16, 2020, and social media reports detailing the 2020 August Lightning Siege and wildfire activity on August 19, 2020.¹²

The demonstration provided information on fire progression and smoke impacts to the nonattainment area and included National Aeronautics and Space Administration (NASA)/NOAA satellite aerosol images over California, a publicly-available publication of 24-hour average PM_{2.5} concentrations at all PM_{2.5} sites in the San Joaquin Valley for August 11-24, 2020, tables of the number of acres burned, percent containment, and excerpts from the Bay Area and Hanford NWS Area Forecast Discussions for August 17-24, 2020, and daily surface weather maps for August 17-24, 2020. The surface weather maps show a high-pressure system over the western U.S., including California, due to Tropical Storm Fausto. SJVAPCD stated that “monsoonal and remnant moisture from dissipating Tropical Storm Fausto streamed over California, resulting in widespread dry lightning across...California.”¹³ These dry lightning strikes ignited hundreds of fires across California. A weak pressure gradient over California from August 17-18, 2020, then contributed to stagnant conditions. A shortwave trough moving into the Pacific Northwest on August 19, 2020, caused increased wind flow across central California and transport of smoke emissions from the fires in the California Coastal Range and Coast into the San Joaquin Valley, followed by a high pressure ridge over the region causing poor dispersion conditions that trapped smoke over the Valley.¹⁴

The demonstration presented a table that included ranks of the exceedances that occurred at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites on August 20-24, 2020, compared to all PM_{2.5} 24-hour averages in the San Joaquin Valley and all other 24-hour PM_{2.5} averages at the respective sites for 2016-2020.¹⁵ The demonstration states that “PM_{2.5} concentrations observed during smoke impacts in the third quarter 2020 were at least three times higher than typical concentrations the same quarter for the previous 5 years.”¹⁶

The demonstration also described SJVAPCD’s public notification process for alerting the public of wildfire smoke impacts to the San Joaquin Valley, including various press releases, public advisories such as Air Quality Alerts and Health Cautionary Statements.¹⁷

¹¹ See demonstration, p. III-9 – III-17.

¹² See demonstration, p. III-17 – III-21.

¹³ See demonstration, p. III-30.

¹⁴ See demonstration, p. III-22 – III-39.

¹⁵ See demonstration, p. III-40 – III-41.

¹⁶ See demonstration, p. 3.

¹⁷ See demonstration, p. IV-51.

Appendix C of the demonstration included NWS Area Forecast Discussions. Consistent with the discussion in Section III of the demonstration, NWS Hanford, CA (located in the central part of the Valley) issued a forecast at 14:10 PDT hours on Wednesday August 19, 2020, stating that “the main concern for our area for the next few days will be smoke from several large uncontrolled wildfires in the region” and that “the smoke will reduce visibility and air quality over the area for the next several days.”¹⁸

Appendix D of the demonstration included copies of public notifications of District Health Caution Statements and Weather Service Air Quality Advisories for August 17-21, 2020, and examples of photographs showing ground smoke at select monitors in the San Joaquin Valley consistent with the discussion in Section III of the demonstration.¹⁹

Appendix I of the demonstration included additional media, newspaper articles, and SJVAPCD air quality tools and social media posts for August 19-24, 2020, consistent with the discussion in Section III of the demonstration.²⁰

Based on the information described above, the demonstration submitted by CARB and SJVAPCD meets the narrative conceptual model criterion of the EER.

Table 2: Documentation of the Narrative Conceptual Model

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 20-24, 2020	Section II: p. 6-8 Section III: p. 9-41 Section IX: Appendix C Section IX: Appendix D Section IX: Appendix I	Sufficient	Yes

Clear Causal Relationship

The demonstration included several analyses to support a clear causal relationship between the wildfire event and the monitored exceedances. These analyses are presented in Section IV.

Comparison with historical concentrations

The demonstration included a comparison with historical concentrations, as required by 40 CFR §50.14(c)(3)(iv)(C). The demonstration compared PM_{2.5} concentrations measured at the Stockton-Hazelton, Modesto-14th Street, Turlock, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites on the event days to historical data by plotting all concentrations measured during July through September in 2016-2020. The analysis showed that all of the exceedances recorded during July through September of 2016-2020 occurred in 2020, including the exceedances requested for exclusion in this demonstration. The exceedances measured between August 20-24, 2020, were among the ten highest concentrations measured at each site during the July through September period for 2016-2020. Since Fresno-Foundry began

¹⁸ See demonstration, Appendix C, p. C-1– C-6.

¹⁹ See demonstration, Appendix D, p. D-1 – D-8.

²⁰ See demonstration, Appendix I, p. I-1 – I-71.

PM_{2.5} monitoring in 2020, there was no historical data available for this site, thus it was not included in the analyses.²¹

Evidence of transport of wildfire emissions from the wildfire to the monitor

The demonstration presented Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) analysis, meteorological data, Moderate Resolution Imaging Spectroradiometer (MODIS) satellite imagery, and PM_{2.5} concentrations from EPA AirNow-Tech's website to show how transport of smoke from wildfires into the San Joaquin Valley caused the exceedances on August 20-24, 2020.

The demonstration included MODIS satellite imagery showing smoke over the San Joaquin Valley nonattainment area on August 20-24, 2020. The demonstration stated that elevated PM_{2.5} concentrations, coincident with the smoke observed by satellite, showed that smoke reached the ground. The demonstration also included ground level concentrations of PM_{2.5} and carbon monoxide (CO) (along with a comparison to historical concentrations) to support that smoke reached the ground on August 20-24, 2020.²²

In conjunction with the smoke maps, the demonstration presented a trajectory analysis using the HYSPLIT model to show transport of smoke from the fires to the exceeding monitoring sites. The analysis included 24-48 hour backward trajectories from each of the eight exceeding monitoring sites and associated forward trajectories from the Woodward, LNU Complex, SCU Complex, and CZU Complex fires at 50, 500, and 1000 meters elevation, which were plotted on maps with the monitor and fire locations. Section IV of the demonstration included all the forward trajectories for the fires and the backward trajectories for the Modesto-14th Street, Hanford-Irwin, and Bakersfield-Planz monitoring sites, while Appendix E of the demonstration included the backward trajectories for the Stockton-Hazelton, Manteca, Turlock, Fresno-Foundry, and Corcoran monitoring sites.²³ The daily backward trajectories were run for 24-48 hours between 1:00PM PST on August 20, 2020, to 1:00PM PST on August 24, 2020, at varying times of day to correspond with the hours when the highest daily peak PM_{2.5} concentrations were recorded at the individual monitoring sites during the event dates. Forward trajectories were run for 24-48 hours on August 19, 2020, through August 22, 2020, at various times to show transport from the fires to the San Joaquin Valley. During each of these days, the trajectories show that the fires transported smoke east and southeast at multiple heights. The individual backward trajectories vary by monitor and height, but generally show transport from areas northwest and west of the nonattainment area, where the fires were located. All exceeding monitoring sites show at least one trajectory passing over or near at least one of the fires, and the surface-level trajectories generally travel through areas with heavy visible smoke as shown from MODIS satellite data. Generally, the 1000-meter trajectories are more consistent with transport from the River, Carmel, and Dolan fires west of the nonattainment area, while the lower trajectories are more consistent with transport from the LNU Complex, CZU Complex, SCU Complex, and Woodward fires to the northwest, although this varies by monitor.²⁴

²¹ See demonstration, p. IV-43 – IV-47.

²² See demonstration, p. IV-48 – IV-50; p. IV-71 – IV-77.

²³ See demonstration, Appendix E, p. E-1 – E-21.

²⁴ See demonstration, p. IV-51 – IV-68.

Appendix H included additional MODIS aerosol products, including maps of the Air Quality Index (AQI) on August 20-24, 2020, overlaid on MODIS aerosol optical depth that showed high concentrations of aerosols and poor air quality in San Joaquin Valley and elsewhere in California for August 20-24, 2020, consistent with the discussion in Section IV of the demonstration.²⁵

Overall, the trajectory analysis and satellite imagery with evidence of smoke reaching the ground shows that emissions from wildfires were transported to the nonattainment area and monitoring sites on August 20-24, 2020.

Evidence that the wildfire emissions affected the monitor

The demonstration provided several forms of evidence that the wildfire emissions reached the ground and affected the eight exceeding sites, including 24-hour PM_{2.5} concentration time series plots for the entire month of August 2020, PM_{2.5}/CO ratios during non-event and event days supporting wildfire smoke impacts, NWS surface observations of smoke conditions and reduced visibility, NWS Area Forecast Discussions and visibility measurements indicating smoke impact or reduced visibility, and news reports of ground level smoke impacts near the impacted sites.

The demonstration provided an analysis of 24-hour PM_{2.5} concentration time series plots for the month of August 2020, which included both the non-event days of August 1-19, 2020, and August 25 -31, 2020, and the August 20-24, 2020 event days for the Modesto-14th Street, Hanford-Irwin, and Bakersfield-Planz monitoring sites, while Appendix G of the demonstration included the 24-hour PM_{2.5} concentration trends for the Turlock, Stockton-Hazelton, Manteca, Fresno-Foundry, and Corcoran monitoring sites.²⁶ The individual trends vary by monitor, but generally the analysis shows that there was an increase in PM_{2.5} concentrations beginning between August 16 and 19, and concentrations remained elevated August 20-24, which is consistent with the start dates of multiple wildfires and smoke transport to monitoring sites across the San Joaquin Valley. PM_{2.5} concentrations begin to decrease by August 25, consistent with the timing of smoke dispersion conditions for the remainder of the month of August 2020 at all impacted monitoring sites.²⁷

The demonstration evaluated PM_{2.5}/CO enhancement ratios at the Stockton-Hazelton, Modesto-14th Street, and Fresno-Foundry sites. These three sites were selected because they had both PM_{2.5} and CO data available at the same monitoring site. PM_{2.5}/CO enhancement ratios can be calculated by determining the regression slope of CO versus PM_{2.5} during a wildfire smoke event and can be used as an indicator of smoke impact. Mobile emission and urban background PM_{2.5}/CO ratios are much lower than typical wildfire smoke ratios; typical urban measurements are on the order of 20-45 µg/m³ parts per million volume (ppmv), while wildfire smoke ratios are typically well-correlated and above 100 µg/m³ ppmv.²⁸

For the event days at each of these three monitoring sites, SJVAPCD calculated slopes based on hourly PM_{2.5} and CO values, and compared these to a slope calculated on a non-event day without wildfire impacts (August 12, 2020). For Stockton-Hazelton, the non-event day slope was

²⁵ See demonstration, Appendix H, p. H-1 – H-10.

²⁶ See demonstration, p. IV-69 – IV-71; Appendix G, p. G-1 – G-6.

²⁷ See demonstration, p. IV-69 – IV-71.

²⁸ Laing, J.R., Jaffe, D.A., Slavens, A.P., Li, W. and Wang, W. (2017). Can ΔPM_{2.5}/ΔCO and ΔNO_y/ΔCO Enhancement Ratios Be Used to Characterize the Influence of Wildfire Smoke in Urban Areas?. *Aerosol Air Qual. Res.* 17: 2413-2423.

<https://doi.org/10.4209/aaqr.2017.02.0069>

approximately $1.4 \mu\text{g}/\text{m}^3$ ppmv, with a very low R^2 (0.0013). For Stockton-Hazelton on August 20, August 21, and August 24, the slopes (~ 127 , 108 , and $97 \mu\text{g}/\text{m}^3$ ppmv, respectively) and R^2 (0.8142, 0.7773, and 0.7925, respectively) clearly indicate the influence of wildfire smoke impacts. For Modesto-14th Street, the non-event day slope was approximately $-3.2 \mu\text{g}/\text{m}^3$ ppmv, with a very low R^2 (0.0093). For Modesto-14th Street on August 20, August 21, and August 22, the slopes (~ 122 , 110 , and $106 \mu\text{g}/\text{m}^3$ ppmv, respectively) and R^2 (0.9012, 0.9364, and 0.9408, respectively) clearly indicate the influence of wildfire smoke impacts. On August 24, the slope ($\sim 84 \mu\text{g}/\text{m}^3$ ppmv) for Modesto-14th Street is larger than the non-event slope, and is also well above the range of normal urban ratios, suggesting mixing of the smoke-related $\text{PM}_{2.5}$ and CO signal with ambient urban air. The increased R^2 (0.6113) when compared to the non-event day also supports that concentrations of these pollutants on August 24 were affected by wildfire emissions. For Fresno-Foundry, the non-event day slope was approximately $1.2 \mu\text{g}/\text{m}^3$ ppmv, with a low R^2 (0.011). For Fresno-Foundry on August 20-24, the slopes (~ 59 - $126 \mu\text{g}/\text{m}^3$ ppmv) are larger than the non-event slope and are also above the range of normal urban ratios. The increased R^2 values (0.1089-0.8531) when compared to the non-event day also supports that concentrations of these pollutants were affected by wildfire emissions. Fresno-Foundry is designed to be a near-road microscale site with the objective of measuring near-road pollution impacts. As a near-road site, it is not surprising that the slopes and R^2 data patterns suggest mixing of the smoke-related $\text{PM}_{2.5}$ and CO signal with ambient urban air. Overall, this analysis adds to the weight of evidence that wildfire emissions reached the ground and affected air quality within the nonattainment area and specifically at three of the exceeding sites.²⁹

Appendix F of the demonstration included additional supporting surface observations of weather conditions showing smoke impacts and reduced visibility consistent with the discussion in Section IV of the demonstration.³⁰

As previously described in the Conceptual Model section of this document, Appendix I of the demonstration included additional media, newspaper articles, and SJVAPCD air quality tools and social media posts for August 19-24, 2020. This documentation presents information consistent with the discussion in Section IV of the demonstration that smoke reached the ground from August 20-24, 2020.³¹

The demonstration did not provide an analysis of $\text{PM}_{2.5}$ speciation data at the affected sites as 2020 speciation data were not available due to monitoring restrictions resulting from the COVID-19 pandemic response.

Conclusion

The analyses included in the demonstration, specifically, the comparison with historical 24-hour $\text{PM}_{2.5}$ concentrations, HYSPLIT trajectory analyses, satellite imagery of smoke and aerosol optical depth, media and NWS reports of wildfire smoke impacting the area, $\text{PM}_{2.5}$ time series plots, and increases in $\text{PM}_{2.5}$ concentrations and $\text{PM}_{2.5}/\text{CO}$ ratios typically associated with wildfire emissions sufficiently demonstrate a clear causal relationship between the emissions generated by the California 2020 August Lightning Siege fires, including the LNU Complex, SCU Complex, CZU Complex, Woodward, River, Carmel, and Dolan fires, and the exceedances

²⁹ See demonstration, p. IV-71 – IV-77.

³⁰ See demonstration, Appendix F, p. F-1 – F-29.

³¹ See demonstration, Appendix I, p. I-1 – I-71.

measured at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites.

Table 3: Documentation of the Clear Causal Relationship criterion

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 20-24, 2020	Section IV: p. 43-78 Section IX: Appendix C Section IX: Appendix E Section IX: Appendix F Section IX: Appendix G Section IX: Appendix H Section IX: Appendix I	Sufficient	Yes

Not Reasonably Controllable or Preventable

The Exceptional Events Rule presumes that wildfire events on wildland are not reasonably controllable or preventable [40 CFR §50.14(b)(4)]. The demonstration provided evidence that the wildfire event meets definition of wildfire. Specifically, Section III of the demonstration included documentation that shows the "the fires were occurring in the California wildland."³² The demonstration also states that "lightning caused the wildfire events on wildland" and that "smoke from the August 2020 Lightning Siege fires was a natural, wildfire smoke event, and the wildfires occurred on wildland."³³ Therefore, the documentation provided sufficiently demonstrates that the event was not reasonably controllable and not reasonably preventable.

Table 4: Documentation of the Not Reasonably Controllable or Preventable criterion

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 20-24, 2020	Section III: p. 9-12 Section V: p. 79	Sufficient	Yes

Natural Event

The definition of "wildfire" at 40 CFR §50.1(n) states, "A wildfire that predominantly occurs on wildland is a natural event." As previously described, the demonstration included documentation that the event meets the definition of a wildfire and occurred predominantly on wildland and has therefore shown that the event was a natural event.

Table 5: Documentation of the Natural Event criterion

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
August 20-24, 2020	Section III: p. 10-12 Section VI: p. 80	Sufficient	Yes

³² See demonstration, p. III-9 – III-12.

³³ See demonstration, p. V-79.

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR §50.14(c) and 40 CFR §51.930 specify schedule and procedural requirements an air agency must follow to request data exclusion. Table 6 outlines the EPA’s evaluation of these requirements.

Table 6: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the agency provide prompt public notification of the event?	40 CFR §50.14 (c)(1)(i)	Section IV: p. 51; Section IX: Appendix D; Section IX: Appendix I	Yes
Did the agency submit an Initial Notification of Potential Exceptional Event and flag the affected data in the EPA's Air Quality System (AQS)?	40 CFR §50.14 (c)(2)(i)	Section IX: Appendix A; ³⁴ Section IX: Appendix B ³⁵	Yes
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations, if applicable? Or the deadlines established by the EPA during the Initial Notification of Potential Exceptional Events process, if applicable?	40 CFR §50.14 Table 2 40 CFR §50.14 (c)(2)(i)(B)	Section IX: Appendix A; April 21, 2021 Letter ³⁶	Yes
Was the public comment process followed and documented? <ul style="list-style-type: none"> • Did the agency document that the comment period was open for a minimum of 30 days? • Did the agency submit to the EPA any public comments received? • Did the state address comments disputing or contradicting factual evidence provided in the demonstration? 	40 CFR §50.14 (c)(3)(v)	Section VII: p. 81; June 30, 2021 Letter ³⁷	Yes
Has the agency met requirements regarding submission of a mitigation plan, if applicable?	40 CFR §51.930 (b)	NA	NA

Conclusion

The EPA has reviewed the documentation provided by CARB and SJVAPCD to support claims that smoke from wildfires in California caused exceedances of the 1997 24-hour PM_{2.5} NAAQS at the Stockton-Hazelton, Modesto-14th Street, Turlock, Fresno-Foundry, Hanford-Irwin, Corcoran-Patterson, Manteca, and Bakersfield-Planz monitoring sites on August 20-24, 2020.

³⁴ See demonstration, Appendix A, p. A-1 – A-10.

³⁵ See demonstration, Appendix B, p. B-1 – B-13.

³⁶ See letter from Elizabeth Adams, EPA Region 9, to Sylvia Vanderspek, CARB, dated April 21, 2021.

³⁷ See letter from Michael Benjamin, CARB, to Elizabeth Adams, EPA Region 9, dated June 30, 2021.

The EPA has determined that the flagged exceedances at these monitoring sites on these days satisfy the exceptional event criteria: the event was a natural event, which affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedances, and was not reasonably controllable or preventable. The EPA has also determined that CARB and SJVAPCD have satisfied the schedule and procedural requirements for data exclusion.