UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OCT 2 4 2017

Francis C. Steitz, Director
Division of Air Quality
New Jersey Department of Environmental Protection
PO Box 420
Mail Code 401-02
Trenton, NJ 08625-0420

Dear Mr. Steitz:

On May 16, 2017, the New Jersey Department of Environmental Protection (NJDEP) submitted an exceptional event demonstration claiming that emissions from the 2016 Fort McMurray large scale wildfire event in Alberta, Canada caused elevated ozone levels in New Jersey, leading to exceedances of the 8-hour Ozone National Ambient Air Quality Standards (NAAQS) at the Ancora State Hospital, Bayonne, Brigantine, Camden Spruce Street, Chester, Clarksboro, Colliers Mills, Columbia WMA, Flemington, Leonia, Millville, Monmouth University, Newark Firehouse, Ramapo, Rider University, Rutgers University and Washington Crossing (operated by EPA) monitoring stations on May 25 and/or 26, 2016. The ozone concentrations on May 25, 2016, either exceeded or led to the violation of the 2015 8-hour Ozone NAAQS for all 17 of the monitoring locations, and in some cases exceeded the 1997 and 2008 8-hour Ozone NAAQS. The ozone concentrations on May 26, 2016, exceeded the 2015 8-hour Ozone NAAQS for 10 of the 17 monitoring locations, and in some of those cases exceeded the 1997 and 2008 8-hour Ozone NAAQS.

NJDEP's exceptional event demonstration was submitted in accordance with the revised Exceptional Events Rule found in sections 50.14 and 51.930 of 40 CFR parts 50 and 51,[1] specifically 40 CFR 50.14(a)(2), (b)(l) and (b)(4). After careful consideration of the information provided, the EPA concurs on all 17 monitoring locations for May 25, 2016 and on the following 10 monitoring locations for May 26, 2016: Bayonne, Chester, Columbia WMA, Flemington, Leonia, Newark Firehouse, Ramapo, Rider University, Rutgers University and Washington Crossing. However, the EPA will not concur on the following seven monitoring locations for May 26, 2016: Ancora State Hospital, Brigantine, Camden Spruce Street, Clarksboro, Colliers Mills, Millville and Monmouth University. The basis for our concurrence and non-concurrence is set forth in the enclosed technical support document. In addition, NJDEP has met the schedule and procedural requirements in section 50.14(c).

The EPA will enter "concurrence flags" in Air Quality System (AQS) database, for NJDEP RF flags (Fire-Canadian request for exclusions) concerning the 17 monitoring locations for May 25, 2016 and the 10 monitoring locations for May 26, 2016, on which we concur, as listed above. For the remaining seven monitoring locations, on May 26, 2016, NJDEP should flag the data as IF (Fire Canadian-INFORM) in EPA's AQS database, and not RF, since these are not exceedances and have no bearing on the fourth-highest Ozone data.

[1] *See* "Treatment of Data Influenced by Exceptional Events," 81 FR 68216 (October 3, 2016).

The EPA's concurrence is a preliminary step in the regulatory process for actions that may rely on the dataset containing the event-influenced data and does not constitute final Agency action. If the EPA takes a regulatory action that is affected by exclusion of the ozone data for May 25 and 26, 2016 at the Ancora State Hospital, Bayonne, Brigantine, Camden Spruce Street, Chester, Clarksboro, Colliers Mills, Columbia WMA, Flemington, Leonia, Millville, Monmouth University, Newark Firehouse, Ramapo, Rider University, Rutgers University and Washington Crossing (operated by EPA) monitoring stations, the EPA will publish notice of its proposed action in the Federal Register. The EPA's concurrence and accompanying technical support document will be included in the record as part of the technical basis for that proposal. When the EPA issues that regulatory action, it will be a final Agency action subject to judicial review.

If you have any questions regarding this matter, please feel free to contact Omar Hammad at (212) 637-3347.

Sincerely,

John Filippelli, Director
Clean Air & Sustainability Division

ENCLOSURE

TECHNICAL SUPPORT DOCUMENT FOR OZONE CONCENTRATIONS IN NEW JERSEY OCCURRING ON MAY 25 AND 26, 2016 THAT ARE TO BE FLAGGED AS EXCEPTIONAL EVENTS

INTRODUCTION

An Air Agency, such as the New Jersey Department of Environmental Protection (NJDEP), may request the United States Environmental Protection Agency (EPA) to exclude air monitoring data influenced by exceptional events from being used to determine the air quality status of an area or in air modeling to determine the amount of emissions reductions needed to attain an ambient air quality standard.

These 'exceptional' data are not removed from the air quality data bases, but are 'flagged' to indicate they are exceptional, that is, outside typical air quality conditions and shown to be caused or enhanced by an outside event beyond the control of, or was not reasonable preventable by, the air agency. This way, air quality data remain available to researchers and the general public.

The EPA reviews these requests from air agencies and determines if they meet the requirements of the EPA's Exceptional Events Rule of 2007, and the Clean Air Act.

This review uses the September 16, 2016 guidance on exceptional events demonstrations issued by the EPA to evaluate if a request for exceptional event status meets the requirements in rules and the related statutes.

BACKGROUND ON 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, EPA finalized revisions to the Exceptional Events Rule. The 2007 Exceptional Events Rule and 2016 Exceptional Events Rule revisions added sections 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. EPA reviews the information and analyses in the air agency's demonstration package to determine if the evidence provided is sufficient to make a convincing case 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 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. The Administrator shall not require a State to prove a specific percentile point in the distribution of data;

D. A demonstration that the event was both not reasonably controllable and not reasonably preventable;

E. A demonstration that the event was caused by 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 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.

What's in an Approvable Exceptional Events Request?

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 ozone (O_3) events, the narrative conceptual model should also discuss the interaction of

[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."

emissions, meteorology, and chemistry of event and non-event ozone formation in the area, 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 specific event and the monitored exceedance or violation. For wildfire ozone events, air agencies should compare the ozone 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 ozone exceedance or violation.

For wildfire ozone events, the EPA has published a guidance document that provides three different 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 some wildfire events may be more clear and/or extreme and, therefore, require relatively less evidence to satisfy the rule requirements. If a wildfire ozone event satisfies the key factors for either Tier 1 or Tier 2 clear causal analyses, then those analyses are the only analyses required to support the clear causal relationship criterion within an air agency's demonstration for that particular event. Other wildfire ozone events will be considered based on Tier 3 analyses.

- Tier 1: Wildfires that clearly influence monitored ozone exceedances or violations when they occur in an area that typically experiences lower ozone concentrations.
    - *Key Factor*: seasonality and/or distinctive level of the monitored ozone concentration. The event-related exceedance occurs during a time of year that typically has no exceedances, or is clearly distinguishable (*e.g.*, 5-10 parts per billion (ppb) higher) from non-event exceedances.
    - In these situations, ozone impacts should be accompanied by clear evidence that the wildfire's emissions were transported to the location of the monitor.
- Tier 2: The wildfire event's ozone influences are higher than non-event related concentrations, and fire emissions compared to the fire's distance from the affected monitor indicate a clear causal relationship.
    - *Key Factor 1*: fire emissions and distance of fire(s) to affected monitoring site location(s). Calculated fire emissions of nitrogen oxides (NOx) and reactive-volatile organic compounds (VOC) in tons per day (Q) divided by the distance

[2] Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations, September 16, 2016. Available at https://www.epa.gov/air-quality-analysis/exceptional-events-rule-andguidance

from the fire to the monitoring site (D) should be equal to or greater than 100 tons per day/kilometers (Q/D ≥ 100 tpd/km). The guidance document provides additional information on the calculation of Q/D.

- *Key Factor 2*: comparison of the event-related ozone concentration with non-event related high ozone concentrations. The exceedance due to the exceptional event:
  - is in the 99th or higher percentile of the 5-year distribution of ozone monitoring data, OR
  - is one of the four highest ozone concentrations within 1 year (among those concentrations that have not already been excluded under the Exceptional Events Rule, if any).
- In addition to the analysis required for Tier 1, the air agency should supply additional information to support the weight of evidence that emissions from the wildfire affected the monitored ozone concentration.

- Tier 3: The wildfire does not fall into the specific scenarios (*i.e.*, does not meet the key factors) that qualify for Tier 1 or Tier 2, but the clear causal relationship criterion can still be satisfied by a weight of evidence showing.
  - 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 ozone exceedance.

Not Reasonably Controllable or Preventable

EPA 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" event 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 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

[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."

relationship between the measurement under consideration and the event, the EPA expects 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.

Regulatory determinations[4]*:* The Exceptional Events Rule clarifies that it applies to the treatment of data showing exceedances or violations for the following types of regulatory actions:

- An action to designate or redesignate an area as attainment, unclassifiable/ attainment, nonattainment or unclassifiable for a particular NAAQS. Such designations rely on a violation at a monitoring site in or near the area being designated;

- The assignment or re-assignment of a classification category (marginal, moderate, serious, etc.) to a nonattainment area to the extent this is based on a comparison of its "design value" to the established framework for such classifications;

- A determination regarding whether a nonattainment area has attained a NAAQS by its CAA deadline. This type of determination includes "clean data determinations;

- A determination that an area has data for the specific NAAQS, which qualify the area for an attainment date extension under the CAA provisions for the applicable pollutant;

- A finding of SIP inadequacy leading to a SIP call to the extent the finding hinges on a determination that the area is violating a NAAQS; and

- *Other actions on a case-by-case basis if determined by the EPA to have regulatory significance based on discussions between the air agency and the EPA Regional office during the Initial Notification of Potential Exceptional Event process.*

In New Jersey's case, most of the data New Jersey requested to be flagged as exceptional exceeded the air quality standard or were one of the fourth-highest concentrations in a year that contributed to a violation of the 2008 or 2015 8-hour Ozone NAAQS[5]. For the data at sites that exceeded or contributed to a violation, EPA Region 2 will concur and place a "concurrence flag" on NJDEP's RF flag (Fire-Canadian request for exclusions). For the data that did not meet one of the first four criteria, above, EPA Region 2 will not concur on the exceptional event, but instead ask the NJDEP to place an IF "inform flags" (Fire-Canadian-INFORM) for the data that is non-concurred into the EPA's Air Quality System (AQS) data repository.

[4] Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations. September 2016, page 5

[5] The Clean Air Act requires the EPA Administrator to set primary air quality standards to protect public health with an "adequate margin of safety," including the health of at-risk groups. The law also requires the EPA to review the standards – and the science behind them -- every five years to determine whether changes are warranted. In 1997, the EPA established the first 8-hour Ozone NAAQS at 84 parts per billion (ppb). The 8-hour Ozone NAAQS was updated during subsequent reviews in 2008 (75 ppb) and 2015 (70 ppb).

OVERVIEW OF EVENT

A wildfire in Fort McMurray, Alberta, Canada, from May 1 to July 5, 2016 consumed 589,995 hectares (about 1,500,000 acres) over 5,900 square kilometers, forced over 80,000 residents out of their homes, and destroyed about 2,400 buildings. Because of the emissions from this Canadian wildfire, sixteen (16) out of seventeen (17) monitors in New Jersey recorded exceedances of the 70 ppb 8-hour average Ozone NAAQS on May 25, 2016. All sixteen stations also exceeded the prior 75 ppb 8-hour Ozone NAAQS, and two stations exceeded the even older 84 ppb 8-hour Ozone NAAQS. On May 26, 2016, ten exceedances were recorded in New Jersey of the 70 ppb 8-hour average Ozone NAAQS of 2015. Nine stations also exceeded the prior 75 ppb 8-hour Ozone NAAQS, and five stations exceeded the even older 84 ppb 8-hour Ozone NAAQS.

The evidence presented included the following.

- Satellite observations of the levels of Aerosol Optical Depth and Carbon Monoxide taken by National Oceanic and Atmospheric Administration's (NOAA) satellite on the days of and preceding the exceptional

- The location of the fires and the resulting levels of smoke were traced using NOAA's Hazard Mapping System (HMS) consisting of real-time satellite imagery loops.

- Ozone levels in the states downwind from Fort McMurray became greatly elevated and unhealthful after the proper weather conditions developed to enhance ozone formation from the smoke (i.e.; greater temperature and sunshine, and favorable wind conditions).

- An analysis of days having similar meteorological conditions as occurred on May 25 and May 26, 2016, but without the presence of wildfires, show that ozone levels in New Jersey are typically very low when the air moves through the area of Fort McMurray to New Jersey.

- Ambient air levels of potassium, a known tracer compound for wood smoke, were found in greater levels within the air of the states upwind from New Jersey on the days that coincided with elevated ozone levels at these upwind states.

- Visual observations, as evidenced by pictures taken within New Jersey, show that an apparent haziness existed on the days of the exceptional event compared to the days immediately following the event.

- Ozone levels in New Jersey were exceptionally high with most of the monitors recording levels greater than the 98th percentile of the highest ozone levels typically monitored during the last five years (2012 – 2016).

- New Jersey monitored elevated 24-hour fine particulate (PM2.5) levels throughout the state on May 25 and 26, 2016. These levels were similar to the levels found in New Jersey's air when a more nearby wildfire earlier in the month caused elevated levels of

fine particulate matter. The Colliers Mills ozone monitor, located directly upwind from this nearby fire, did measure elevated levels of ozone.

- HYSPLIT back trajectories on the days of the exceptional event in New Jersey show that the wind patterns would have carried the wildfire emissions from the air around Fort Mc Murray, Canada to reach New Jersey on May 25 and 26, 2016.

- Overlays of the satellite image of wood smoke with the ground level monitored ambient air levels of ozone show that the movement of the smoke plume from the location of the wildfires to New Jersey match with the elevated ozone levels on the ground.

Table 1: 8-hour Ozone Summary

Site Name	AQS ID	Daily Max 8-Hr Ozone Concentrations (ppb)		2016 Daily Maximum 8-Hr Ozone Concentrations (ppb)			
		5/25/2016	5/27/2016	1st Max	2nd Max	3rd Max	4th Max
Ancora State Hospital	340071001	76	64	76	76	69	69
Bayonne	340170006	69	76	76	74	69	69
Brigantine	340010006	79	62	79	68	67	63
Camden Spruce Street	340070002	78	68	81	78	78	78
Chester	340273001	83	86	86	83	72	69
Clarksboro	340150002	83	70	83	79	77	76
Colliers Mills	340290006	90	70	90	77	73	72
Columbia WMA	340410007	76	73	76	73	72	66
Flemington	340190001	83	88	88	83	78	78
Leonia	340030006	86	85	86	85	77	75
Millville	340110007	81	69	81	70	69	69
Monmouth University	340250005	81	65	81	73	72	70
Newark Firehouse	340130003	81	77	81	77	71	70
Ramapo	340315001	79	81	81	79	79	72
Rider University	340210005	82	82	82	82	76	74
Rutgers University	340230011	84	86	86	84	78	76
Washington Crossing*	340219991	83	86	86	83	75	74

*Site is operated by the EPA

Narrative Conceptual Model

NJDEP's research demonstrates how smoke was transported thousands of miles from fires in western Canada and that it mixed down into the air over the eastern United States. The constituents of the smoke caused increased ozone concentrations over what is typically seen at this time of year in recent years. Past smoke episodes have been shown to enhance ozone production by adding in NOx, hydrocarbons and carbon monoxide. The weather patterns leading up to and during this event, when recorded in the past, have not been involved in ozone concentrations at the levels recorded during this episode.

NJDEP explained how the evolution of elevated ozone episodes in the eastern United States often begin with the movement of a large high pressure area from the Midwest to the middle or southern Atlantic states, where it assimilates into and becomes an extension of the Atlantic (Bermuda) high pressure system.[6] During its movement east, the air mass accumulates air pollutants emitted by large coal-fired power plants and other sources located outside the Ozone Transport Region (OTR). As the air mass passes over the eastern United States, sources within the OTR contribute to the air pollution. These expansive weather systems are conducive to the formation of ozone by creating a vast area of clear skies and high temperatures. These two prerequisites for elevated ozone formation are further compounded by a circulation pattern favorable for pollution transport over large distances.

NJDEP's demonstration indicated the proposed data exclusion may have regulatory significance for current and future design values. The Flemington, New Jersey monitoring site would attain the 2015 70 ppb 8-hour Ozone NAAQS in the state's northern nonattainment area and attainment for the southern nonattainment area would be closer for future years' design values based on the exemption of this exceptional event.

NJDEP summarized the event and included several data analyses to show evidence that smoke was transported from the Ft. McMurray fire into New Jersey and impacted ground-level monitors. Based on the information described above, NJDEP's demonstration meets the narrative conceptual model criterion of the Exceptional Events Rule.

Table 2: Documentation of Narrative Conceptual Model

Event Date	Demonstration Citation	Quality of Evidence	Criterion Met?
May 25, 2016	Primarily Section I (pages 3-31)	Sufficient	Yes
May 26, 2016	Primarily Section I (pages 3-31)	Sufficient	Yes

Clear Causal Relationship and Supporting Analyses

NJDEP's analysis included multiple lines of evidence needed to support their case that ozone air quality on May 25 and 26, 2016 was increased substantially over typical concentrations that would occur with similar weather conditions. NJDEP was able to show the causal relationship

[6] The State of New Jersey Department of Environmental Protection, State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard 8-Hour Ozone Attainment Demonstration, Chapter 2, Final, October 29, 2007

between the Ft. McMurray fire and the monitored ozone elevation in the State consistent with the EPA's wildfire ozone guidance. These analyses are presented throughout the demonstration.

Comparison to Historical Concentrations

NJDEP included a comparison of historical concentrations, as required by 40 CFR §50.14(c)(3)(iv)(C). Ozone and weather data from days with similar weather patterns in recent years to May 25 -26, 2016 show lower concentrations of ozone on those days. Concentrations on May 16 - 17, 2015, June 16, 2015, May 12, 2014, June 16-17, 2013 and May 28, 2012 are markedly lower than May 25-26, 2016, despite similar overall weather patterns, local conditions at the surface and aloft and trajectories.

Tier 1: Key Factor

To meet the key factor for a Tier 1 analysis, exceedances should be clearly higher than other, non-event related exceedances, or occur during a time of year that typically experiences no exceedances. The event-related exceedances identified in this demonstration occurred during the regular ozone season. Although statistically abnormal for that time of year, exceedances during this timeframe of similar magnitude are not unprecedented and do occur. However, when looking at the meteorological conditions of these days, NJDEP was able to analyze several similar days between 2012 and 2016 to show that the Ft. McMurray fires led to elevated ozone within the state.

NJDEP was able to meet the key factor for Tier 1 analysis by demonstrating the distinctive level of ozone monitored on May 25 and 26, 2016 are clearly distinguishable from non-event ozone levels. The demonstration included clear evidence that the wildfire's emissions were transported from Ft. McMurray and affected the monitors.

The method New Jersey used to find similar meteorological days was to use upper air data in combination with surface data to filter out days that were meteorologically similar to the May 25 and 26, 2016 ozone event. First, sounding data from NOAA's Radiosonde Database was analyzed on May 25 and 26, 2016 to determine upper air wind criteria. Four years of 850mb sounding data was downloaded for May and June of 2012 – 2016 to compare against the event day data. The next step was to flag days meeting upper air criteria.

Tier 2: Key Factors:

NJDEP conducted a Tier 2 analysis showing that the Ft. McMurray fire ozone influences are higher than non-event related concentrations, and fire emissions compared to the fire's distance from the affected monitor indicate a clear causal relationship.

For Tier 2, Key Factor 1, NJDEP estimated the emissions (Q) using information from EPA's AP-42, Compilation of Air Emission Factors, Section 13.1, Wildfires and Prescribed Burning. Emission factors are presented for various pollutants by fire and fuel configurations for the fire. To get a more realistic estimate of the emissions, NJDEP assumed that the fire only lasted for a period of 30 days. While this is also an over-estimate of actual emissions, it is more realistic than the worst case assumption. NJDEP estimated the distance (d) from the Fort McMurray fire to the

Rider University monitor located in Trenton, New Jersey since this monitor is centrally located within the state and experienced ozone violations during the exceptional event. Using the values determined for (Q) and (d), Q/d becomes 228 tpd/km under worst case assumptions. Using conservative, but still over-estimated, assumptions, the Q/d would be 7.6 tpd/km. This 7.6 tpd/km conservative value is well below the EPA recommended level of 100 tpd/km above which would indicating a clear causality. Noting the wide variability in emissions estimates from different approaches, and as the Q/d method does not generally satisfy the expectation of a clear causal impact, NJDEP presented other evidence demonstrating that the plume from the Ft. McMurray fire caused elevated ozone levels in New Jersey.

For Tier 2, Key Factor 2, NJDEP looked at the second largest cluster of ozone exceedances in New Jersey during 2016 occurred on July 21 and 22. The July wind trajectories also originated from Pennsylvania, Delaware, Maryland, Michigan, Virginia, New York and New Jersey, with some contribution from Illinois and Indiana. Similarly, during the days of the exceptional event, forty-eight-hour back trajectories from Colliers Mills show air originating from Pennsylvania, Delaware, Maryland, Michigan, Virginia, West Virginia, western New York, Ontario, and New Jersey. Maximum temperatures at Trenton were comparable during the two events with a temperature range of 87° F to 90° F in May and a range of 88° F to 93° F in July. Synoptic weather patterns were generally similar for the two events. Because the average temperature had been in the 50 degree Fahrenheit range for several weeks in May, there is less overall heat to remove in buildings by air conditioning than if the buildings are “heat soaked” after several days of temperatures being in the high 70’s to low 80 degree Fahrenheit range. The lack of residual heating in May, as opposed to mid-July, accounts for the reduced air conditioning and, therefore, lower electric loads, generation, and NOx emissions. During the two days of May 25 and 26, 2016, respectively, there were 16 and 10 site exceedances of the 70 ppb NAAQS with maximum daily ozone values of 90 and 88 ppb. The two day July hot spell produced 3 and 7 site exceedances, with peak ozone values of 74 and 81 ppb. The daily NOx tonnage from electric generating units during the May event was 26% lower than that in July, (576 vs 776 tons per day). This seeming inverse association is the opposite of what has been previously observed between High Electric Demand Day (HEDD) EGU emission profiles and ozone exceedances. Therefore, large stationary sources were not emitting NOx at levels typically seen when high ozone episodes occur at New Jersey monitors during ozone season at the time the May exceedance.

Local Weather Features

When the plumes from the Ft. McMurray fires crossed into the eastern United States, a high pressure system below them provided a mechanism for the smoke to mix down into the near-surface air, setting the stage for sunlight and favorable winds to produce ozone in the locations observed.

Evidence that the wildfire emissions affected the monitors and caused ozone exceedances

In addition, NJDEP supplied additional information, in line with Tier 3 clear causal relationship analysis, to support the weight of evidence that emissions from the Ft. McMurray fire affected

the monitored ozone concentration. This included, high potassium concentrations[7], elevated in forest fire smoke plumes, were observed to increase in areas affected by the smoke. Cameras in New Jersey showed decreased visibility, apparently due to smoke over the State during the higher ozone. The elevated ozone levels for the majority of the monitors was at or exceeded the 99th percentile for daily max 8-hour average ozone concentrations from 2012 to 2016. Scatter plots of daily ozone concentrations for 2016 showed the concentrations of May 25 and 26 were out of line with concentrations for those sites at those times of year. Concentrations of PM 2.5, which are (but not uniquely) associated with fires were also elevated during the elevated ozone event.

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

NJDEP provided trajectory analysis using the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model. The NOAA HYSPLIT models for Colliers Mill, New Jersey showed the trajectories were consistent with the satellite observations and the long range wind trajectories for the period of the exceptional event (May 25 and 26, 2016) were from the direction of the Fort McMurray fire in Alberta, Canada. Atmospheric heights of 500, 1500 and 2000 meters were chosen due to the elevated ozone levels occurring along the trajectory path. NJDEP demonstrated a 150-hour backward trajectory path of where the air in New Jersey on May 25th originated. This trajectory showed a path of the air mass traveling through Canada and Michigan into New Jersey. The satellite imagery obtained during this exceptional event showed elevated carbon monoxide and aerosol optical depth levels were observed in the Midwestern U.S. and these elevated levels were shown to move to the eastern U.S. as the event progressed.

Generally, the trajectory analysis, satellite imagery, and evidence of smoke reaching the ground show that emissions from the Ft. McMurray fire in Alberta, Canada were transported to New Jersey on both days.

The analyses in the demonstration, specifically, the comparison with historical ozone 8-hour maximum concentrations and percentile analysis, trajectory analysis, satellite imagery, upwind K data analysis, time series plots of concentrations of ozone and other ground level pollutants associated with wildfire smoke, weather pattern analysis, comparison to non-event days with similar meteorology and matching day analysis, and the visual photographic evidence sufficiently demonstrate a clear causal relationship between the emissions generated by the Ft. McMurray wildfire and the exceedances measured at the East Providence, Narragansett, and West Greenwich monitoring locations.

Table 3: Documentation of Clear Causal Relationship and the Supporting Analyses

Event Date	Demonstration Citation	Quality of Evidence	Criterion Met?
May 25, 2016	Primarily Section II and III (pages 32-94)	Sufficient	Yes
May 26, 2016	Primarily Section II and III (pages 32-94)	Sufficient	Yes

[7] A comparison of four receptor models used to quantify the boreal wildfire smoke contribution to surface PM2.5 in Halifax, Nova Scotia during the BORTAS-B experiment", Gibson, Haelssig, et al, Atmos. Chem. Phys., 15, 815-827, 2015

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)]. NJDEP's demonstration provided evidence that the wildfire event meets the definition of a wildfire. Additionally, the EPA believes that it is not reasonable to expect a downwind air agency to have required or persuaded an upwind foreign country to have implemented controls on sources sufficient to limit event-related emissions in the downwind state. Therefore, the documentation provided sufficiently demonstrates that the event was not reasonably controllable and not reasonably preventable.

Table 4: Documentation of not Reasonably Controllable or Preventable

Event Date	Demonstration Citation	Quality of Evidence	Criterion Met?
May 25, 2016	Primarily Section IV (page 95)	Sufficient	Yes
May 26, 2016	Primarily Section IV (page 95)	Sufficient	Yes

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

Wildfires are defined at 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." NJDEP provided information which discusses the origin and evolution of the wildfire event. The Ft. McMurray fire qualifies as a natural event because non-prescribed human activity was suspected as the cause of the unplanned fire event which occurred on wildland. While the city of Ft. McMurray itself does not meet the definition of a wildland in the rule, ozone exceedances occurred several weeks after the fire spread outside the town. Therefore, the wildfire emissions affecting ozone concentrations in New Jersey were generated predominantly from sparsely populated forested areas that meet the definition of wildland. The EPA generally considers the emissions of ozone precursors from wildfires on wildland to meet the regulatory definition of a natural event at 40 CFR 50.1(k). New Jersey has therefore shown that the event qualifies as a natural event.

Table 5: Documentation of Nature of Event

Event Date	Demonstration Citation	Quality of Evidence	Criterion Met?
May 25, 2016	Primarily Section V (pages 95-96)	Sufficient	Yes
May 26, 2016	Primarily Section V (pages 95-96)	Sufficient	Yes

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 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)	NJDEP submitted an Unhealthy for Sensitive Groups (USG) Forecast for the entire state of NJ for May 25 and May 26, 2016 to Airnowtech.gov	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)	Letter dated November 21, 2016	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 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)	May 16, 2017	Yes
Was the public comment process followed and documented? • Did the agency document that the comment period was open for a minimum of 30 days? • Did the agency submit to 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 VI (page 96) The comment period was open from April 3, 2017 to May 3, 2017 (30 days). No comments were received during the comment period.	Yes
Has the agency met requirements regarding submission of a mitigation plan, if applicable?	40 CFR §51.930(b)	Not Applicable	Not Applicable

Conclusion

EPA has reviewed the documentation provided by NJDEP to support claims that smoke from wildfires in Alberta, Canada contributed to elevated ozone at the Ancora State Hospital, Bayonne, Brigantine, Camden Spruce Street, Chester, Clarksboro, Colliers Mills, Columbia WMA, Flemington, Leonia, Millville, Monmouth University, Newark Firehouse, Ramapo, Rider

University, Rutgers University and Washington Crossing (Operated by EPA) monitoring stations on May 25 and 26, 2016. The ozone concentrations on May 25, 2016 either exceeded or led to the violation of the 2015 8-hour Ozone NAAQS for all the monitoring locations, and in some cases exceeded the 1997 and 2008 8-hour Ozone NAAQS. The ozone concentrations on May 26, 2016 exceeded 2015 8-hour Ozone NAAQS for 10 of the 17 monitoring locations, and in some of those cases exceeded the 1997 and 2008 8-hour Ozone NAAQS.

While the EPA agrees that the Ft. McMurray fires were responsible for elevated ozone levels at the State's monitors, not all of these elevated levels led to exceedances or violations at the monitoring locations for both days. As such, the EPA concurs on all 17 monitoring locations for May 25, 2016 and on the following 10 monitoring locations for May 26, 2016; Bayonne, Chester, Columbia WMA, Flemington, Leonia, Newark Firehouse, Ramapo, Rider University, Rutgers University and Washington Crossing monitoring locations, and, the EPA non-concurs on the following seven monitoring locations for May 26, 2016; Ancora State Hospital, Brigantine, Camden Spruce Street, Clarksboro, Colliers Mills, Millville and Monmouth University monitoring locations.

EPA has determined that the concurred upon flagged exceedances at these monitoring sites on May 25 and 26 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 exceedance or violations, and was not reasonably controllable or preventable. EPA intends to concur on all monitor-days that resulted in an exceedance or contributed to a violation not just those with immediate regulatory significance, because of the unique region-wide impacts and the coordinated multi-state demonstration development process related to this event. EPA has also determined that the NJDEP has satisfied the procedural requirements for data exclusion for the concurred on data.

The EPA will enter "concurrence flags" for the NJDEP's RF flags (Fire-Canadian request for exclusions) for the data that is concurred on and request that the NJDEP enter IF "inform flags" (Fire-Canadian-INFORM) for the data that is non-concurred into the EPA's Air Quality System (AQS) data repository.