

TECHNICAL SUPPORT DOCUMENT FOR THE EPA'S CONCURRENCE ON PM_{2.5} EXCEEDANCES MEASURED IN CANTON, OHIO JUNE 6-8, JUNE 17, JUNE 27-30, JULY 16-17, AND AUGUST 2-3, 2023, AS EXCEPTIONAL EVENTS

On January 30, 2025, the Ohio Environmental Protection Agency submitted an exceptional events demonstration for exceedances of the 2024 annual particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers National Ambient Air Quality Standards that occurred at the Canton Fire St8 (Air Quality System ID: 39-151-0017) monitoring site on June 8, June 17, June 29, July 16-17, and August 2-3, 2023, and the Canton (AQS ID: 39-151-0020) monitoring site on June 6-8, June 17, June 27-30, and July 16-17, 2023. The demonstration submitted by Ohio EPA states that the exceedances measured on these dates were caused by smoke entering the region from multiple wildfires in Canada. Under the Exceptional Events Rule, air agencies can request the exclusion of event-influenced data, and the U.S. Environmental Protection Agency can concur to exclude these data, from the data set used for certain regulatory decisions. The remainder of this document summarizes the EER requirements, the subject event and the EPA's review of the Ohio EPA's exceptional events demonstration.

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the current EER in 2016, pursuant to Clean Air Act Section 319. The EER added Sections 50.1(j)-(r), 50.14, and 51.930 to Title 40 of the Code of Federal Regulations. These sections contain definitions, criteria for the 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 the EER criteria for the EPA to concur with excluding the air quality data from regulatory decisions. If the demonstration is found to not have regulatory significance, the EPA will defer making a concurrence determination.

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

- 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.”¹

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

1. submission of an Initial Notification of Potential Exceptional Event (“initial notification”) 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 applicable mitigation requirements as described in 40 CFR §51.930.

For data influenced by exceptional events to be used 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 EER criteria, including those identified in 40 CFR §50.14(c)(3)(iv).

Regulatory Significance

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

Narrative Conceptual Model

The EER 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. Further, under 40 CFR §50.14(a)(1)(i), the narrative conceptual model must describe the regulatory significance of the proposed data exclusion. For wildfire events, the EPA recommends that the narrative conceptual model also discuss emissions, meteorology, and pollutant transport. Air agencies may support the narrative conceptual model with summary tables or maps.

¹ 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.”

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 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.

For wildfire PM_{2.5} events, the EPA has published the *PM_{2.5} Wildland Fire Exceptional Events Tiering Document* which provides three tiers of analyses that apply to the "clear causal relationship" criterion within an air agency's exceptional events demonstration.² This tiered approach recognizes that the clear causal relationship for some wildfire events may be more explicit and/or extreme and, under the weight of evidence approach, may require relatively less evidence to satisfy the rule requirements.

To determine the tier for an event, the air agency will first determine the tiering threshold for the monitor day. The tiering thresholds are based on the lesser value of either (a) the most recent 5-year month specific 98th percentile for 24-hour PM_{2.5} data, or (b) the minimum annual 98th percentile for 24-hour PM_{2.5} data for the most recent 5-year period. In calculating both (a) and (b), all data with any "Request Exclusion" (R) or fire-related "Informational Only" (I) qualifiers are excluded when using the *PM_{2.5} Tiering Tool* available on the EPA's website. Air agencies are encouraged to evaluate their data carefully and consult with their EPA regional office about any data anomalies on a case-by-case basis. The EPA also retains its authority and discretion to evaluate data anomalies in submitted data and determine what tier is applicable for a candidate event.

- Tier 1:
 - **Key Factor for Tier 1 Analyses:** Distinct high levels of monitored 24-hour PM_{2.5} concentrations when compared to historical monthly or annual 24-hour levels of PM_{2.5}.
 - **Criteria:** Event-related exceedances should be greater than or equal to 1.5 times the tiering threshold as described for that candidate event day to be clearly distinguishable from non-event related concentrations.
 - In addition to the supporting analysis used to determine the Tier 1 criteria are met, the air agency should also supply at least one piece of additional evidence to support that the emissions from the fire were transported to the monitor location.

² See the EPA's PM_{2.5} *Wildland Fire Exceptional Events Tiering Document*, April 2024 (The EPA's PM_{2.5} Tiering Document).

- Tier 2:
 - **Key Factor for Tier 2 Analyses:** High levels of monitored 24-hour PM_{2.5} concentrations, when compared to historical monthly or annual 24-hour levels of PM_{2.5}.
 - **Criteria:** Event-related exceedances are greater than or equal to the tiering threshold but less than 1.5 times the tiering threshold.
 - In addition to the evidence required for a Tier 1 analysis, the air agency should supply at least two additional pieces of evidence, one of which must be quantitative, to support a weight of evidence conclusion that it was the emissions from the wildfire, rather than other sources, that affected the monitored PM_{2.5} concentration.
- Tier 3:
 - **Key Factor for Tier 3 Analyses:** The relationship between the wildfire and the PM_{2.5} exceedance/violation is more complicated than the relationship in a Tier 2 analysis and thus would require more supporting documentation.
 - **Criteria:** Tier 3 demonstrations are appropriate when the measured 24-hour PM_{2.5} concentration is less than the tiering threshold and there are not any other extenuating circumstances or data anomalies that would point to a Tier 2 analysis being sufficient.
 - In addition to the analyses required for Tier 1 and Tier 2, an air agency may further support the clear causal relationship with additional evidence that the fire emissions caused the PM_{2.5} exceedance.

Not Reasonably Controllable or Preventable

The EER 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.³

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

According to the CAA and the EER, an exceptional event must be “an event caused by human activity that is unlikely to recur at a particular location or a natural event.” The EER 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 minimal documentation would be needed to satisfy the “human activity that is unlikely to recur at a particular

³ 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.”

location or a natural event” element. The EPA will address wildfires on other lands on a case-by-case basis.

THE EPA’S REVIEW OF EXCEPTIONAL EVENTS DEMONSTRATION

On September 10, 2024, the Ohio EPA submitted an Initial Notification of Potential Exceptional Events and on January 30, 2025, the Ohio EPA submitted an exceptional events demonstration. The demonstration is for 17 exceedances of the 2024 annual PM_{2.5} NAAQS that occurred at the Canton Fire St8 (Air Quality System ID: 39-151-0017) monitoring site on June 8, June 17, June 29, July 16-17, and August 2-3, 2023, and the Canton (AQS ID: 39-151-0020) monitoring site on June 6-8, June 17, June 27-30, and July 16-17, 2023 located within the Canton-Massillon Core-Based Statistical Area.⁴

Regulatory Significance

The EPA determined that the exclusion of the 17 exceedances of the PM_{2.5} standard contained in Ohio EPA’s demonstration have regulatory significance for initial area designations of the Canton-Massillon CBSA for the 2024 annual PM_{2.5} NAAQS. The EPA worked with Ohio EPA to identify the relevant exceedances and monitoring sites affected. Table 1 summarizes these exceedances.

Table 1: Summary of Data Requested for Exclusion⁵

Exceedance Date	Monitoring Site Name	AQS ID	Monitored Concentration (µg/m³)	Tier
June 6, 2023	Canton	39-151-0020	36.5	1
June 7, 2023	Canton	39-151-0020	43.1	1
June 8, 2023	Canton Fire St8	39-151-0017	30.1	1
June 8, 2023	Canton	39-151-0020	29.6	1
June 17, 2023	Canton Fire St8	39-151-0017	28.3	1
June 17, 2023	Canton	39-151-0020	27.2	1
June 27, 2023	Canton	39-151-0020	35.9	1
June 28, 2023	Canton	39-151-0020	206.4	1
June 29, 2023	Canton Fire St8	39-151-0017	110.5	1
June 29, 2023	Canton	39-151-0020	105.4	1
June 30, 2023	Canton	39-151-0020	31.6	1

⁴ Appendix A – EE Demo for the Canton-Massillon, OH MSA – Submittal from Ohio EPA, September 10, 2024

⁵ See AQS Report AMP 355, Report Request ID: 2252387 dated January 8, 2025.

July 16, 2023	Canton Fire St8	39-151-0017	33.2	1
July 16, 2023	Canton	39-151-0020	31.1	1
July 17, 2023	Canton Fire St8	39-151-0017	48.0	1
July 17, 2023	Canton	39-151-0020	46.8	1
August 2, 2023	Canton Fire St8	39-151-0017	29.5	1
August 3, 2023	Canton Fire St8	39-151-0017	28.6	1

Concurrence on the exceedances listed in Table 1 would result in reducing the design value for the Canton Fire St8 and Canton monitoring sites from 9.5 $\mu\text{g}/\text{m}^3$ and 9.2 $\mu\text{g}/\text{m}^3$ to 9.0 $\mu\text{g}/\text{m}^3$ and 8.7 $\mu\text{g}/\text{m}^3$, respectively. This reduction would result in the Canton-Massillon CBSA attaining the 2024 annual $\text{PM}_{2.5}$ NAAQS. Table 2 summarizes the effect of this exceptional events demonstration on the monitor's design value.

Table 2: Summary of Regulatory Significance

Monitoring Site	Affected Regulatory Action	21-23 Design Value without the EPA's Concurrence ($\mu\text{g}/\text{m}^3$)	21-23 Design Value with the EPA's Concurrence ($\mu\text{g}/\text{m}^3$)
Canton Fire St8	Initial area designations determinations for the 2024 annual $\text{PM}_{2.5}$ NAAQS	9.5	9.0
Canton	Initial area designations determinations for the 2024 annual $\text{PM}_{2.5}$ NAAQS	9.2	8.7

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 3 outlines the EPA's evaluation of these requirements.

Table 3: Procedural Criteria

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Did the agency appropriately flag the affected data in the EPA's Air Quality System (AQS)	Appendix A	The EPA verified that Ohio EPA applied request exclusion qualifiers to all applicable $\text{PM}_{2.5}$ monitors for the dates of June 6-8, June 17, June 27-30, July 16-17, and August 2-3, 2023.	Y

Did the agency submit an Initial Notification?	Appendix A	Ohio EPA submitted the Initial Notification via email to the EPA on September 10, 2024.	Y
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations?	Demonstration p. 1, Appendix A	Ohio EPA submitted the Initial Notification via email to the EPA on September 10, 2024, and submitted the final demonstration to the EPA on January 30, 2025.	Y
Was the 30-day public comment process followed and documented?	Demonstration p. 98, Appendix B	Ohio EPA solicited, reviewed, and documented public comments per 40 CFR §50.14(c)(3)(v). The comment period was open from November 25, 2024, to December 27, 2024.	Y
Did the agency submit to the EPA, and address in their demonstration, any public comments received?	Demonstration p. 98, Appendix B	Ohio EPA addressed all public comments in the submission package.	Y

Mitigation Requirements

Ohio EPA is not subject to mitigation planning requirements under 40 CFR §51.930(b) for this event and the 2024 annual PM_{2.5} NAAQS.

Narrative Conceptual Model

Ohio EPA's demonstration provided a narrative conceptual model on pages 9-52 to describe how emissions from wildfires in Canada caused PM_{2.5} exceedances at Canton Fire St8 and Canton monitoring stations.

The demonstration identifies five distinct event periods: June 6-8, June 17, June 27-30, July 16-17, and August 2-3, 2023. The conceptual model for all event periods is supported by media reports, daily average PM_{2.5} concentration plots, surface weather maps, satellite imagery, Canadian Wildland Information System maps, and the EPA's AirNow maps with the National Oceanic and Atmospheric Administration's Hazard Mapping System smoke plumes, PM_{2.5} concentrations, and active fire locations. These analyses support the conclusion that wildfire smoke was the primary contributor to the PM_{2.5} exceedances recorded at the dates and sites listed in Table 1.

The discussion of the interaction of wildfire smoke formation and meteorology resulting in smoke impacts at the monitors in the Canton area is consistent with the EPA's recommendations (Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations (EPA, 2016)). The regulatory significance of the proposed data exclusion is also discussed (see demonstration, pp. 1-7), as required by 40 CFR 50.14(c)(3)(i).

June 6-8, 2023, Narrative Conceptual Model Overview

On May 27, 2023, extreme fire danger conditions were reported across regions of Canada, with significant wildfire activity recorded in Quebec and Ontario. Ohio EPA's demonstration describes a low-pressure system over eastern portion of the US with a high pressure settling in over the Hudson Bay by June 6, 2023. These meteorological features created a flow pattern that transported Canadian wildfire smoke from Quebec to a wide swath of the eastern US, including the Canton area. The stalled frontal system and building high-pressure system allowed the smoke to build up in the area causing elevated PM_{2.5} concentrations in Canton. These meteorological features allowed transport and stagnation of Canadian wildfire smoke into eastern portions of the US, including Canton, Ohio. The June 6-8, 2023, Hybrid Single-Particle Lagrangian Integrated Trajectory analyses intersected the source regions of the Canadian wildfires which supports the meteorology transport narrative in the demonstration.

Table 4: Narrative Conceptual Model for June 6-8, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 14-17	Ohio EPA described wildfire complexes in Quebec and Ontario which caused PM _{2.5} exceedances on June 6-8, 2023.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 10-13	Ohio EPA included meteorological surface analyses, as well as visible satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 10-17	Ohio EPA included meteorological surface analyses, HYSPLIT trajectory analyses, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Canton area.	Y
Explains regulatory significance	Demonstration pp. 1-7, 99	Ohio EPA explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

June 17, 2023, Narrative Conceptual Model Overview

On June 17, 2023, widespread wildfire activity continued across Quebec. By June 15, 2023, a low-pressure system had transported wildfire smoke from Quebec into the Midwest while a high-pressure system began to form in the Great Lakes region which trapped the wildfire smoke in the Canton, Ohio area causing PM_{2.5} exceedances at the Canton Fire St8 and Canton monitoring sites. HYSPLIT trajectories for June 17, 2023, confirm air parcel transport from the Quebec fire regions to Canton, providing further evidence of the wildfire smoke's impact.

Table 5: Narrative Conceptual Model for June 17, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration p. 24	Ohio EPA described wildfire complexes in Quebec which caused PM _{2.5} exceedances on June 17, 2023.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 20-23	Ohio EPA included meteorological surface analyses, as well as visible satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 20-24	Ohio EPA included meteorological surface analyses, HYSPLIT trajectory analyses, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Canton area.	Y
Explains regulatory significance	Demonstration pp. 1-7, 99	Ohio EPA explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

June 27-30, 2023, Narrative Conceptual Model Overview

Through the entirety of June 2023, Quebec experienced extreme fire danger conditions with fires clustered in Quebec and Ontario. Ohio EPA's demonstration describes a low-pressure system centered over the Great Lakes from June 25-27, 2023, which brought smoke from the wildfires in Ontario and Quebec to the Midwest, including Canton, Ohio. By June 28, 2023, a high-pressure system moved into the area and persisted until June 29, 2023, trapping the wildfire emissions at the surface allowing PM_{2.5} concentrations to continue building through June 30, 2023. The June 27-30, 2023, HYSPLIT trajectories

intersected the source regions of the Canadian wildfires which supports the meteorology transport narrative in the demonstration.

Table 6: Narrative Conceptual Model for June 27-30, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 31-34	Ohio EPA described wildfire complexes in Quebec and Ontario which caused PM _{2.5} exceedances on June 27-30, 2023.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 27-30	Ohio EPA included meteorological surface analyses, as well as visible satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 27-34	Ohio EPA included meteorological surface analyses, HYSPLIT trajectory analyses, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Canton area.	Y
Explains regulatory significance	Demonstration pp. 1-7, 99	Ohio EPA explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

July 16-17, 2023, Narrative Conceptual Model Overview

During mid-July 2023, there were 120 active fires burning more than 3 million acres across Alberta. In mid-July, counterclockwise flow around a low-pressure system in northern Manitoba transported smoke from Alberta to the Midwest on July 15, 2023. As the low-pressure system weakened and a high-pressure system formed, wildfire smoke slowly pushed east towards Canton, Ohio and continued building through July 16-17, 2023, causing PM_{2.5} exceedances. Ohio EPA's demonstration describes how these meteorological conditions allowed wildfire smoke to move directly into the Canton area. The July 16-17, 2023, HYSPLIT trajectories intersected the source regions of the Canadian wildfires which supports the meteorology transport narrative in the demonstration.

Table 7: Narrative Conceptual Model for July 16-17, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of event(s) causing exceedance or violation	Demonstration pp. 41-43	Ohio EPA described wildfire complexes in Alberta which caused PM _{2.5} exceedances on July 16-17, 2023.	Y
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 37-40	Ohio EPA included meteorological surface analyses as well as visible satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 37-43	Ohio EPA included meteorological surface analyses, HYSPLIT trajectory analyses, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Canton area.	Y
Explains regulatory significance	Demonstration pp. 1-7, 99	Ohio EPA explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

August 2-3, 2023, Narrative Conceptual Model Overview

Throughout August of 2023, there were several active fires in Saskatchewan, Manitoba, Alberta, and the Northwest Territories burning more than 4 million acres. From July 28, 2023, through August 3, 2023, a high-pressure system over Alberta transported wildfire smoke from fires in the area to the Midwest including the Canton, Ohio area. This system coupled with a low-pressure system forming over James Bay allowed smoke to continue pushing east towards the Midwest until clearing out by August 4 when the cold front pushed through the area. Ohio EPA's demonstration describes how these meteorological conditions allowed wildfire smoke to move directly into the Canton area. The August 2-3, 2023, HYSPLIT trajectories intersected the source regions of the central Canadian wildfires which supports the meteorology transport narrative in the demonstration.

Table 8: Narrative Conceptual Model for August 2-3, 2023

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Description of event(s) causing	Demonstration pp. 49-51	Ohio EPA described wildfire complexes in central Canada which	Y

exceedance or violation		caused PM _{2.5} exceedances on August 2-3, 2023.	
Discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	Demonstration pp. 46-48	Ohio EPA included meteorological surface analyses, as well as visible satellite imagery depicting wildfire smoke, which aligned with PM _{2.5} concentrations at ground level.	Y
Discusses the interaction of emissions and meteorology	Demonstration pp. 46-51	Ohio EPA included meteorological surface analyses, HYSPLIT trajectory analyses, and a meteorological narrative describing how the wildfire emissions from Canada were transported to the Canton area.	Y
Explains regulatory significance	Demonstration pp. 1-7, 99	Ohio EPA explained these days are regulatory significant for initial area designations for the 2024 annual PM _{2.5} NAAQS.	Y

Clear Causal Relationship and Supporting Analyses

Ohio EPA's demonstration included an analysis of the EPA's Tiering Tool, comparison of event days with historical concentrations, HYSPLIT trajectory analyses (forward and backward), Aerosol Optical Depth satellite imagery, NOAA HMS smoke plume maps, HMS fire detection maps, and PM_{2.5} concentration maps to demonstrate the clear causal relationship between the Canadian wildfires and the monitors in the Canton area. Ohio EPA also included public health alerts that were issued during the event time periods for wildfire smoke-driven episodes. Based on the measured PM_{2.5} values, as well as other criteria, all the days requested for exclusion in Ohio EPA's demonstration are Tier I.

Comparison with Historical Concentrations

The demonstration includes a comparison with historical concentrations, as required by 40 CFR §50.14(c)(3)(iv)(C). The demonstration compares daily average PM_{2.5} concentrations during the wildfire smoke events on June 6-8, June 17, June 27-30, July 16-17, and August 2-3, 2023, to the 2019-2023 5-year average which illustrate the enhancement of PM_{2.5} concentrations on the event days compared to monitor concentrations during the rest of the year (see demonstration, pp. 3-10, Figs 1-4). Additionally, a tabular presentation of the concentration's percentiles and rank illustrate the uniqueness of the data over a 5-year period (see demonstration, pp. 2-5, Tables 1-2). As shown in Figure 1 below, daily concentrations of exceedance days for the three monitors are compared to the Tier 1 cutoff for justification of the demonstration's tier selection.

Figure 1: the EPA's PM_{2.5} Tiering Tool for Exceptional Events Analysis

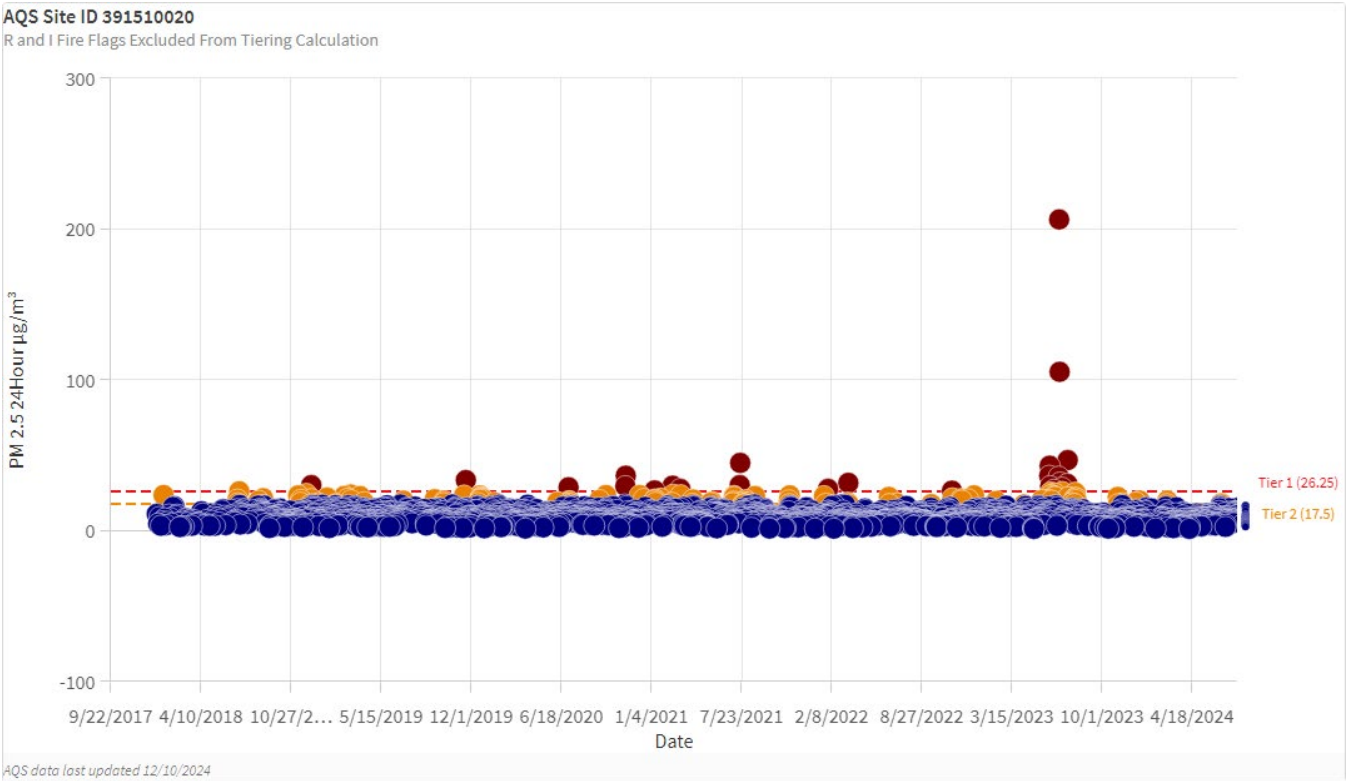
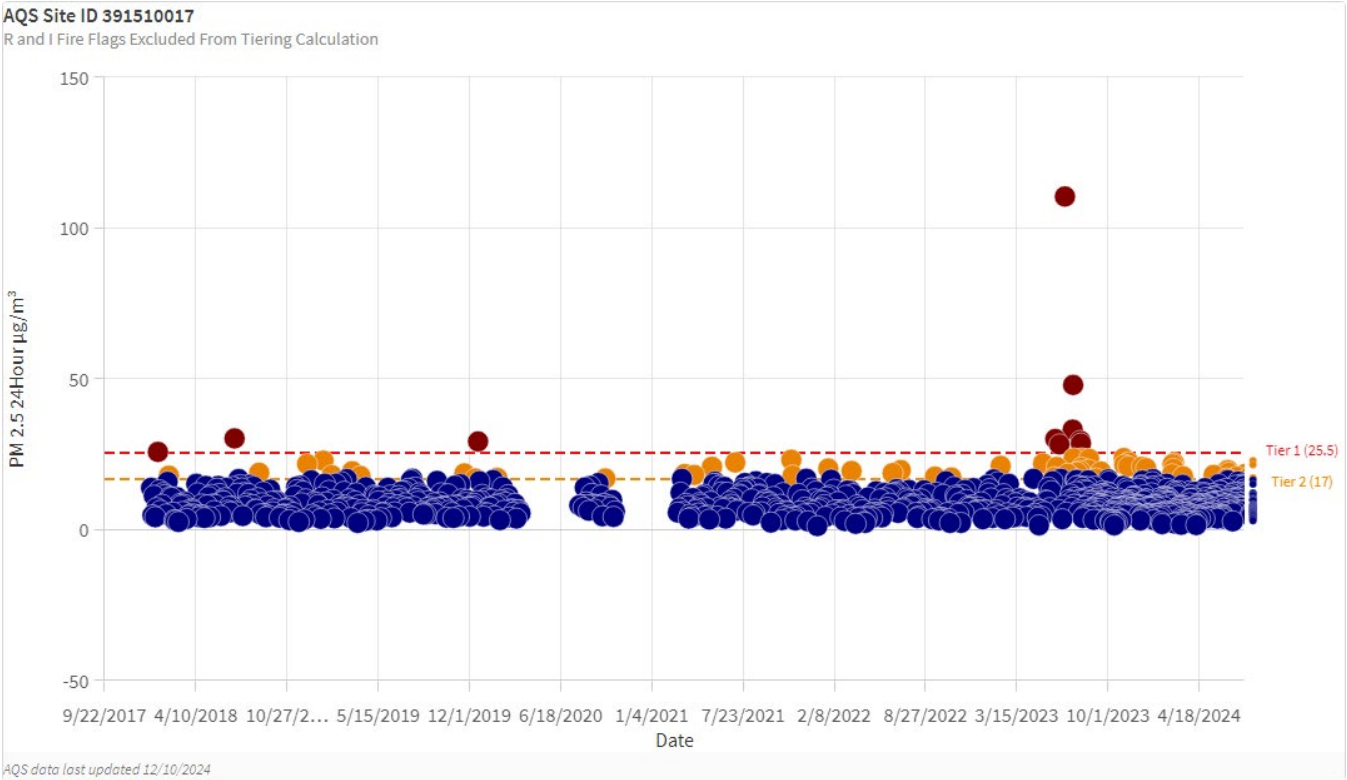


Table 9: Summary of Tiering for Relevant Monitoring Days

Tiering	Demonstration Citation	Tiering Details	Tiers
Tiering for June 6-8, June 17, June 27-30, July 16-17, and August 2-3, 2023, at Canton Fire St8 and Canton	Demonstration pp. 1-7	Ohio EPA cited the EPA's Tiering Tool. Flags excluded from the calculation included R and I Fire Flags. The tiering thresholds were determined by analyzing the full 5-year dataset from 2019-2023.	1

June 6-8, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 6-8, 2023, Ohio EPA's demonstration presents evidence of smoke transport from Quebec wildfires to the Canton area (see demonstration, pp. 10-17). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 56-60, Figs. 34, 36, 38) and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 57-61, Figs. 35, 37, 39). HYSPLIT trajectories illustrate transport of smoke from eastern Canada to the Canton area on June 6-8, 2023, and smoke is evident on the satellite imagery.

Evidence that the Wildfire Emissions Affected the Monitors

Ohio EPA included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from June 6, 2023, to June 8, 2023, (see demonstration, pp. 12-13, 56-60). These maps support the transport of the smoke and also visually depict the smoke impacts from June 6-8, 2023. Additionally, the demonstration included media articles discussing the wildfire plume impacts in the eastern US as well as Canton (see demonstration, p. 18).

Table 10: Clear Causal Relationship for June 6-8, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations⁶			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 1-7	PM _{2.5} concentrations on June 6-8, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
Evidence that the Fire Emissions were Transported to the Monitor(s)⁷			
HYSPLIT Trajectories and Satellite Imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada)	Demonstration pp. 10-13, 55-61	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec to Canton on June 6-8, 2023.	Y

⁶ The EPA's Guidance Prescribed Fire on Wildland that May Influence Ozone and Particulate Matter Concentrations (Prescribed Fire Guidance) offers examples of analyses that may be used to satisfy the comparison to historical concentrations criterion for wildland fires that may have influenced PM concentrations, including: Comparison of concentration on the claimed event day(s) with a set of similar days, a percentile of event-related concentration(s) relative to annual and/or seasonal data; 99th percentile over 5 years or fourth highest within one year; Description of past high data points labeled as being associated with previous exceptional events, suspected exceptional events, other unusual occurrences, or high pollution days due to normal emissions, with basic evidence to support claims and recognition that a history of concentrations above the standard could indicate additional evidence needed; Indication of how typically observed non-event diurnal or seasonal pattern differs, if such a deviation occurred, due to the event, with more weight given to effective statistical summaries that characterize non-event, high-concentration day historical data and the differences seen on event days over anecdotal or general assertions.

⁷ The EPA's Prescribed Fire Guidance offers examples of analyses that may be used to show emissions transport from wildland fires that may have influenced PM concentrations, including: Atmospheric trajectory analysis/modeling; Satellite imagery of plume with evidence of plume impacting the ground; Satellite imagery of plume with evidence of plume impacting the ground; Provision of additional information, such as analyses of relevant meteorological conditions (e.g., wind speed and direction at the height of the smoke plume) further supporting the clear causal relationship rule element.

Evidence that the Fire Emissions Affected the Monitor(s)⁸			
PM _{2.5} surface concentrations	Demonstration pp. 12-13, 56-61	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 6-8, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 99	Ohio EPA's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

June 17, 2023,

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 17, 2023, Ohio EPA's demonstration presents evidence of smoke transport from Quebec wildfires to the Canton area (see demonstration, pp. 20-24). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 62-63, Fig. 40), and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 64, Fig. 41). HYSPLIT trajectories illustrate transport of smoke from eastern Canada to the Canton area on June 17, 2023, and smoke is evident on the satellite imagery.

⁸ The EPA's Prescribed Fire Guidance offers examples of analyses that may be used to show impacts from emissions of wildland fires at the monitor, including: Plots of elevated fire-related species near the monitor (e.g., PM, carbon monoxide); Elevated light extinction measurements at or near the monitoring site; Photographic evidence of ground-level smoke at the monitor; The timing and spatial distribution of fire-related pollutants shown with data from multiple monitoring sites; Differences in Carbon monoxide: nitrogen oxides ratios, and/or; PM speciation data that indicate fire impacts; Inclusion of matching day analyses, statistical regression models, or photochemical models, as needed.

Evidence that the Wildfire Emissions Affected the Monitors

Ohio EPA included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor on June 17, 2023, (see demonstration, pp. 21-22, 63). These maps support the transport of the smoke and also visually depict the smoke impacts on June 17, 2023. Additionally, the demonstration included media articles discussing the wildfire plume impacts in the eastern US as well as Canton (see demonstration, p. 25).

Table 11: Clear Causal Relationship for June 17, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 1-7	PM _{2.5} concentrations on June 17, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
Evidence that the Fire Emissions were Transported to the Monitor(s)			
HYSPLIT Trajectories and Satellite Imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada)	Demonstration pp. 21-22, 62-64	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec to Canton on June 17, 2023.	Y
Evidence that the Fire Emissions Affected the Monitor(s)			
PM _{2.5} surface concentrations	Demonstration pp. 21-22, 63	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 17, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the	Demonstration p. 99	Ohio EPA's demonstration summarizes how the demonstration meets the	Y

demonstration meets the relevant statutory and regulatory criteria		requirements in the Exceptional Event Rule and meets the clear causal criteria.	
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June 27-30, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on June 27-30, 2023, Ohio EPA's demonstration presents evidence of smoke transport from Quebec wildfires to the Canton area (pp. 27-34, 65-74). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 66-73, Figs. 42, 44, 46, 48) and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 67-74, Figs. 43, 45, 47, 49). HYSPLIT trajectories illustrate transport of smoke from eastern Canada to the Canton area on June 27-30, 2023, and smoke is evident on the satellite imagery.

Evidence that the Wildfire Emissions Affected the Monitors

Ohio EPA included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from June 27, 2023, to June 30, 2023, (see demonstration, pp. 28-29, 66-74). These maps support the transport of the smoke and also visually depict the smoke impacts on June 27-30, 2023. Additionally, the demonstration included media articles discussing the wildfire plume impacts in the eastern US as well as Canton (see demonstration, p. 35).

Table 12: Clear Causal Relationship for June 27-30, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 1-7	PM _{2.5} concentrations on June 27-30, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y

Evidence that the Fire Emissions were Transported to the Monitor(s)			
HYSPLIT Trajectories and Satellite Imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada)	Demonstration pp. 27-30, 66-74	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec to Canton on June 27-30, 2023.	Y
Evidence that the Fire Emissions Affected the Monitor(s)			
PM _{2.5} surface concentrations	Demonstration pp. 28-29, 66-73	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on June 27-30, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 99	Ohio EPA's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

July 16-17, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on July 16-17, 2023, Ohio EPA's demonstration presents evidence of smoke transport from Alberta wildfires to the Canton area (see demonstration, pp. 37-43, 75-79). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 75-78, Figs. 50, 52) and are accompanied by AOD and visible satellite imagery see (demonstration, pp. 77-79, Figs. 51, 53). HYSPLIT trajectories illustrate transport of smoke from Alberta to the Canton area on July 16-17, 2023, and smoke is evident on the satellite imagery.

Evidence that the Wildfire Emissions Affected the Monitors

Ohio EPA included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from July 16-17, 2023 (see demonstration, pp. 38-39, 76-79). These maps support the transport of the smoke and also visually depict the smoke impacts on July 16-17, 2023. Additionally, the demonstration included media articles discussing the wildfire plume impacts in the eastern US as well as Canton (see demonstration, pp. 43-44).

Table 13: Clear Causal Relationship for July 16-17, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 1-7	PM _{2.5} concentrations on July 16-17, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y
Evidence that the Fire Emissions were Transported to the Monitor(s)			
HYSPLIT Trajectories and Satellite Imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada)	Demonstration pp. 38-39, 75-79	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Alberta to Canton on July 16-17, 2023.	Y
Evidence that the Fire Emissions Affected the Monitor(s)			
PM _{2.5} surface concentrations	Demonstration pp. 38-39, 76-79	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on July 16-17, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement	Demonstration p. 99	Ohio EPA's demonstration summarizes how the	Y

that explains how the demonstration meets the relevant statutory and regulatory criteria		demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	
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August 2-3, 2023

Evidence of Transport of Wildfire Emissions from the Wildfire to the Monitors

For the exceedances on August 2-3, 2023, Ohio EPA's demonstration presents evidence of smoke transport from wildfires in central Canada to the Canton area (pp. 46-51, 80-84). Analyses are supported by forward and backward HYSPLIT trajectories overlaid on PM_{2.5} concentrations, smoke contours, and fire data (see demonstration, pp. 81-83, Figs. 54, 56) and are accompanied by AOD and visible satellite imagery (see demonstration, pp. 82-84, Figs. 55, 57). HYSPLIT trajectories illustrate transport of smoke from central Canada to the Canton area on August 2-3, 2023.

Evidence that the Wildfire Emissions Affected the Monitors

Ohio EPA included PM_{2.5} concentration maps to show the spatial impacts of the Canadian wildfire smoke plume at the monitor level from August 2-3, 2023, (see demonstration, pp. 47-48, 81-83). These maps support the transport of the smoke and also visually depict the smoke impacts from August 2-3, 2023. Additionally, the demonstration included media articles discussing the wildfire plume impacts in the eastern US as well as Canton (see demonstration, p. 52).

Table 14: Clear Causal Relationship for August 2-3, 2023

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Comparison of Event-Related and Historical Concentrations			
Tiering Tool plots across 5-years (2019-2023) and daily average PM _{2.5} concentration plots	Demonstration pp. 1-7	PM _{2.5} concentrations on August 2-3, 2023, exceeded 1.5 times the Tiering Threshold, confirming Tier 1 and distinct elevated concentrations.	Y

Evidence that the Fire Emissions were Transported to the Monitor(s)			
HYSPLIT Trajectories and Satellite Imagery (AOD, visible, HMS smoke plumes, and detections of active fires in Canada)	Demonstration pp. 47-48, 81-84	HYSPLIT trajectories (backward and forward) and satellite imagery demonstrated smoke transport from Quebec to Canton on August 2-3, 2023.	Y
Evidence that the Fire Emissions Affected the Monitor(s)			
PM _{2.5} surface concentrations	Demonstration pp. 47-48, 81-83	Spatial distribution of PM _{2.5} across the Midwest demonstrates regional impacts of wildfire smoke at the ground level on August 2-3, 2023.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration p. 99	Ohio EPA's demonstration summarizes how the demonstration meets the requirements in the Exceptional Event Rule and meets the clear causal criteria.	Y

Not Reasonably Controllable or Preventable

The EER presumes that wildfire events on wildland are not reasonably controllable or preventable at 40 CFR §50.14(b)(4). Ohio EPA's demonstration provided evidence that the wildfire event meets definition of wildfire. Specifically, Ohio EPA described how unplanned ignitions were caused by lightning strikes and included satellite images of fire locations demonstrating fires occurred on wildlands. As the fires in Canada were reported to have been started by unplanned ignitions caused by lightning, they are considered wildfires as defined in 40 CFR 50.1(n)" (see demonstration, p. 85-89). Therefore, the documentation provided sufficiently demonstrates that the event was not reasonably controllable and not reasonably preventable.

Table 15: Not Reasonably Controllable or Preventable

Evidence	Demonstration Citation, if applicable	Summary of the EPA's Review	Criterion Met?
Does the event meet the EER definition of a wildfire?	Demonstration p. 85-89	The wildfires were caused by natural factors such as lightning.	Y
Did the wildfire occur predominately on wildland as defined in the EER?	Demonstration pp. 85-89	Ohio EPA demonstrated the fires occurred on wildland.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the demonstration meets the relevant statutory and regulatory criteria	Demonstration pp. 89	Ohio EPA summarizes how the wildfire events were on wildland and not reasonably controllable or preventable.	Y

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

The definition of “wildfire” at 40 CFR §50.1(n) states, “A wildfire that predominantly occurs on wildland is a natural event.” Ohio EPA’s demonstration includes documentation that the event meets the definition of a wildfire and occurred predominantly on wildland, including satellite imagery and land-use maps, demonstrating that the fires were unplanned and occurred in areas with little human activity or development (see demonstration, pp. 85-90). Ohio EPA has therefore shown that the event was a natural event.

Table 16: Natural Event or Human Activity Unlikely to Recur at a Particular Location

Evidence	Demonstration Citation	Summary of the EPA's Review	Criterion Met?
Does the event meet the EER definition of a wildfire?	Demonstration pp. 85-90	Fires were unplanned ignitions caused by natural factors, as defined in the EER. These fires that impacted the monitor also occurred on wildland.	Y
Concluding Statement			
Inclusion of a concluding statement that explains how the	Demonstration p. 90	Ohio EPA’s evidence demonstrated the fires were	Y

demonstration meets the relevant statutory and regulatory criteria		natural events occurring predominantly on wildland.	
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CONCLUSION

The EPA has reviewed the documentation provided by Ohio EPA to support claims that smoke from wildfires in Canada caused exceedances of the 2024 annual PM_{2.5} NAAQS at the Canton Fire St8 monitoring site on June 8, June 17, June 29, July 16-17, and August 2-3, 2023, and the Canton monitoring site on June 6-8, June 17, June 27-30, and July 16-17, 2023. The EPA has determined that the flagged exceedances at these monitoring sites on June 6-8, June 17, June 27-30, July 16-17, and August 2-3, 2023, satisfy the exceptional events 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 exceedance and was not reasonably controllable or preventable. The EPA has also determined that the Ohio EPA has satisfied the procedural requirements for data exclusion from comparison to the NAAQS.