



State of Utah

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF AIR QUALITY
Cheryl Heying
Director

DAQP-018-10

August 16, 2010

Callie Videtich, Director
Air and Radiation Program
EPA Region VIII 8P-AR
1595 Wynkoop Street
Denver, Colorado 80202-1109

Dear Ms. Videtich:

Re: Exceptional Event Documentation
Wildfire June 26, 2008

This letter transmits and summarizes the documentation necessary to flag a data point for removal from regulatory consideration for a wildfire event.

The initial flag indicating that the state intended to have the data removed from regulatory consideration was provided to EPA through the Air Quality System (AQS). An initial description indicating wildfire was provided with this action.

The documentation report was prepared in accordance with EPA's regulation for the "Treatment of Data Influenced by Exceptional Events" (Exceptional Events Rule) 40 CFR, Parts 50 and 51, and associated guidance (preamble), which can be found at 72 FR 55 March 22, 2007, 13560-81.

This documentation pertains to a data point that was influenced by wildfire resulting in exceedance of the 24-hour PM_{2.5} National Ambient Air Quality Standard (Brigham City 42.5 µg/m³).

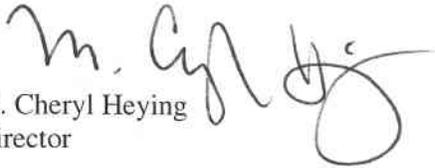
The documentation report verifies, in accordance with the Exceptional Events Rule, that the event day:

- Meets the definition of an exceptional event;
- There is a clear causal relationship between the measurement under consideration and affected air quality;
- The measurement is associated with a measured concentration in excess of normal historical fluctuation, including background; and
- There would have been no exceedance or violation but for the event.

We encourage you to concur with this flag and make the appropriate denotations in AQS.

If you have any questions on this data or need any further information, please contact Joel Karmazyn
jkarmazyn@utah.gov or by phone at (801) 536-4423.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Cheryl Heying". The signature is fluid and cursive, with a large loop at the end.

M. Cheryl Heying
Director

MCH/JK/cy

Attachment

UTAH

Administrative Documentation

**PM2.5 Exceptional Event - Wildfire
Brigham City
Event Date – June 26, 2008**

**State of Utah
Department of Environmental Quality
Division of Air Quality
195 N. 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820
801-536-4000**

August 17, 2010

UTAH
PM2.5 Exceptional Event - Wildfire - June 26, 2008

PM2.5 Exceptional Event - Wildfire - June 26, 2008

ADMINISTRATIVE DOCUMENTATION

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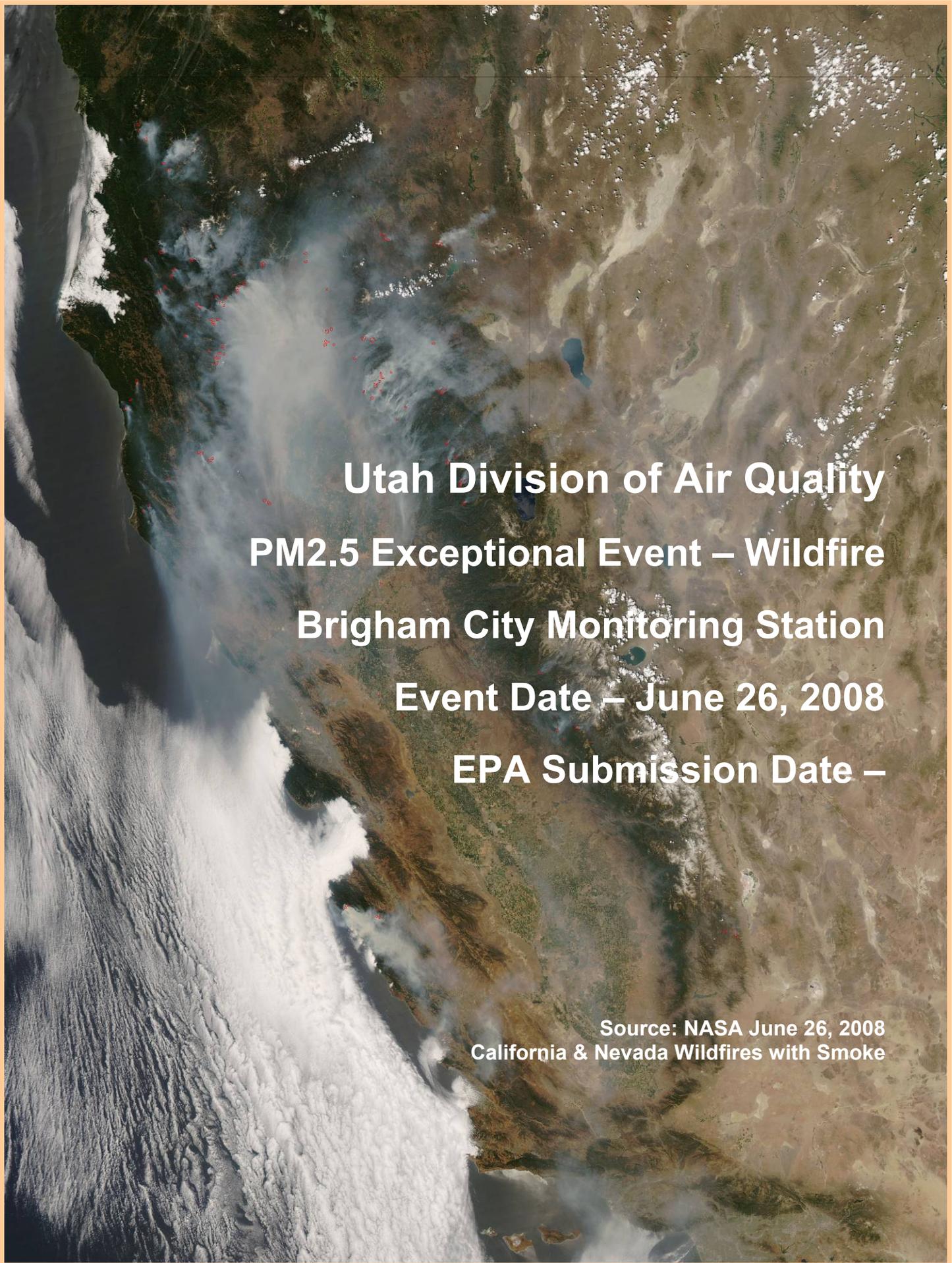
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Final Version

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Certification

Proposed

A satellite image showing a large plume of white smoke rising from the western United States, specifically from California and Nevada. The smoke is dense and extends eastward over the mountainous terrain. Numerous small red markers are scattered across the smoke plume, indicating the locations of active wildfires. The background shows the rugged landscape of the region, including mountains and valleys.

Utah Division of Air Quality
PM2.5 Exceptional Event – Wildfire
Brigham City Monitoring Station
Event Date – June 26, 2008
EPA Submission Date –

Source: NASA June 26, 2008
California & Nevada Wildfires with Smoke

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Definition of Event (40 CFR 50.1(j)) and Introduction

The Code of Federal Regulations (CFR) provides the definition and criteria for determining whether air quality data is impacted by an exceptional event. The 40 CFR 50.1 (j) definition states that “exceptional event means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event.” The demonstration to justify data exclusion as outlined in 40 CFR 50.14 specifies that evidence must be provided that:

1. The event meets the definition of an exceptional event;
2. The event is associated with a measured concentration in excess of normal historical fluctuations, including background;
3. There is a clear causal relationship between the measurements under consideration and the event that is claimed to have affected air quality in the area;
4. There would have been no exceedance or violation but for the event; and
5. The demonstration must include a public comment process and documentation of such to the Environmental Protection Agency (EPA).

This report documents that the PM_{2.5} event due to wildfire smoke from California and Nevada fires meets the above criteria and provides analyses to demonstrate that:

- I. The smoke was not reasonably controllable or preventable because a predominate portion of the PM_{2.5} originated from a non-anthropogenic source – California and Nevada fires;
- II. There is a clear-causal connection between the smoke clouds emanating from California and Nevada and the event at the Brigham City monitoring station;
- III. The measured concentration was beyond normal historical levels; and
- IV. The exceedance would not have occurred “but for” the smoke clouds.

California Wildfires

In the summer of 2008, Northern California experienced an extreme fire season. From June 20 – July 22, 2008, a series of thunderstorms produced over 6,000 lightning strikes throughout Northern and Central California. These ignited numerous wildfires in over 26 counties that consumed over one million acres before containment on July 29.

An estimated 900 wildfires were raging in California and Nevada during June 2008. The following article describes the extent of the conditions.

Wildfires started by lightning burn in California From Wikinews, Wednesday, June 25, 2008

A large lightning storm this week sparked over 800 wildfires in northern California. A lightning storm this past Friday caused wildfires burning from Mendocino County to Monterey County, the latter a county that has been declared an emergency zone, along with Trinity County. Of the 800 wildfires burning, recent numbers say that around 200 are unattended, some being left to burn themselves out.

Governor Arnold Schwarzenegger asked for help from other states, and Nevada and Oregon have thus far responded. Oregon has sent 2,400 firefighters already. Nevada itself has struggled with wildfires, nearly 100 fires are estimated to be burning. Oregon does not have as many wildfires due to their saturated climate.

Sources: Associated Press "Help arrives for California fire crews" – MSNBC, June 25, 2008
Marcus and Wohlsen "Lightning sparks more than 800 wildfires in California" – USA Today, June 25, 2008

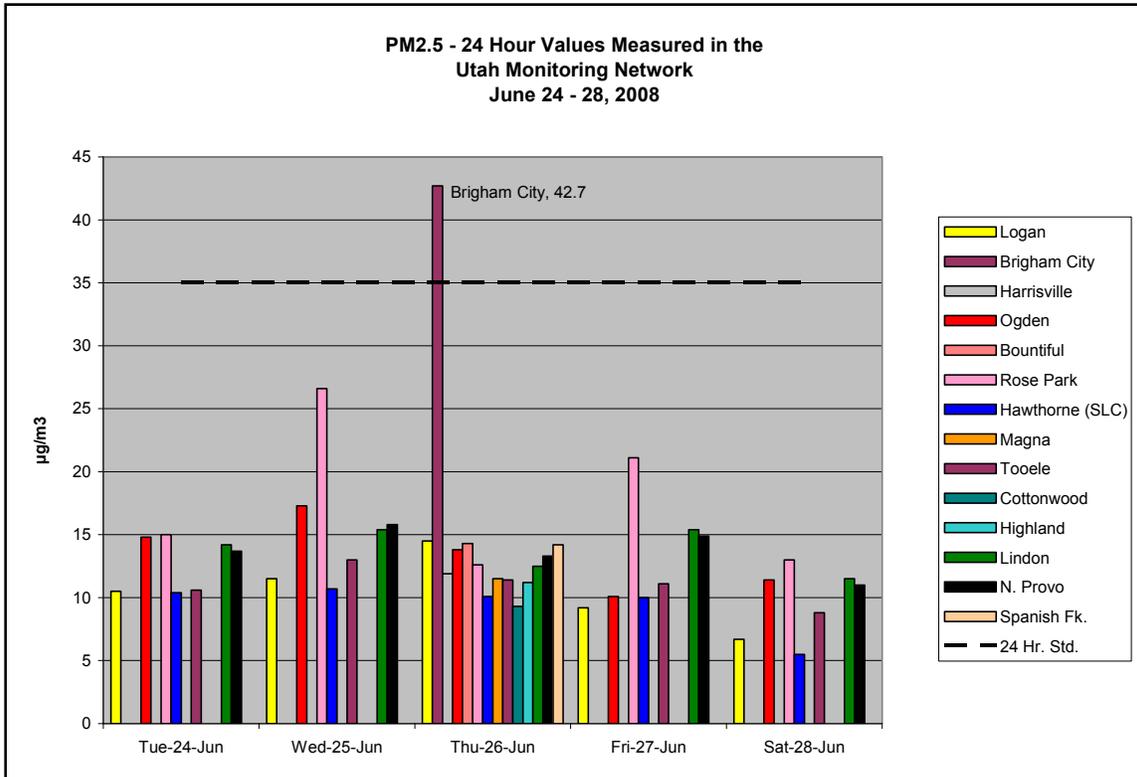
A Trackback posted by Professor Ray Hoff, Director of the collaborative NASA-University of Maryland Research Centers, at 11:08 PM on June 22, 2008 stated, "In California, the fires have led to very high PM2.5 concentrations from the East Bay through the foothills above Sacramento. Levels exceeding 80 ug/m-3 were seen today." The enormity of the air quality impact can only be fully understood when viewing this image taken on June 26, 2008. Smoke covered northern and central California and portions of Nevada and northwestern Utah.



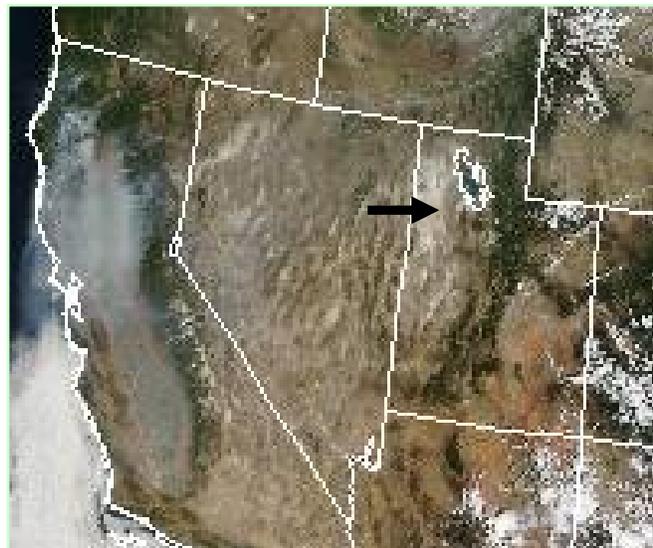
Affect Air Quality

Figure 1 shows the PM2.5 24-hr values for the entire Utah monitoring network during June 24 to 28, 2008. The only exceedance of the PM2.5 24-hr National Ambient Air Quality Standard (NAAQS) of 35 $\mu\text{g}/\text{m}^3$ occurred at the Brigham City station (42.7 $\mu\text{g}/\text{m}^3$). This can be explained by studying the MODIS image and surface wind trends together for June 26.

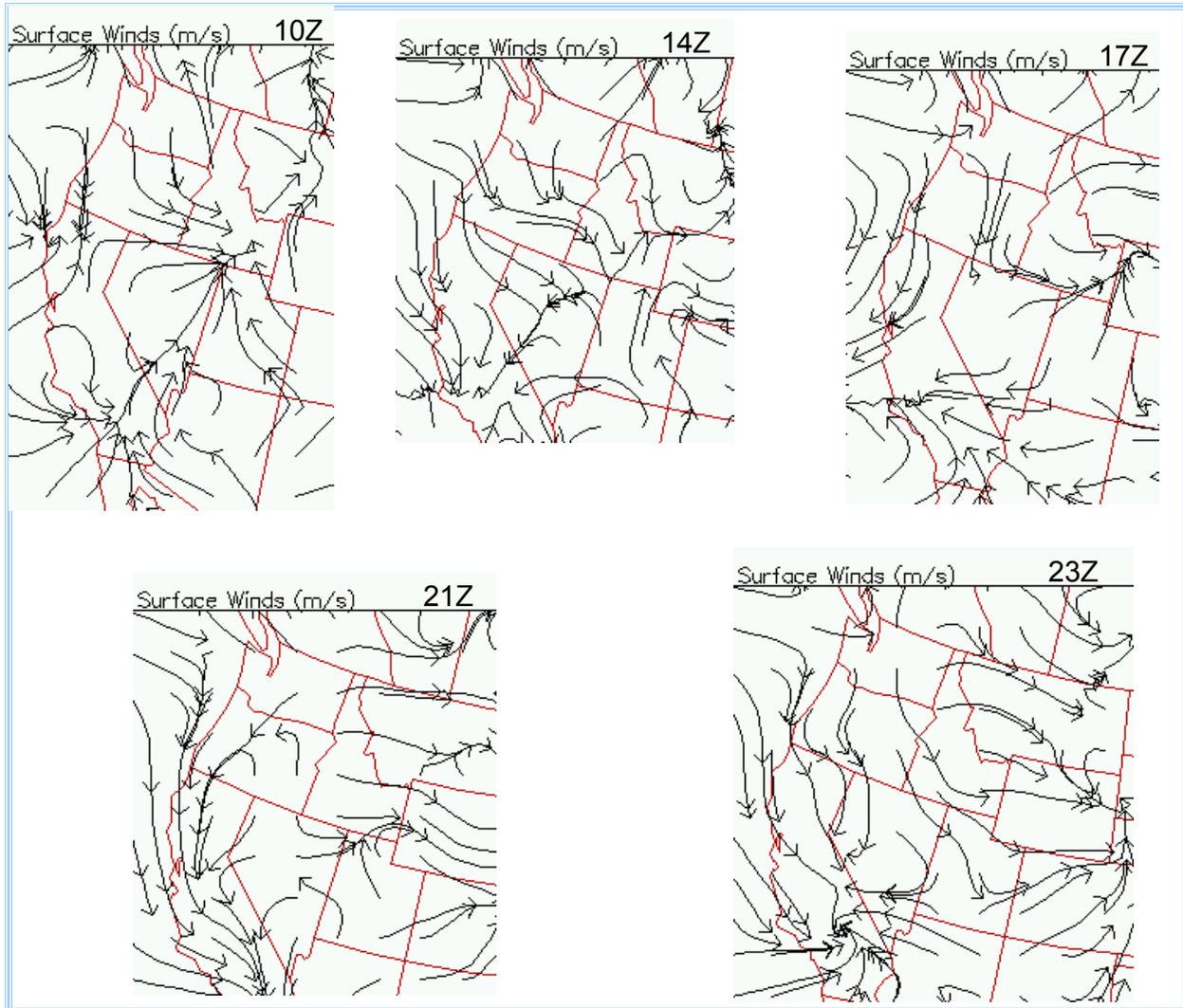
Figure 1 – PM2.5 24-hr Values



This MODIS image, taken on June 26, shows smoke that traversed the Nevada border into northwestern and western Utah. If we look at the streamline plot of the surface winds on the event day, we can see during the early morning (10Z) that winds in Utah were from the southeast moving towards the northwest and that winds from Nevada were also congregating at the same northwestern Utah location. This wind pattern would preclude smoke from moving into the Salt Lake City valley and pushing smoke towards

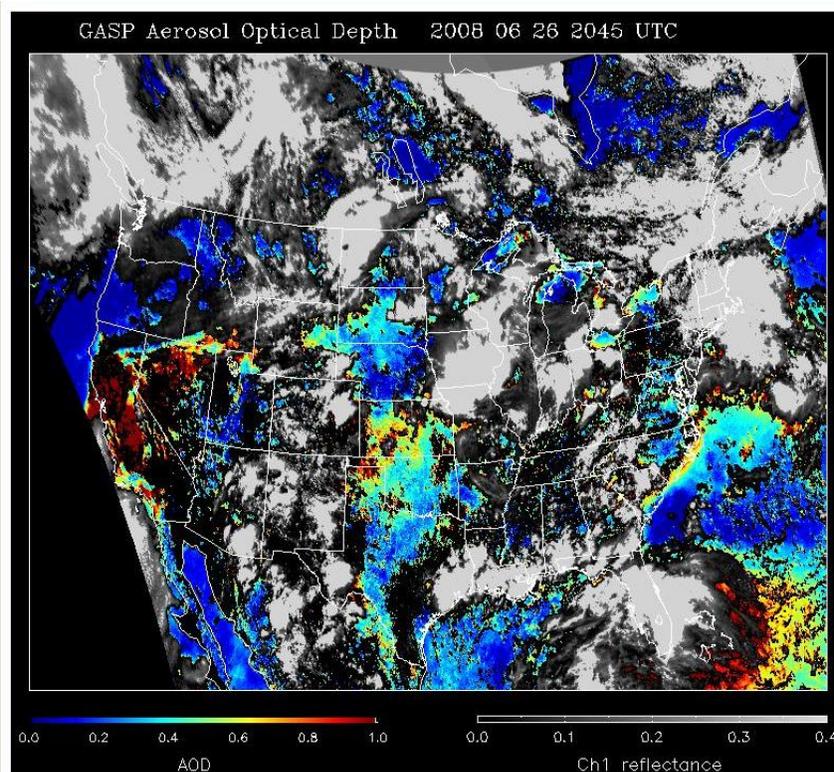


Idaho. Four hours later, surface winds in Nevada directed smoke back into central Nevada. Winds at noon (17Z) shifted again, directing smoke towards the Brigham City monitoring station. Wind pattern towards the northeast intensified by mid afternoon (21Z) and together with morning winds likely drove enough smoke to the Brigham station that caused the PM_{2.5} exceedance. Winds shifted towards central Utah by early evening (23Z), which would then permit smoke to impact the rest of the monitoring stations in the Salt Lake City valley. This late day wafting smoke in the valley was insufficient to cause NAAQS exceedances at monitoring stations within the valley.

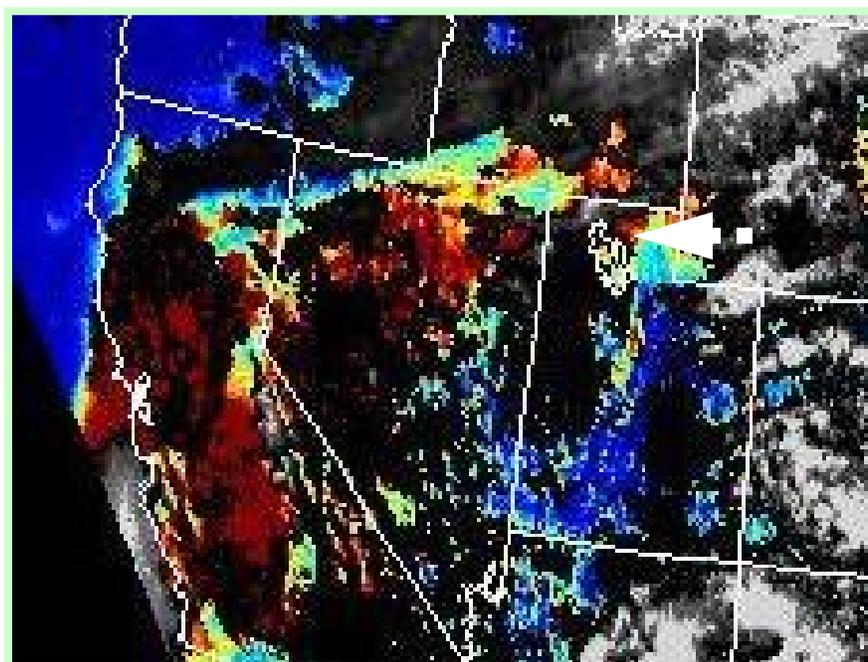


Source: Plymouth State Weather Center

Aerosols are small particles in the air that originate from a number of different sources, including dust storms and fires. Aerosol optical depth improves the interpretation of atmospheric turbidity. The color scale displays the amount of aerosols in the atmosphere. The higher the value, the greater impact there is on visibility. Blue colors indicate clear conditions (low aerosol content) while the yellows and reds indicate high concentrations of atmospheric particles that are associated with reduced visibility. Thus, we can use aerosol imagery to support the wind vector analysis above.



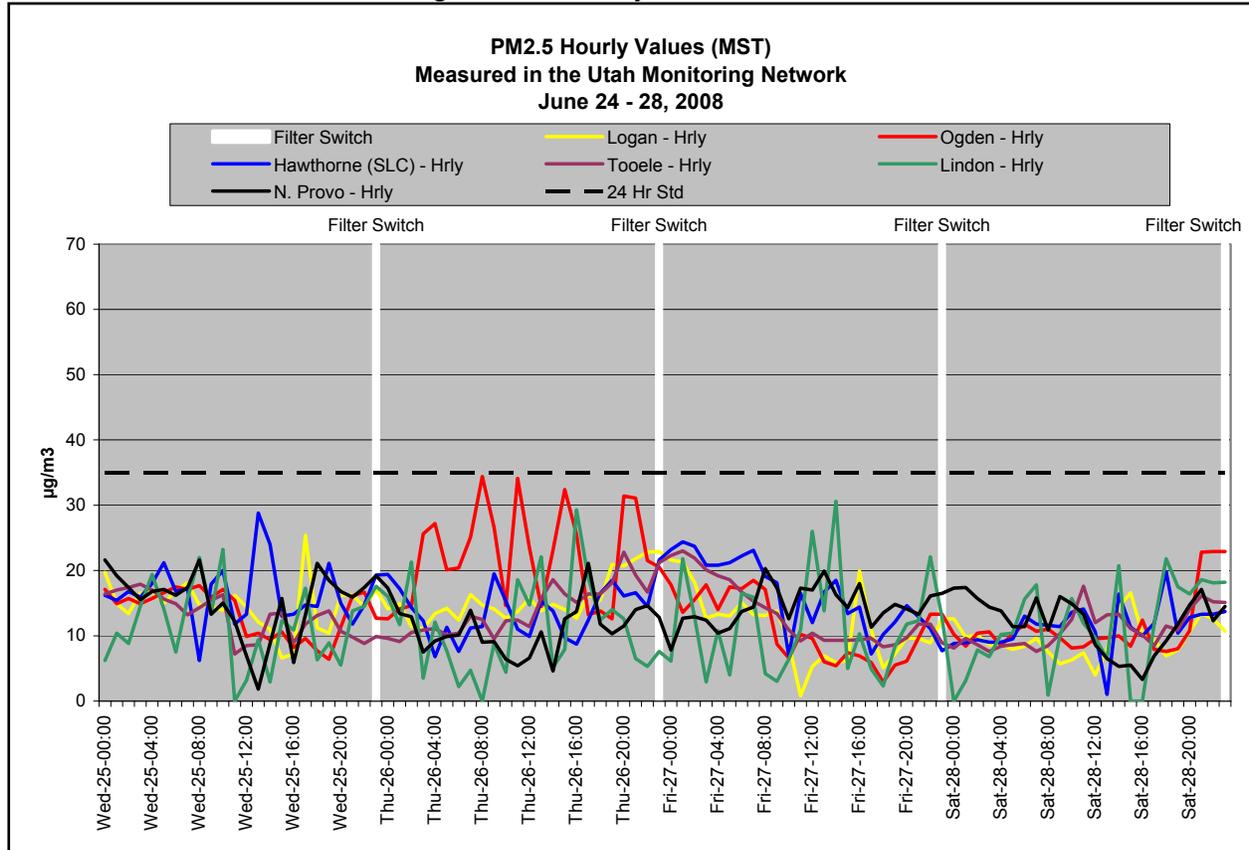
An enlargement of the original image of the western states helps us see the small area around Brigham City that is colored red (highlighted by white arrow), indicating a high concentration of smoke. Note the similar red areas in California and Nevada, where the fires were raging. Several yellow areas (northeast and central Utah) indicate moderate amount of smoke, while most of central and southwestern Utah are blue, indicating low concentrations.



The impact to air quality from the wildfire smoke is more readily observed by plotting the hourly PM_{2.5} values, where hourly values are collected (Figure 2)(raw data in Appendix

A). The erratic nature of the hourly values is attributable to the varying, yet small amount of atmospheric smoke from the wildfires transported across Utah. The Ogden station, which is south of the Brigham station, shows the greatest impact of hourly values, consistent with the surface wind and aerosol analyses that indicate smoke was predominately driven to the far northern Utah stations.

Figure 2 – Hourly PM2.5 Values



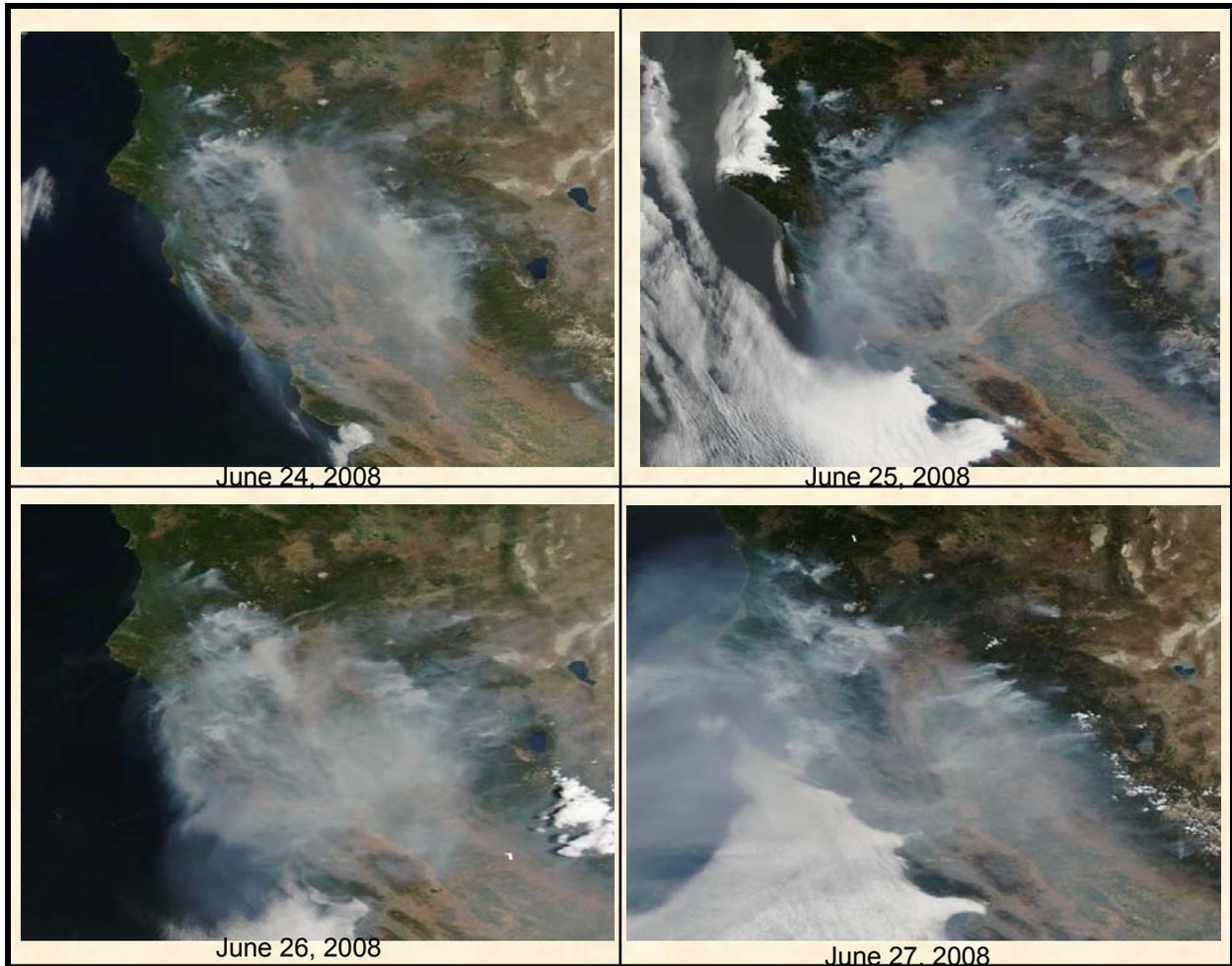
Not Reasonably Controllable or Preventable & Natural Event

The Exceptional Events Rule defines a wildfire as an unplanned, unwanted wildland fire “such as fires caused by lightning...” The summer 2008 California and Nevada fires were caused by lightning and therefore qualify as wildfires under the Rule. Lightning ignition is an uncontrollable natural event, and is not reasonably controllable or preventable.

The MODIS Active Fire Mapping Program, compiled at the USDA Forest Service Remote Sensing Applications Center, provides geospatial overview of the wildland fire situation at regional and national scales. Locations of fires and the extent of previous fire activity are ascertained using satellite imagery acquired by the MODIS sensor. This information is utilized by fire managers to assess active fire situation and serves as a decision support tool in strategic decisions regarding fire suppression resource allocation. These images were taken during the wildfires in California and Nevada

Utah Division of Air Quality – High Wind Exceptional Event
Wildfire Event Date – June 26, 2008

during June 2008 (labeled as local time). Each image shows the primary source of the fires in northern California and portions of Nevada. Wafting smoke into Utah presented in these images, explains the erratic hourly PM_{2.5} readings presented in Figure 2.



Normal Historical Fluctuation (40 CFR 50.14)

Normal historical fluctuation was determined by aligning all historical PM_{2.5} values from each monitoring station from least to greatest. The location of the effected value in relation to the rest of the historically values is expressed as a %ile.

Second, a box plot analysis was preformed on the historical data. The interquartile range (IQR) was calculated. This was then compared to the event value.

Third, a lognormal distribution analysis was preformed on the historical data. The geometric mean, geometric standard deviation, and the 1st, 2nd, and 3rd geomantic standard deviations above the geometric mean where calculated. These where then compared to the event value.

Ranking

Guidance found at 72 Federal Register 55 March 22, 2007, pages 13560-81, states that a lesser amount of documentation would likely be necessary for “extremely high” concentrations (e.g. > 95th%ile) than for concentrations that were closer to “typical levels” (e.g. < 75th%ile.).

The data ranking for the Brigham City monitoring station data collected from 2000 through 2008 verifies that the PM_{2.5} concentration on June 26, 2008, is above the 95th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Interquartile Range

The IQR is a measure of statistical dispersion, and is a “robust statistic.” Robust statistics seek to provide methods that emulate classical methods, but which are not unduly affected by outliers or other small departures from model assumptions. The IQR was calculated on a quarterly basis and on a yearly basis.

The following is the IQR for all Brigham City data:

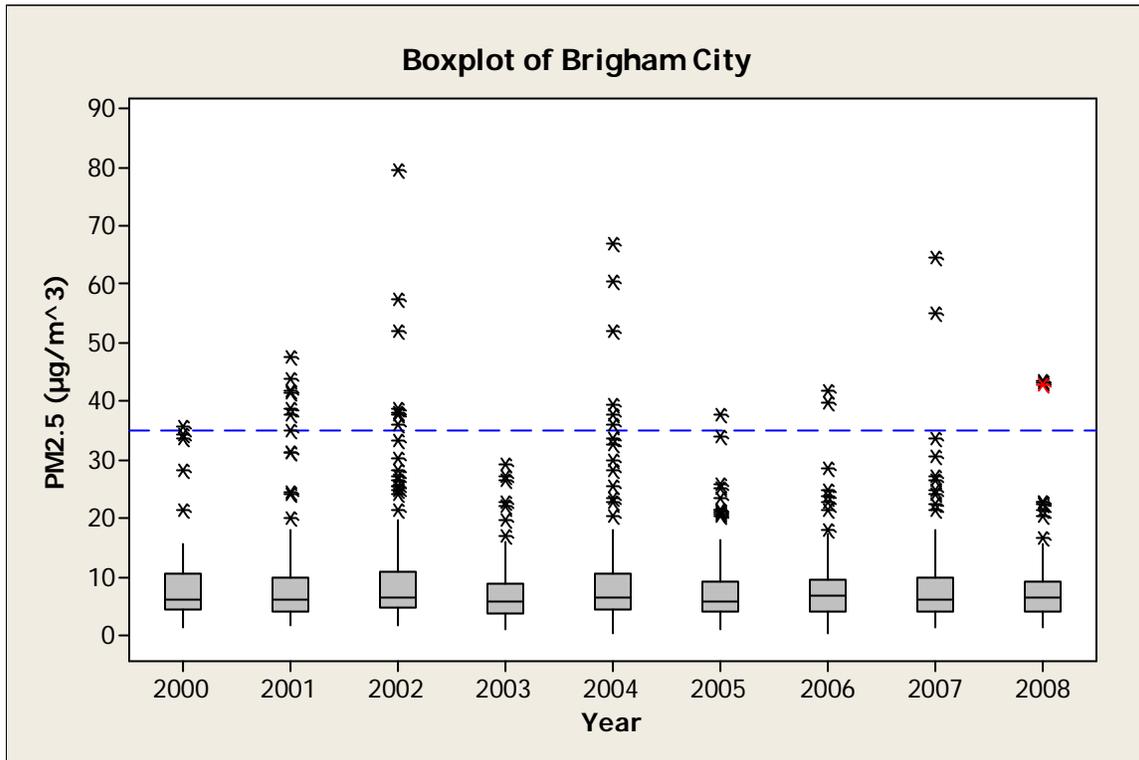
First Quartile (Q1): 4.0 µg/m³
Median (Q2): 6.2 µg/m³
Third Quartile (Q3): 9.5 µg/m³
IQR: 5.5 µg/m³

The IQR was calculated on a quarterly basis (shown in Table 1) along with the annual.

Table – 1 Brigham City Interquartile ($\mu\text{g}/\text{m}^3$)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	244	4.7	11.7	23.3	18.6
2	240	3.1	4.8	6.9	3.8
3	243	5.2	6.5	8.8	3.6
4	264	3.8	5.7	7.9	4.1
All	991	4.0	6.2	9.5	5.5

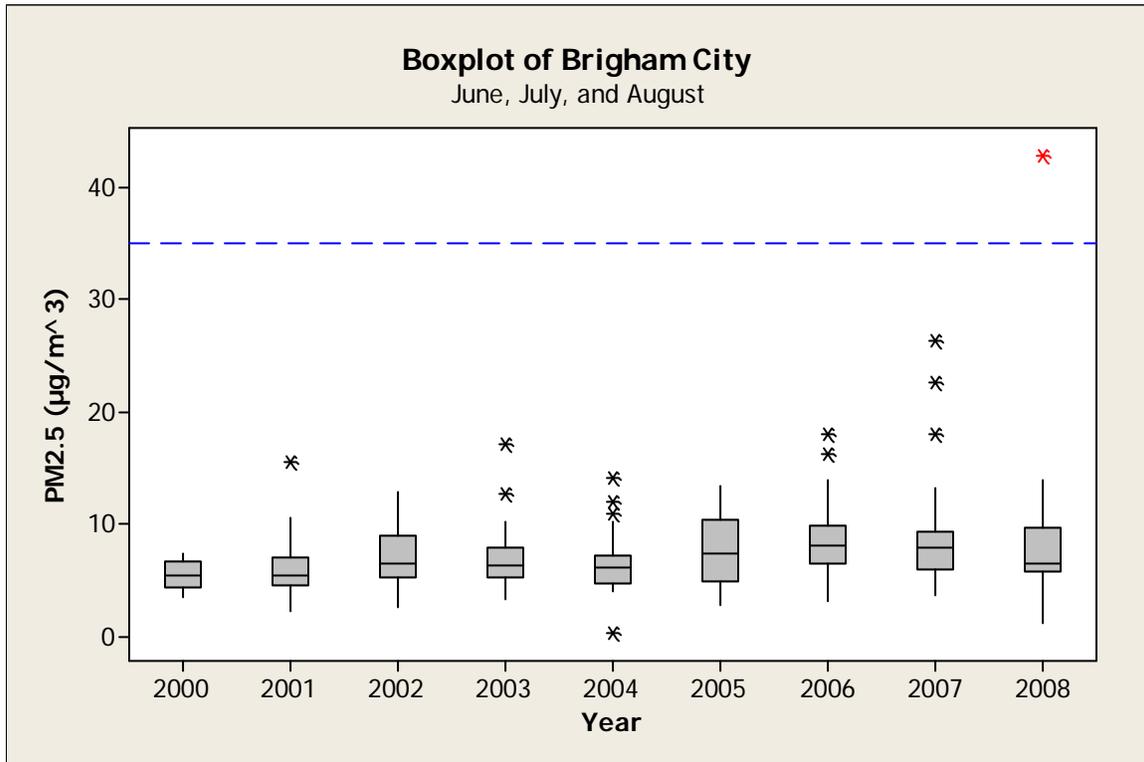
The boxplot presents the historical PM2.5 values, by year; the event value is marked in red. The blue dashed line represents the current PM2.5 standard.



The boxplot whiskers extend to points (events) that are statistically considered to be outliers from the sample population, typically 1.5 times the IQR above the third quartile (Q3).

Because this event occurred during the third quarter, it may be more valuable to only focus on other PM2.5 values during the same time of the year, June-August. The revised boxplot presents the historical PM2.5 values, by year, during the 3rd quarter

(June-August) of each year. The event value is marked in red. The blue dashed line represents the current PM2.5 standard.



The June 26th event is the only exceedance of the current PM2.5 standard during the third quarter.

Analysis of the boxplot graphs permit us to conclude that the event concentration is outside of normal historical variation.

Lognormal Distribution

Lognormal distribution analysis was conducted to establish the normal historical fluctuations for the Bingham City station (inclusive of exceptional event results). Lognormal distribution was selected because of its ability to accurately describe the distribution of measured concentrations of PM2.5. The geometric mean was calculated on a quarterly basis and on an annual basis. The annual basis provides the greatest number of data points and is sufficiently similar to the summer quarterly value thus; the annual geometric mean is used to reflect the normal historical values for the four stations.

Table 2 - Geometric Mean of PM2.5

Location	Quarter	N Quarterly	μ_{geo} ($\mu\text{g}/\text{m}^3$)	Annual μ_{geo} ($\mu\text{g}/\text{m}^3$)
Bingham City 08/8/2000 to 12/31/2008	1	244	10.06	6.39
	2	240	4.62	
	3	243	6.62	
	4	264	5.50	

The annual value is far below the June 26 event of $42.7 \mu\text{g}/\text{m}^3$.

The following are the calculations for the geometric mean, geometric standard deviation, and the upper boundary of the 1st, 2nd, and 3rd standard deviations from the geometric mean.

Geometric Mean (μ_{geo}): $\text{Exp}(\text{Loc}) = 6.39$

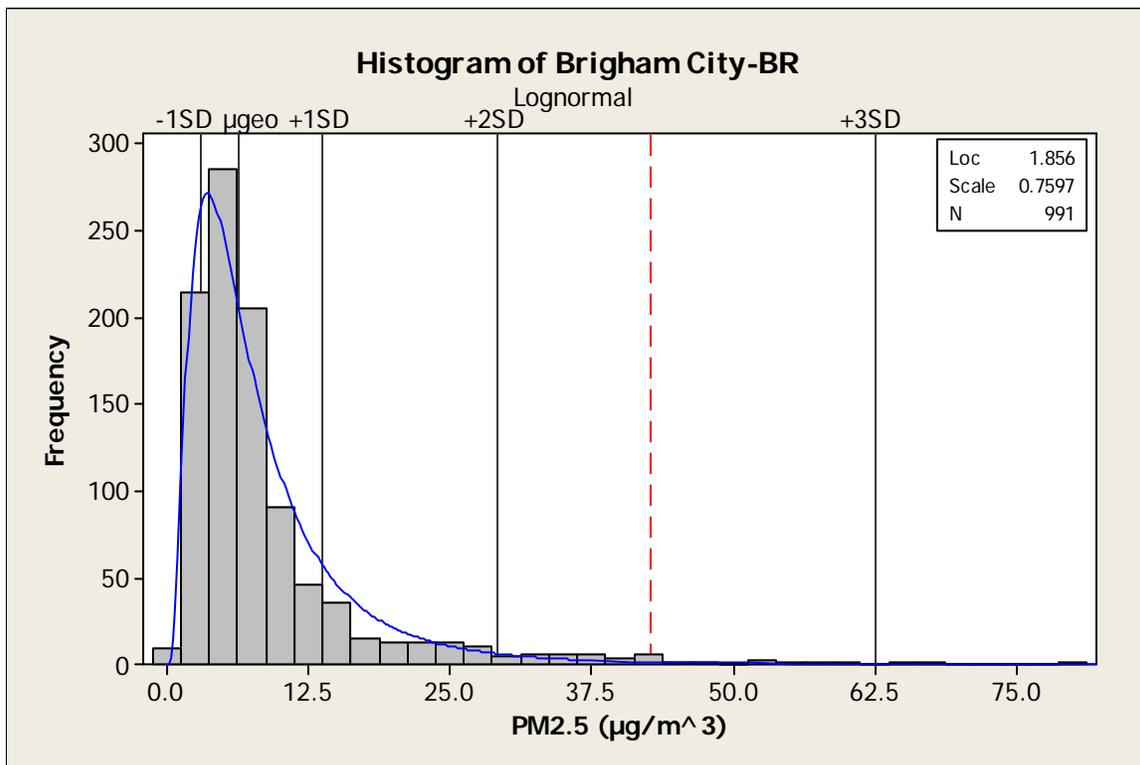
Geometric Standard Deviation (σ_{geo}): $\text{Exp}(\text{Scale}) = 2.13$

+1 Standard Deviation (+1SD): $\text{Exp}(\text{Loc} + \text{Scale}) = \mu_{geo} * \sigma_{geo} = 13.67$

+2 Standard Deviation (+2SD): $\text{Exp}(\text{Loc} + 2 * \text{Scale}) = \mu_{geo} * (\sigma_{geo})^2 = 29.23$

+3 Standard Deviation (+3SD): $\text{Exp}(\text{Loc} + 3 * \text{Scale}) = \mu_{geo} * (\sigma_{geo})^3 = 62.49$

The histogram presents the historical values and the event value with a red dashed line. The blue line is a fitted line overlay of a lognormal distribution.

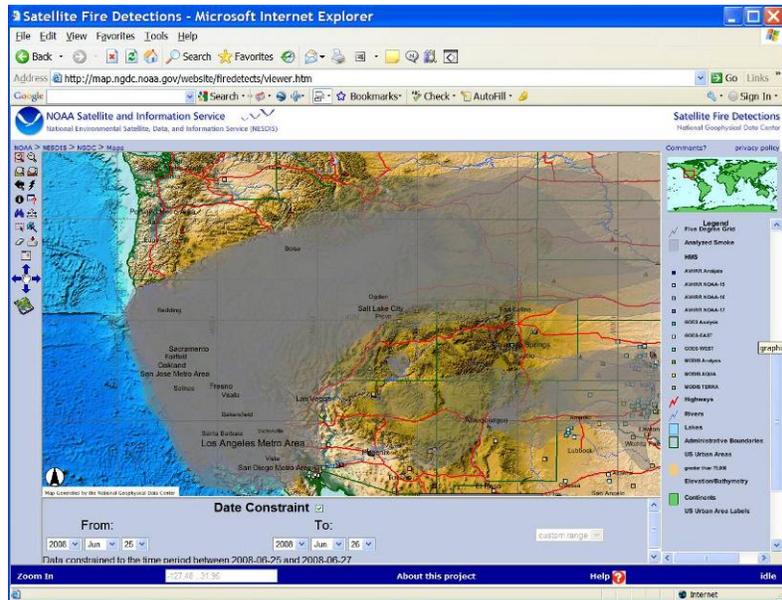


Noting that the normal historical values fall within the lognormal distribution, it is reasonable to utilize plus or minus 2SD above or below the geometric mean as the bounds of normal PM10 values. The event value **exceeds 2SD**. The event value is clearly outside the normal historical fluctuation.

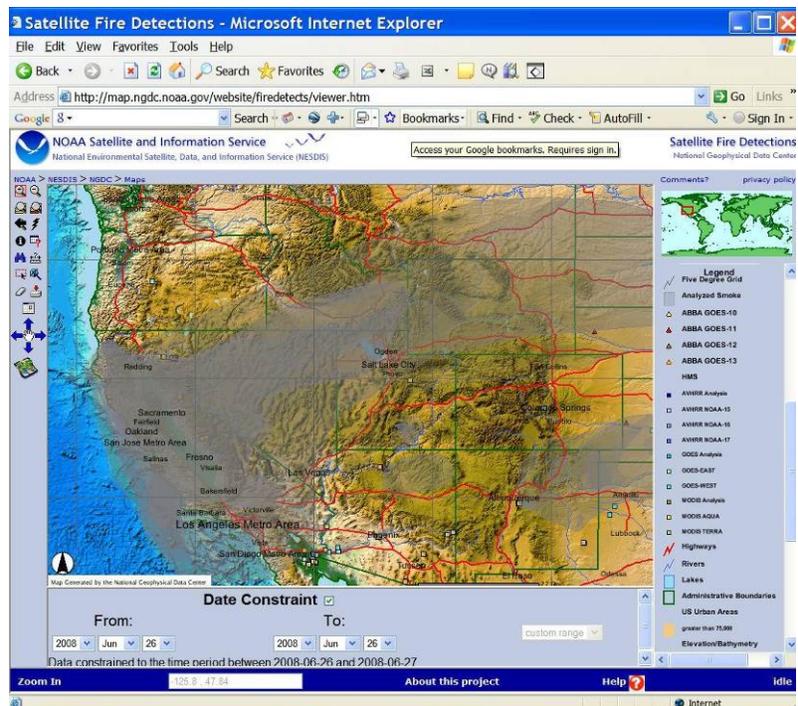
Clear Causal Relationship (40 CFR 50.14)

Trajectory and Impacted Area

NOAA projected heavy smoke coverage over northern Utah on June 25. Actual smoke coverage was light as reflected in Figure 2, erratic hourly PM2.5 values.

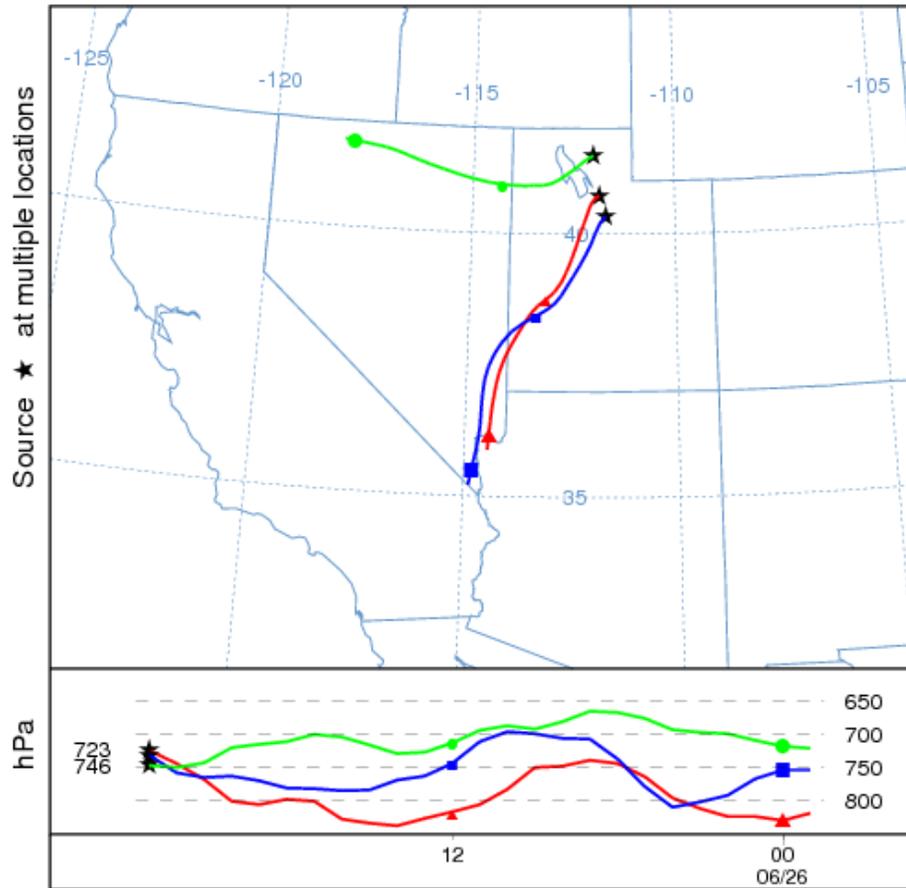


NOAA projected lighter smoke plume coverage over northern Utah on June 26, the day of the event. The MODIS satellite visible image, aerosol imagery and PM2.5 analyses confirm this projection.



The Hysplit 24 hour back trajectory at steering height winds of 1000 meters for Brigham City, Hawthorne and Lindon, confirms that the Brigham City monitoring station received smoke from the Nevada fires as seen in the MODIS visible image. Lindon and Hawthorne back trajectories are from the southwest, where NOAA projected no smoke and the aerosol imagery confirmed low concentrations or no smoke.

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 26 Jun 08
EDAS Meteorological Data

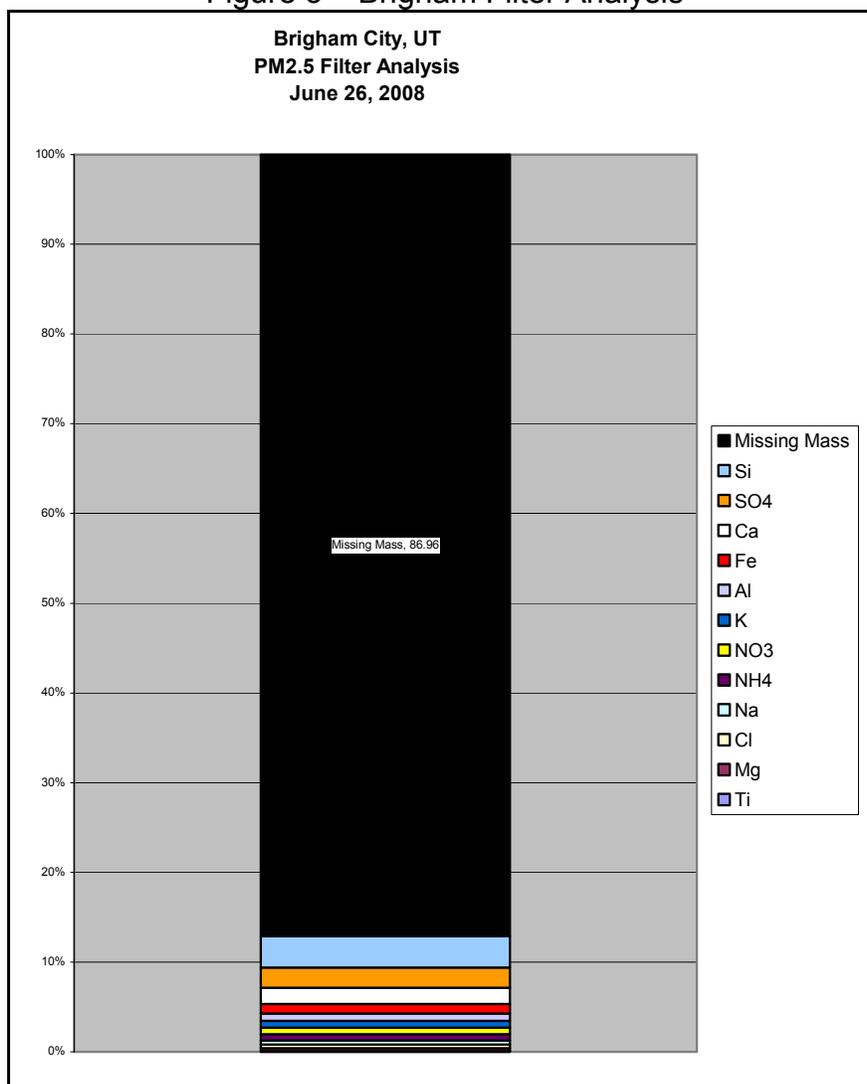


These trajectories, wind vector analysis, along with the NOAA forecast and varied imagery, demonstrate clear and causal relationship of the smoke from wildfires in Nevada to the Brigham City monitoring station. This trajectory further explains why the remaining stations did not exceed the PM_{2.5} 24hr standard.

Speciation

Clear and causal relationship evidence may be evaluated from the filter analysis, which is dominated by 87% missing mass (due to sampling protocol), as shown in Figure 3. The mass is not distinguishable from the Teflon filter on which it was collected. Most of this mass is carbon (organic and elemental forms) due to the smoke from the fires. Typical filters contain some missing mass in the form of carbon, but not nearly to this extent. Past speciation data from the Lindon monitoring station during the same season showed a missing mass to be about 5.9 µg/m³ (Exceptional Event Report to EPA July 9, 2007) compared to 37.2 µg/m³ in this case (speciation data in Appendix B).

Figure 3 – Brigham Filter Analysis



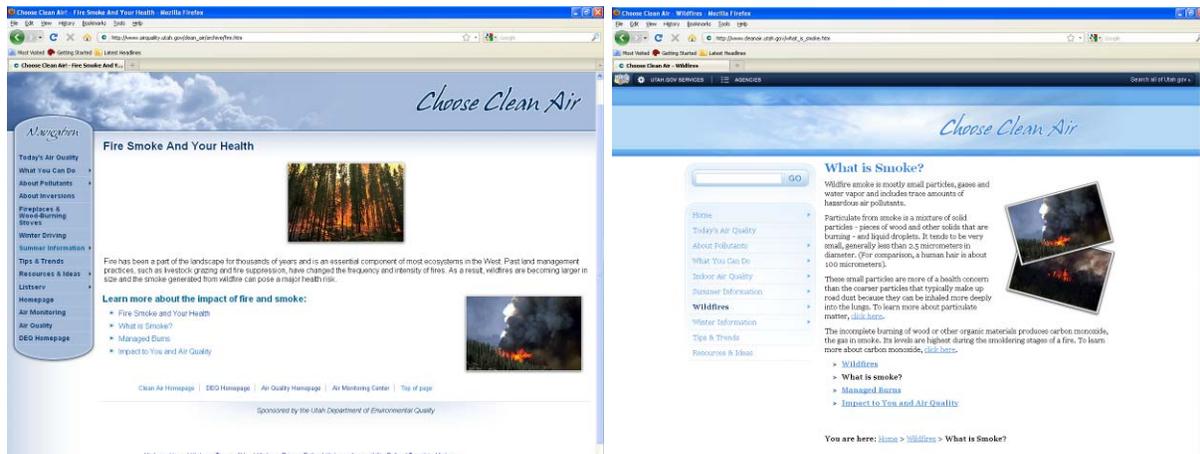
No Exceedance or Violation But For the Event

1. Background concentration of PM_{2.5} can be described as with in the whiskers on a boxplot (0.2-17.75 $\mu\text{g}/\text{m}^3$). This is well below the 24-hr PM_{2.5} NAAQS standard of 35 $\mu\text{g}/\text{m}^3$.
2. Background concentration can also be described as two standard deviations above or below the geometric mean, equivalent to a 95th percentile prediction interval. The upper boundary of this fluctuation for the Brigham City monitoring station would then be 29.23 $\mu\text{g}/\text{m}^3$. The difference between the measured concentration and the upper boundary of the normal historical fluctuation is 13.47 $\mu\text{g}/\text{m}^3$. This difference can be considered the amount of impact from the wildfire smoke event.

3. Filter chemistry analysis reveals that $37.2 \mu\text{g}/\text{m}^3$ is associated with missing mass likely attributed to smoke from the wildfires.
4. Using the IQR approach the measured concentration would not have exceeded the PM_{2.5} 24-hr NAAQS ($42.7 - 17.75 = 24.95 \mu\text{g}/\text{m}^3$). Using the lognormal approach, the measured concentration would not have exceeded the PM_{2.5} 24-hr NAAQS ($42.7 - 29.1 = 13.6 \mu\text{g}/\text{m}^3$). Using the filter analysis approach would also result in a value that would not exceed the NAAQS ($42.7 - 37.2 = 5.5 \mu\text{g}/\text{m}^3$). All computation methods support that a substantial concentration was attributable to the wildfire event and if not but for the event, an exceedance would not have occurred.

Mitigation (40 CFR 51.930)

1. Utah rule R302-202 prohibits open burning and burning of waste materials.
2. A smoke management rule and plan (R307-204) helps minimize smoke from other sources during an event. The rule and plan states that new prescribed fires and new wildland fire use events would not be approved if there was a potential to exceed the NAAQS.
3. A news release during the episode advised citizens of the potential health impacts of smoke from wildfires. Extensive news coverage existed during the event.
4. A series of web sites about emissions from wildfire were posted on the DEQ web site during the event. They covered the health impacts of PM and actions a person could take to minimize exposure to PM.



Public Comment (Preamble V.G.)

The DEQ established a 30-day comment period from _____ through _____. The announcement of the comment period was published in the Salt Lake Tribune and Deseret News on _____.

Affidavit of publication will be inserted in final documentation.

All comments received will be inserted in the final documentation.

Appendix 1

Hourly PM2.5 Concentrations

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

		Ogden - Hrly	N. Salt Lake - Hrly	Hawthorne (SLC) - Hrly	Lindon - Hrly	N. Provo - Hrly
6/25/08 0:00	0:00	31.2	68.4	33.6	37.1	35.8
6/25/08 1:00	1:00	39.8	40.6	34.6	29.1	34.2
6/25/08 2:00	2:00	48.9	34.7	29.5	39.5	27
6/25/08 3:00	3:00	34.7	37.9	31.3	55.4	26.1
6/25/08 4:00	4:00	49	46.8	40.8	44.1	28.2
6/25/08 5:00	5:00	58.6	71.8	30.4	82.1	27.3
6/25/08 6:00	6:00	66.6	107.2	47.7	58.7	33.7
6/25/08 7:00	7:00	40.5	168.1	25.6	28	46.6
6/25/08 8:00	8:00	12.2	44.6	33.6	8	21
6/25/08 9:00	9:00	21.1	62.7	24.5	16.3	17.6
6/25/08 10:00	10:00	24.4	132.2	25.8	25.1	48.7
6/25/08 11:00	11:00	14.2	69	19.4	17.8	20.9
6/25/08 12:00	12:00	20.3	58.1	19.6	10.2	11
6/25/08 13:00	13:00	18.6	33.5	22.6	10.4	6.5
6/25/08 14:00	14:00	5.9	20.2	22	19.4	28.9
6/25/08 15:00	15:00	5.5	23.2	23.5	35.7	41.7
6/25/08 16:00	16:00	6.2	26.6	25.4	29.1	39.2
6/25/08 17:00	17:00	6.6	21	22	32.9	51.1
6/25/08 18:00	18:00	7.2	32.8	17.4	28.6	61.1
6/25/08 19:00	19:00	44.8	74.2	24.6	31.2	42.9
6/25/08 20:00	20:00	26.9	58	20.4	30	45.3
6/25/08 21:00	21:00	46.4	49.4	25.5	29.8	49.7
6/25/08 22:00	22:00	22.7	134.3	26.4	34.2	51.5
6/25/08 23:00	23:00	23.7	278.3	38	35.6	48.5
6/26/08 0:00	0:00	23.8	67.8	29.8	30.4	44.2
6/26/08 1:00	1:00	12.9	39.7	25.5	12.9	37.3
6/26/08 2:00	2:00	34.2	25.6	13.9	7.3	32.9
6/26/08 3:00	3:00	31.9	30.2	14	9	26.1
6/26/08 4:00	4:00	47	37.9	14.9	15.1	20.9
6/26/08 5:00	5:00	61.9	29.9	22.4	13.4	17.8
6/26/08 6:00	6:00	60.9	36.7	25.4	20	19.8
6/26/08 7:00	7:00	23.3	44.2	25.5	12.6	33.5
6/26/08 8:00	8:00	15.5	37.6	24.5	9.9	65.9
6/26/08 9:00	9:00	24.5	26.6	16.7	13.9	38.1
6/26/08 10:00	10:00	15.5	28.1	17.3	17.6	9.5
6/26/08 11:00	11:00	12.8	26.6	16.5	16.4	17.5

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

6/26/08 12:00	12:00	9.2	18	13.8	16.6	19.4
6/26/08 13:00	13:00	15.8	20.9	15	17.2	15.8
6/26/08 14:00	14:00	8.7	23.2	14.7	27	14.4
6/26/08 15:00	15:00	5.8	34.1	18.6	27.8	53.6
6/26/08 16:00	16:00	5.9	22.6	20.7	27.6	40
6/26/08 17:00	17:00	11.3	40.4	15.7	18.2	53.3
6/26/08 18:00	18:00	9.9	49.6	17.3	19.5	25.5
6/26/08 19:00	19:00	54.1	80	23.7	28.6	33.4
6/26/08 20:00	20:00	48.2	90.2	19.4	19.3	34
6/26/08 21:00	21:00	38.3	108.1	22.8	24.7	29
6/26/08 22:00	22:00	16.8	90.8	30	40.4	24.6
6/26/08 23:00	23:00	21.8	53.7	46.5	39.6	27.2
6/27/08 0:00	0:00	19.9	37.3	46.8	37.6	24.5
6/27/08 1:00	1:00	28.8	45.3	37.7	20.1	23
6/27/08 2:00	2:00	32.5	66.3	28.3	22.7	29
6/27/08 3:00	3:00	31.3	51.2	31.6	35.7	26.8
6/27/08 4:00	4:00	42.9	62	35.6	46.9	24
6/27/08 5:00	5:00	64.6	55.8	40.2	60.9	25.4
6/27/08 6:00	6:00	49.9	76.1	43.5	272.7	36.2
6/27/08 7:00	7:00	45.4	19.4	45.7	38.6	43.3
6/27/08 8:00	8:00	13.7	16.2	31.8	30.9	49.9
6/27/08 9:00	9:00	15.1	17.3	24.8	38.5	42
6/27/08 10:00	10:00	24.1	47	18.2	61.5	35.4
6/27/08 11:00	11:00	16.3	28.2	19.4	40.5	35.3
6/27/08 12:00	12:00	6.9	30.7	18.7	15.8	26.2
6/27/08 13:00	13:00	6	32.8	17.1	28	22.1
6/27/08 14:00	14:00	6.1	12.5	13.4	26.2	36.3
6/27/08 15:00	15:00	5.7	13.3	11.5	26	23.3
6/27/08 16:00	16:00	5.6	17.9	10.5	27.8	39
6/27/08 17:00	17:00	3.3	8.6	8.7	12.1	29.7
6/27/08 18:00	18:00	4.2	5.2	9.4	33.6	18.4
6/27/08 19:00	19:00	16.9	11.9	17.9	31.5	15.9
6/27/08 20:00	20:00	42.4	74.4	17.5	58.6	19.2
6/27/08 21:00	21:00	39.1	34.3	13.5	43.7	36
6/27/08 22:00	22:00	40.3	32.6	12.1	40.3	32.5
6/27/08 23:00	23:00	43	31.2	10.8	38	29.3
6/28/08 0:00	0:00	26.1	33.6	9.7	43.8	25.5
6/28/08 1:00	1:00	29.4	47.7	11.2	30.5	27.3
6/28/08 2:00	2:00	42.9	32.6	12.2	14.3	25.8

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

6/28/08 3:00	3:00	41.3	38.5	11.5	51.5	26.7
6/28/08 4:00	4:00	32.1	37.8	13.2	55.6	22.3
6/28/08 5:00	5:00	48.2	43.7	19.5	66.1	20.7
6/28/08 6:00	6:00	30.4	93	19.9	76.9	23.6
6/28/08 7:00	7:00	28.5	59.1	16.1	44.8	37.1
6/28/08 8:00	8:00	24.9	55.5	14.6	31.9	27.6
6/28/08 9:00	9:00	8.8	36.8	14.5	24.1	33.1
6/28/08 10:00	10:00	10.6	21.8	10.4	33.4	23.8
6/28/08 11:00	11:00	7.9	21.5	7.1	40	23.4
6/28/08 12:00	12:00	3.6	13	7.8	13	15.2
6/28/08 13:00	13:00	3.9	8.5	7.2	24.6	8.5
6/28/08 14:00	14:00	9.1	6.5	10.3	17.7	18.6
6/28/08 15:00	15:00	7.1	5.4	10.4	22.4	11.4
6/28/08 16:00	16:00	20.8	4.7	9.3	15.4	11.9
6/28/08 17:00	17:00	13.3	2.7	11	6.4	23.5
6/28/08 18:00	18:00	10	23.9	12.1	18.1	22
6/28/08 19:00	19:00	19.7	36	22.8	33.5	22
6/28/08 20:00	20:00	66.6	80.2	11.4	37.7	27.9
6/28/08 21:00	21:00	64.5	39.2	11.5	48.4	29
6/28/08 22:00	22:00	45.1	31.6	14.2	24.9	23.5
6/28/08 23:00	23:00	46.5	44.9	22	32.3	32.8
6/29/08 0:00	0:00	32.3	50.9	23.2	30.7	28.8

Appendix 2 Speciation Data

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

Lab ID: 09-X784
Client ID: 8132053
Site: Brigham City (BR)
Sample Date: 6/26/08
Mass: 1026. +/- 10. ?g
Volume: 24.00 +/- 2.400 m³
Deposit Area: 11.3 cm²
Size Fraction: PM2.5

Suspended
Particulates: 42.75 +/- 4.30 ?g/m³
Analyte ?g/filter percent ?g/m³

XRF

Na 0.3865 ± 0.5345 0.0377 ± 0.0521 0.0161 ± 0.0223
Mg 3.445 ± 0.5062 0.3358 ± 0.0494 0.1436 ± 0.0255
Al 8.667 ± 0.6068 0.8447 ± 0.0597 0.3611 ± 0.0441
Si 35.73 ± 1.947 3.483 ± 0.1928 1.489 ± 0.1695
P 0.0000 ± 0.0384 0.0000 ± 0.0037 0.0000 ± 0.0016
S 7.094 ± 0.3887 0.6914 ± 0.0385 0.2956 ± 0.0337
Cl 2.907 ± 0.1695 0.2834 ± 0.0167 0.1211 ± 0.0140
K 7.734 ± 0.6803 0.7538 ± 0.0667 0.3222 ± 0.0429
Ca 18.51 ± 0.9402 1.804 ± 0.0933 0.7712 ± 0.0865
Ti 0.8611 ± 0.0475 0.0839 ± 0.0047 0.0359 ± 0.0041
V 0.0215 ± 0.0090 0.0021 ± 0.0009 0.0009 ± 0.0004
Cr 0.0090 ± 0.0079 0.0009 ± 0.0008 0.0004 ± 0.0003
Mn 0.2011 ± 0.0147 0.0196 ± 0.0014 0.0084 ± 0.0010
Fe 10.71 ± 0.5390 1.044 ± 0.0535 0.4464 ± 0.0500
Co 0.0000 ± 0.0237 0.0000 ± 0.0023 0.0000 ± 0.0010
Ni 0.0475 ± 0.0158 0.0046 ± 0.0015 0.0020 ± 0.0007
Cu 0.1322 ± 0.0170 0.0129 ± 0.0017 0.0055 ± 0.0009
Zn 0.2656 ± 0.0192 0.0259 ± 0.0019 0.0111 ± 0.0014
Ga 0.0000 ± 0.0090 0.0000 ± 0.0009 0.0000 ± 0.0004
Ge 0.0000 ± 0.0079 0.0000 ± 0.0008 0.0000 ± 0.0003
As 0.0000 ± 0.0124 0.0000 ± 0.0012 0.0000 ± 0.0005
Se 0.0000 ± 0.0068 0.0000 ± 0.0007 0.0000 ± 0.0003
Br 0.2712 ± 0.0158 0.0264 ± 0.0016 0.0113 ± 0.0013
Rb 0.0181 ± 0.0068 0.0018 ± 0.0007 0.0008 ± 0.0003
Sr 0.0983 ± 0.0090 0.0096 ± 0.0009 0.0041 ± 0.0006
Y 0.0124 ± 0.0090 0.0012 ± 0.0009 0.0005 ± 0.0004
Zr 0.0667 ± 0.0124 0.0065 ± 0.0012 0.0028 ± 0.0006
Mo 0.0079 ± 0.0158 0.0008 ± 0.0015 0.0003 ± 0.0007
Pd 0.1130 ± 0.0475 0.0110 ± 0.0046 0.0047 ± 0.0020
Ag 0.0588 ± 0.0497 0.0057 ± 0.0048 0.0024 ± 0.0021
Cd 0.0678 ± 0.0531 0.0066 ± 0.0052 0.0028 ± 0.0022
In 0.0429 ± 0.0588 0.0042 ± 0.0057 0.0018 ± 0.0025
Sn 0.0678 ± 0.0701 0.0066 ± 0.0068 0.0028 ± 0.0029
Sb 0.0271 ± 0.1379 0.0026 ± 0.0134 0.0011 ± 0.0057
Ba 0.1446 ± 0.0475 0.0141 ± 0.0046 0.0060 ± 0.0021
La 0.0000 ± 0.0373 0.0000 ± 0.0036 0.0000 ± 0.0016
Hg 0.0000 ± 0.0170 0.0000 ± 0.0017 0.0000 ± 0.0007
Pb 0.0599 ± 0.0181 0.0058 ± 0.0018 0.0025 ± 0.0008

IC

Cl 4.070 ± 0.2035 0.3967 ± 0.0059 0.1696 ± 0.0190
Br 0.0000 ± 0.5000 0.0000 ± 0.0069 0.0000 ± 0.0208
NO3 7.400 ± 0.3700 0.7212 ± 0.0092 0.3083 ± 0.0345
SO4 23.13 ± 1.156 2.254 ± 0.0243 0.9638 ± 0.1078
Na 4.570 ± 0.2285 0.4454 ± 0.0064 0.1904 ± 0.0213
NH4 7.250 ± 0.3625 0.7066 ± 0.0090 0.3021 ± 0.0338
K 3.060 ± 0.1530 0.2982 ± 0.0048 0.1275 ± 0.0143

Comment Period

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SCHEDULE	
Start 06/21/2010	End 07/05/2010
CUST. REF. NO.	
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Notice of Public Comment Period Wildfire	
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OLD YEAR

Notice of Public Comment Period
 Wildfire Exceptional Event - Event Date June 26, 2008

Federal regulations, 40 Code of Federal Regulations (CFR) Part 50, allow states to exclude air quality data that exceed or violate a National Ambient Air Quality Standard (NAAQS) if they can demonstrate that an "exceptional event" has caused the exceedance or violation. Exceptional events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable or preventable using techniques implemented to attain and maintain the NAAQS.

Exceptional events may be caused by human activity that is unlikely to recur at a particular location, or may be due to a natural event. The Environmental Protection Agency (EPA) defines a "natural event" as an event in which human activity plays little or no direct causal role to the event in question. For example, a natural event could include such things as high winds, wild fires, and seismic/volcanic activity. In addition, the EPA will allow states to exclude data from regulatory determinations on a case-by-case basis for monitoring stations that measure values that exceed or violate the NAAQS due to emissions from fireworks displays from cultural events.

Federal regulations (40 CFR Part 50.14 (e) (3)(i)) require that all relevant flagged data, the reasons for the data being flagged, and a demonstration that the flagged data are caused by exceptional events be made available by the State for 30 days of public review and comment. These comments will be considered in the final determination of the event that is submitted to EPA. The following monitored values have been attributed to a high wind exceptional event:

- Brigham City Monitoring Station, 42.7 $\mu\text{g}/\text{m}^3$ PM_{2.5}

The documentation to support removing this data from use in regulatory determinations will be available beginning July 5, 2010 (for public review and comment) at the following: www.airquality.utah.gov/PublicInterest/PublicCommentsHearings/ExceptionalEvents/ExceptionalEvents.htm or at the Multi Agency State Government Office Building, 195 North 1950 West in Salt Lake City. In compliance with the American with Disabilities Act, individuals with special needs (including auxiliary communicative aids and services) should contact Brooke Baker, Office of Human Resources at (801) 536-4412 (TDD 536-4414).

The comment period will close at 5:00 p.m. on August 5, 2010. Comments postmarked on or before that date will be accepted. Comments may be submitted by electronic mail to jkarmazyn@utah.gov or may be mailed to:

M. Cheryl Heying, Director
 ATTN: Wildfire Exceptional Event
 Utah Division of Air Quality
 PO Box 144820
 195 N 1950 W
 Salt Lake City, UT 84114-4820

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF Notice of Public Comment Period Wildfire FOR UT ST DEPT OF ENV QUALITY, WAS PUBLISHED BY THE NEWSPAPER AGENCY CORPORATION, AGENT FOR THE SALT LAKE TRIBUNE AND DESERET NEWS, DAILY NEWSPAPERS PRINTED IN THE ENGLISH LANGUAGE WITH GENERAL CIRCULATION IN UTAH, AND PUBLISHED IN SALT LAKE CITY, SALT LAKE COUNTY IN THE STATE OF UTAH. NOTICE IS ALSO POSTED ON UTAHLEGALS.COM ON THE SAME DAY AS THE FIRST NEWSPAPER PUBLICATION DATE AND REMAINS ON UTAHLEGALS.COM INDEFINATELY.

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Public Comment

DEQ received two comments during the public comment period. The first commenter pointed out a minor labeling error that has been corrected. The second commenter submitted an objection to the exceptional event filing. A point by point response to that position is provided below.

Response to Comments

The Division provides no proof for its statement that wildfires were occurring in Nevada. Rather, the Division only provides proof that fires were occurring in California.

DEQ Response: Please refer to page 2, Associated Press release, “Nevada itself has struggled with wildfires, nearly 100 fires are estimated to be burning.”

On page 2 of its analysis, the Division claims, without providing evidence, that smoke from wildfires covered northern Utah. The picture on the right hand side of the page does not provide sufficient evidence for this assertion and neither does reference to statements by Professor Ray Hoff.

DEQ Response: Reference to the MODIS image on page 3 has been added on page 2 that shows smoke in northwest Utah.

As mentioned above, the Division’s analysis on pages 3 and 4 does not show, for example, that the wind was “directing smoke towards the Brigham City monitoring station” when the agency is relying on a map that shows the entire State of Utah at a scale of about one square inch. This is particularly true given that the Division seeks to differentiate what is occurring at the Brigham City monitor from what is occurring at the Ogden monitor, 20 miles away.

DEQ Response: National Weather Service meteorological data used to project wind vectors are usually between 12-40 kilometers, as such, wind vectors are plotted at a scale greater than the distance between Ogden and Brigham City. Thus, we do not solely rely on wind vector and apply multiple data in our analysis, such as particle trajectory (NOAA Hysplit model) to explain regional effects. The particle back trajectory presented in page 13 shows trajectory from the smoke clouds in northeast Nevada to Brigham City.

The Division’s analysis on page 5 suffers from the same fate. Here, the State of Utah is 3 inches by 2 inches. Moreover, as the Division admits, aerosol data can show red when there is dust in the air. In addition, as the Division also states, aerosols can originate “from a number of sources[.]” Therefore, this data does nothing to rule out emissions from a dust storm or, for example, a stationary source.

DEQ Response: As explained above, national meteorological measurements are taken at a large scale. Enlarging the Utah map would not change the scale of the meteorological measurement.

Aerosol data does include dust and smoke which is why we compared aerosol signal in Utah to the known fires in California and those closer in Nevada. The weight of evidence approach is used to support the exceptional events determination that includes the use of, but not limited to imaging, wind vector, particle trajectory, NOAA smoke maps and speciation data.

Wildfires are often accompanied by high wind, but in this case, wind was not a factor, thus DEQ did not include wind data in the documentation. The adjacent table presents the wind data for the Brigham City monitoring station.

A stationary source emitting particulates of the magnitude necessary to trigger an exceedance over the standard would certainly be noted. DEQ did not receive a dust complaint of this magnitude. The weight of evidence supports the DEQ conclusion that the source of the PM2.5 exceedance was smoke.

Date	Hour	MPH
6/26/2008	0	8.6
6/26/2008	1	4.5
6/26/2008	2	3.8
6/26/2008	3	4.1
6/26/2008	4	3.4
6/26/2008	5	3.1
6/26/2008	6	3.8
6/26/2008	7	4.1
6/26/2008	8	3.8
6/26/2008	9	4.7
6/26/2008	10	9.6
6/26/2008	11	11.3
6/26/2008	12	8.1
6/26/2008	13	7
6/26/2008	14	7.8
6/26/2008	15	6.8
6/26/2008	16	6.4
6/26/2008	17	5.5
6/26/2008	18	3.8
6/26/2008	19	6
6/26/2008	20	3.5
6/26/2008	21	7.7
6/26/2008	22	7.1
6/26/2008	23	6.7

Page 6 of the Division’s analysis shows the variability of readings at the various monitors along the Wasatch Front. Again, this data does nothing to distinguish Ogden – with the greatest variability but lower PM2.5 concentration (below 15 µg/m³) compared to the rest of the Wasatch Front monitors (which have equally “low” PM2.5 concentration but not as much variability). Moreover, the graph does not show Brigham City monitors or explain why Brigham City would experience a 43 µg/m³ concentration of PM2.5, when Ogden’s measured below 15 µg/m³.

DEQ Response: Page 5 states that Figure 2 is of hourly values, “where hourly values are collected.” The Brigham City monitoring station is not equipped to monitor hourly values therefore, DEQ plotted all available data. Figure 2 does show hourly oscillation at Ogden which is attributable to regional smoke and localized weather conditions. The adjacent table presents the actual hourly values and it is evident that Ogden did indeed experience elevated levels.

Hour	PM2.5 at Ogden µ/m ³
0	12.6
1	14.1
2	14.6
3	25.6
4	27.2
5	20.1
6	20.4
7	25.1
8	34.4
9	26.6
10	14.6
11	34.1
12	23.5
13	14.5
14	23.1
15	32.4
16	25.5
17	13.2
18	13.8
19	12.6
20	31.4
21	31.1
22	21.5
23	20.5

It is important to note that the hourly measurement and the filter method used to calculate the daily value are different methods and serve different purposes. The hourly values tells us that wafting smoke did impact Ogden, while the filter measurement, that is used to compare against the standard, tells us that the overall smoke emission was not enough to exceed the standard.

Again, the maps displayed on page 7 do nothing to explain why the Brigham City monitor registered a reading of 43 µg/m³, while Ogden, 20 miles away, measured 15 µg/m³.

DEQ Response: Page 7 of the documentation is presented to meet the exceptional event rule requirement regarding “not reasonably controllable or preventable and natural event,” it is related to wafting smoke transported into northern Utah and not intended to address separate station measurements. Page 4 does discuss the wind vectors over the measurement period, explaining why Brigham City registered an exceedance while other stations did not.

The Division's analysis of the historical variation appears sound, but addresses only one of the four factors necessary to establish an exceptional event. The Division has not provided data or analysis to establish any of the other three factors and therefore has not met its evidentiary burden.

DEQ Response: This comment is too vague to respond. DEQ does believe that the documentation is complete.

The Division's Hysplit analysis is not forthcoming. First, although this analysis is intended for the public, the Division does not explain it in a way that the public can understand. Second, as mentioned above, the Division did not provide evidence that fires were occurring in Nevada. Third, the analysis says nothing about Ogden, which had a PM_{2.5} reading of below 15 µg/m³. Fourth, the agency speaks of "winds of 1000 meters" which suggests a height well above the monitor. Fifth, the analysis refers to the "NOAA forecast," which indicates a forecast, not what actually happened. As a result, the Division has not explained "why the remaining stations" particularly Ogden "did not exceed the PM_{2.5} 24hr standard." Exceptional Event Analysis at 13.

DEQ Response: The commenter has appropriately pointed out that the documentation does not include an introduction of the complex Hysplit model. A brief introduction has been added to that section.

The documentation did present evidence of Nevada fires, please refer to DEQ's first response above.

The Hysplit model was used to show the Bingham City trajectory, the subject of this documentation and to demonstrate that wind patterns differed along the Wasatch Front.

Steering heights are modeled because they influence particle trajectory over Utah's complex terrain. If we modeled at 10 meters (near the height of the monitoring stations), localized effect and varying terrain would overly influence the model and present a false picture of regional movement.

NOAA smoke maps are produced based on predicted weather patterns while the Hysplit modeling utilizes actual meteorological data downloaded from the National Weather Service. Therefore, our Hysplit model output is based on actual, not predicted meteorology data. We make a point that our modeling of actual conditions matched the NOAA smoke prediction, adding to the weight of evident.

DEQ has explained above that the steering winds kept the smoke in northern Utah and in fact, at one point during the day, the winds drove the smoke backwards to Nevada. The Ogden station was impacted by wafting smoke as evident from the hourly PM_{2.5} data, just not enough to cause an exceedance of the standard.

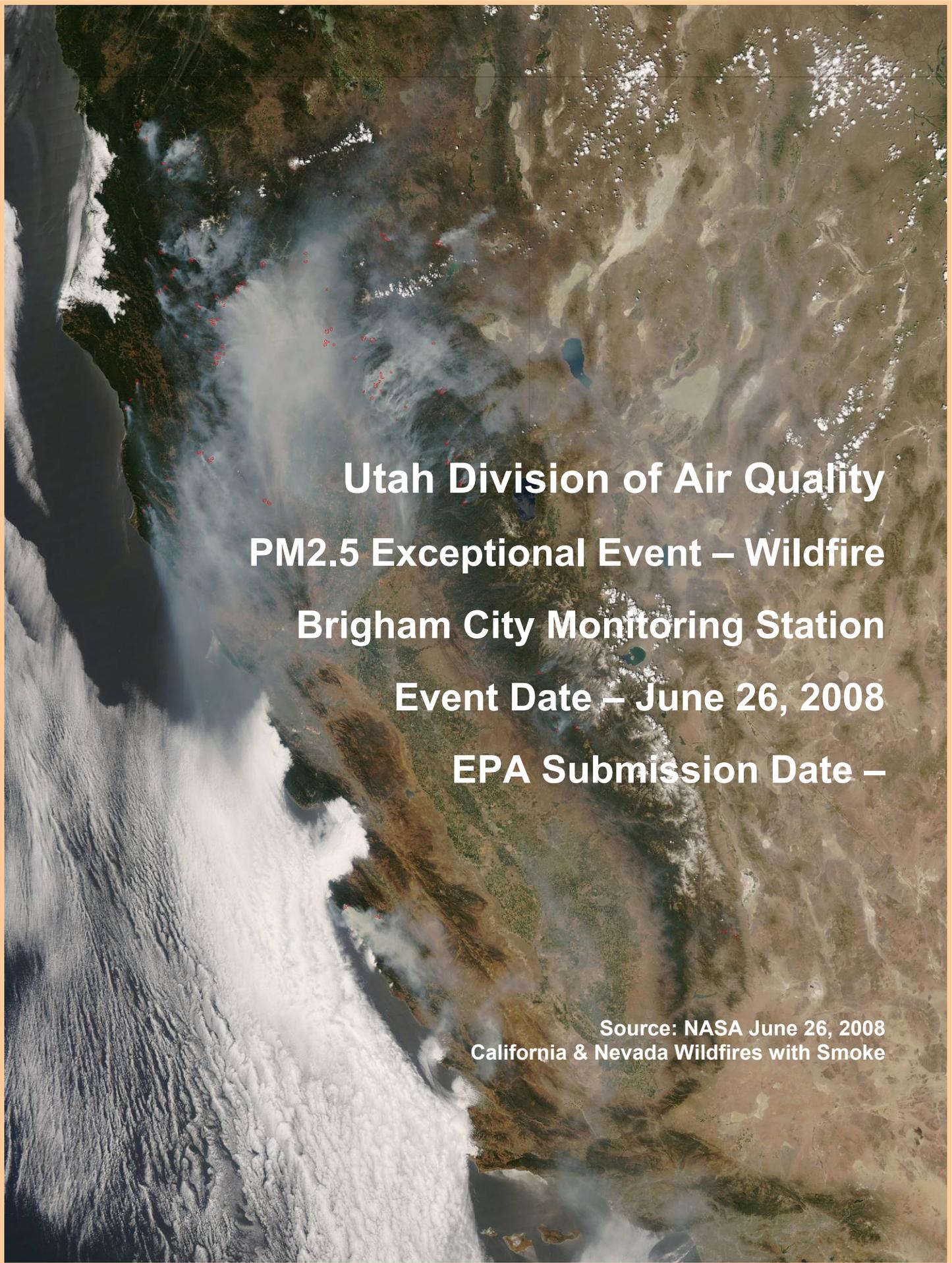
The Division offers no basis for its contention that the “missing mass” can “likely” be attributed to wildfire smoke. There is no citation or analysis to support this statement.

DEQ Response: DEQ explained that missing mass data is usually negligible and that we have observed the extensive difference during wildfire events, thus we point to this cause and effect.

Finally, the Division’s analysis of “mitigation” may be appropriate were the event actually attributable to wildfires. However, such mitigation is not relevant to an event caused by a stationary source or a dust storm.

DEQ Response: The exceptional event rule requires mitigation measure(s) documentation for each type of event. DEQ has concluded that this event is a wildfire event, as there were no reports of anthropogenic sources or weather conditions suggesting dust entrainment.

Final

A satellite image showing a large plume of white smoke rising from the western United States, specifically from California and Nevada. The smoke is dense and extends eastward across the continent. The background shows the terrain of the region, including mountains and valleys. Several small red markers are visible on the ground, likely indicating the locations of wildfires. The text is overlaid on the image in white, bold font.

Utah Division of Air Quality
PM2.5 Exceptional Event – Wildfire
Brigham City Monitoring Station
Event Date – June 26, 2008
EPA Submission Date –

Source: NASA June 26, 2008
California & Nevada Wildfires with Smoke

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Definition of Event (40 CFR 50.1(j)) and Introduction

The Code of Federal Regulations (CFR) provides the definition and criteria for determining whether air quality data is impacted by an exceptional event. The 40 CFR 50.1 (j) definition states that “exceptional event means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event.” The demonstration to justify data exclusion as outlined in 40 CFR 50.14 specifies that evidence must be provided that:

1. The event meets the definition of an exceptional event;
2. The event is associated with a measured concentration in excess of normal historical fluctuations, including background;
3. There is a clear causal relationship between the measurements under consideration and the event that is claimed to have affected air quality in the area;
4. There would have been no exceedance or violation but for the event; and
5. The demonstration must include a public comment process and documentation of such to the Environmental Protection Agency (EPA).

This report documents that the PM_{2.5} event due to wildfire smoke from California and Nevada fires meets the above criteria and provides analyses to demonstrate that:

- I. The smoke was not reasonably controllable or preventable because a predominate portion of the PM_{2.5} originated from a non-anthropogenic source – California and Nevada fires;
- II. There is a clear-causal connection between the smoke clouds emanating from California and Nevada and the event at the Brigham City monitoring station;
- III. The measured concentration was beyond normal historical levels; and
- IV. The exceedance would not have occurred “but for” the smoke clouds.

California Wildfires

In the summer of 2008, Northern California experienced an extreme fire season. From June 20 – July 22, 2008, a series of thunderstorms produced over 6,000 lightning strikes throughout Northern and Central California. These ignited numerous wildfires in over 26 counties that consumed over one million acres before containment on July 29.

An estimated 900 wildfires were raging in California and Nevada during June 2008. The following article describes the extent of the conditions.

Wildfires started by lightning burn in California From Wikinews, Wednesday, June 25, 2008

A large lightning storm this week sparked over 800 wildfires in northern California. A lightning storm this past Friday caused wildfires burning from Mendocino County to Monterey County, the latter a county that has been declared an emergency zone, along with Trinity County. Of the 800 wildfires burning, recent numbers say that around 200 are unattended, some being left to burn themselves out.

Governor Arnold Schwarzenegger asked for help from other states, and Nevada and Oregon have thus far responded. Oregon has sent 2,400 firefighters already. Nevada itself has struggled with wildfires, nearly 100 fires are estimated to be burning. Oregon does not have as many wildfires due to their saturated climate.

Sources: Associated Press "Help arrives for California fire crews" – MSNBC, June 25, 2008
Marcus and Wohlsen "Lightning sparks more than 800 wildfires in California" – USA Today, June 25, 2008

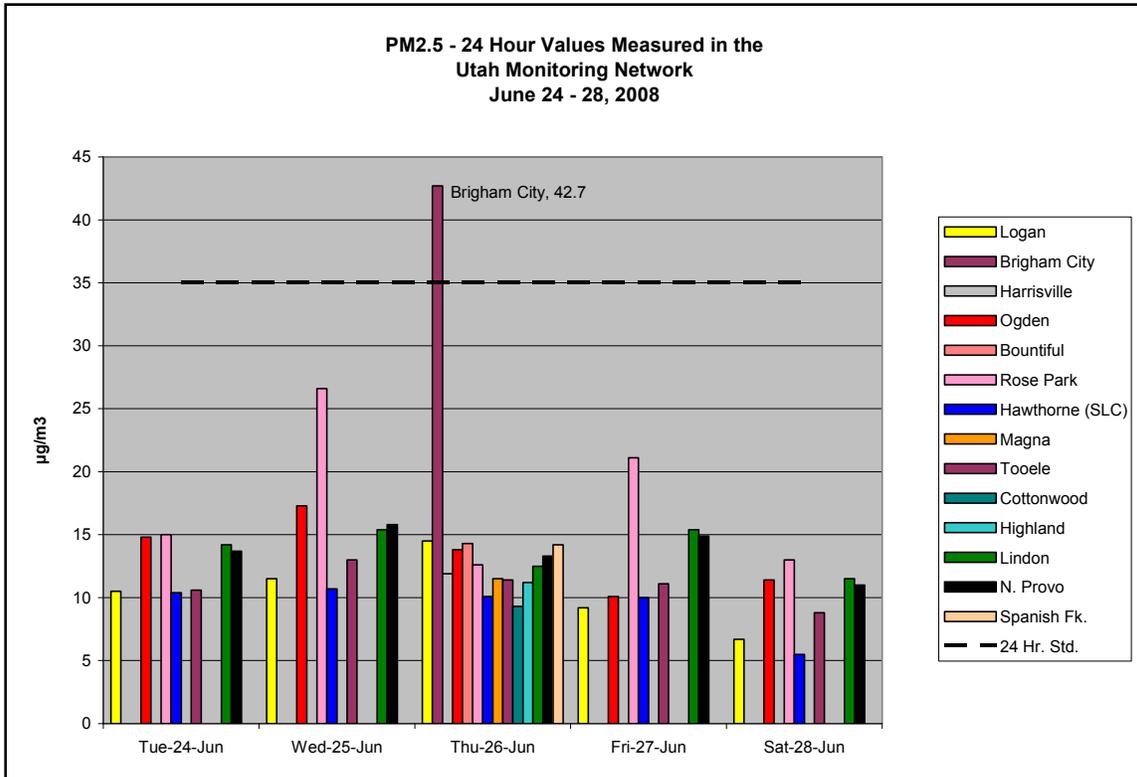
A Trackback posted by Professor Ray Hoff, Director of the collaborative NASA-University of Maryland Research Centers, at 11:08 PM on June 22, 2008 stated, "In California, the fires have led to very high PM2.5 concentrations from the East Bay through the foothills above Sacramento. Levels exceeding 80 ug/m-3 were seen today." The enormity of the air quality impact can only be fully understood when viewing this image taken on June 26, 2008. Smoke covered northern and central California and portions of Nevada and northwestern Utah.



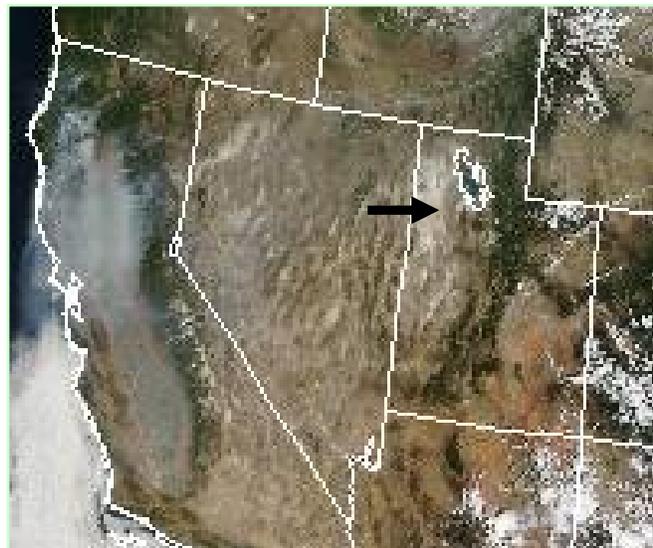
Affect Air Quality

Figure 1 shows the PM2.5 24-hr values for the entire Utah monitoring network during June 24 to 28, 2008. The only exceedance of the PM2.5 24-hr National Ambient Air Quality Standard (NAAQS) of 35 $\mu\text{g}/\text{m}^3$ occurred at the Brigham City station (42.7 $\mu\text{g}/\text{m}^3$). This can be explained by studying the MODIS image and surface wind trends together for June 26.

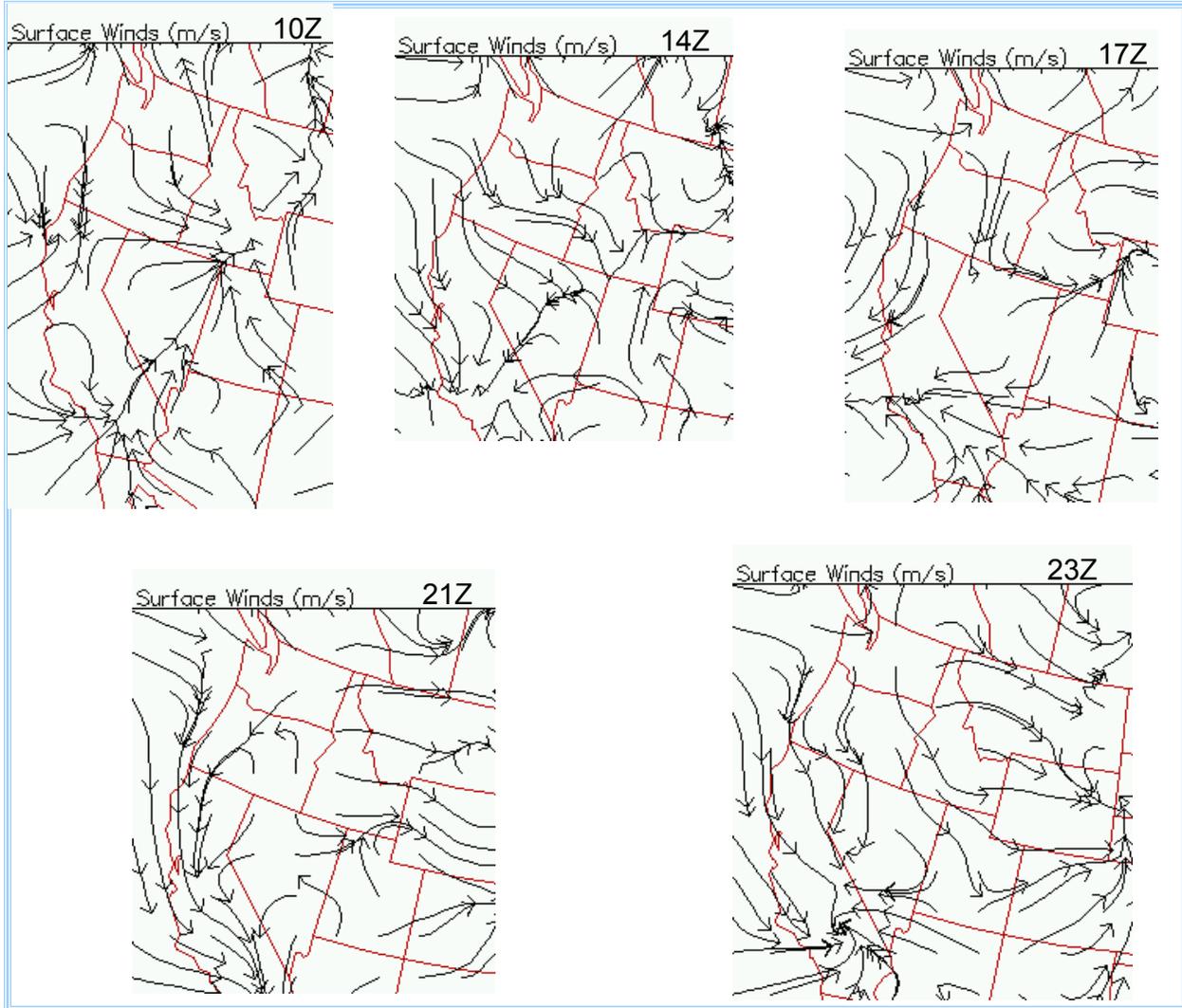
Figure 1 – PM2.5 24-hr Values



This MODIS image, taken on June 26, shows smoke that traversed the Nevada border into northwestern and western Utah. If we look at the streamline plot of the surface winds on the event day, we can see during the early morning (10Z) that winds in Utah were from the southeast moving towards the northwest and that winds from Nevada were also congregating at the same northwestern Utah location. This wind pattern would preclude smoke from moving into the Salt Lake City valley and pushing smoke towards

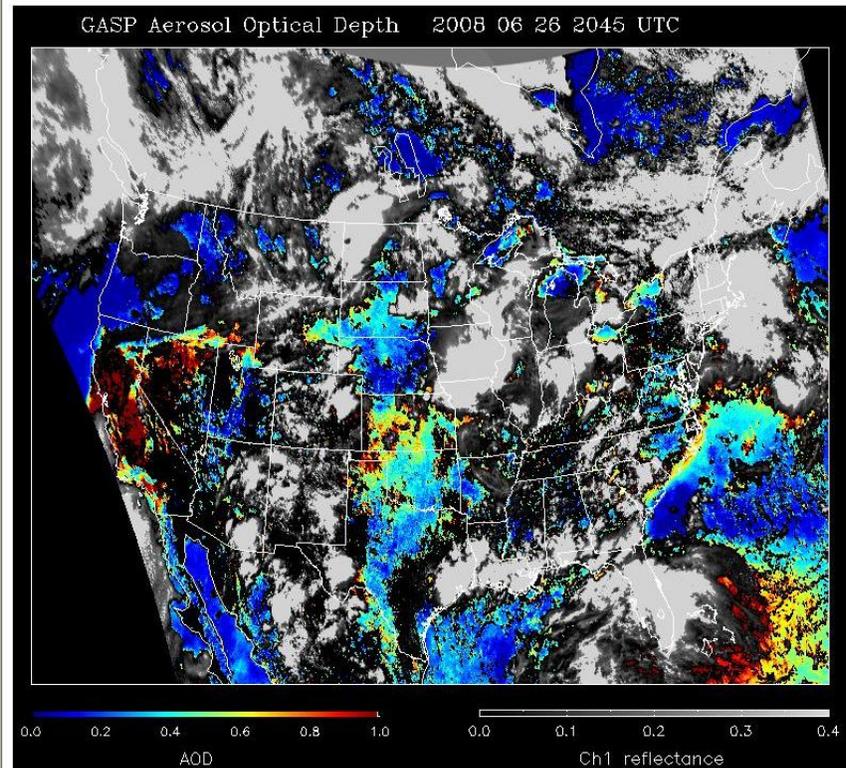


Idaho. Four hours later, surface winds in Nevada directed smoke back into central Nevada. Winds at noon (17Z) shifted again, directing smoke towards the Brigham City monitoring station. Wind pattern towards the northeast intensified by mid afternoon (21Z) and together with morning winds likely drove enough smoke to the Brigham station that caused the PM_{2.5} exceedance. Winds shifted towards central Utah by early evening (23Z), which would then permit smoke to impact the rest of the monitoring stations in the Salt Lake City valley. This late day wafting smoke in the valley was insufficient to cause NAAQS exceedances at monitoring stations within the valley.

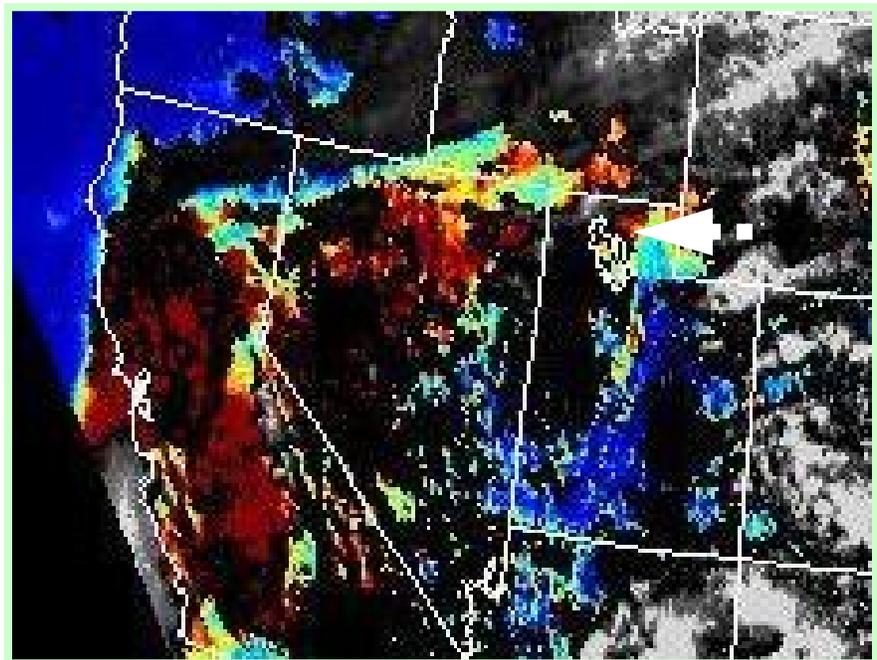


Source: Plymouth State Weather Center

Aerosols are small particles in the air that originate from a number of different sources, including dust storms and fires. Aerosol optical depth improves the interpretation of atmospheric turbidity. The color scale displays the amount of aerosols in the atmosphere. The higher the value, the greater impact there is on visibility. Blue colors indicate clear conditions (low aerosol content) while the yellows and reds indicate high concentrations of atmospheric particles that are associated with reduced visibility. Thus, we can use aerosol imagery to support the wind vector analysis above.



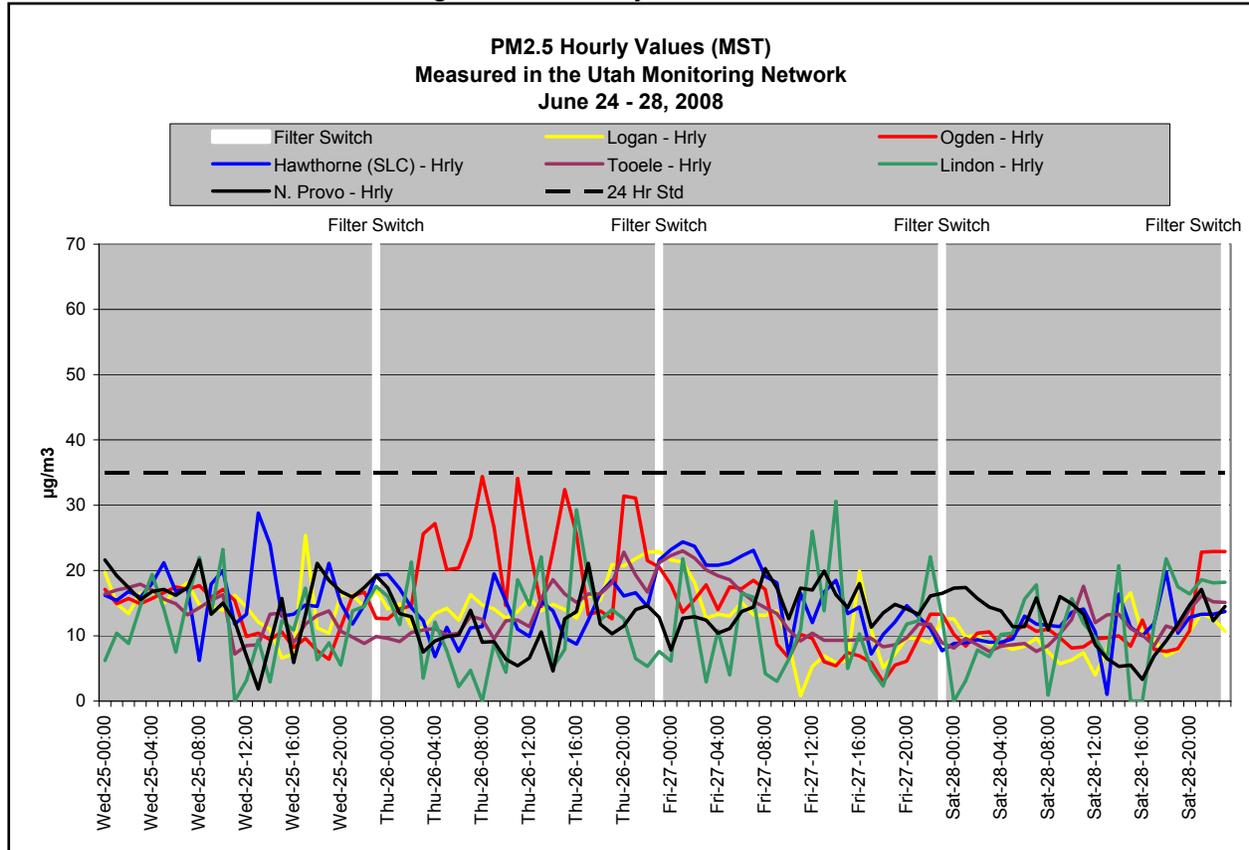
An enlargement of the original image of the western states helps us see the small area around Brigham City that is colored red (highlighted by white arrow), indicating a high concentration of smoke. Note the similar red areas in California and Nevada, where the fires were raging. Several yellow areas (northeast and central Utah) indicate moderate amount of smoke, while most of central and southwestern Utah are blue, indicating low concentrations.



The impact to air quality from the wildfire smoke is more readily observed by plotting the hourly PM_{2.5} values, where hourly values are collected (Figure 2)(raw data in Appendix

A). The erratic nature of the hourly values is attributable to the varying, yet small amount of atmospheric smoke from the wildfires transported across Utah. The Ogden station, which is south of the Brigham station, shows the greatest impact of hourly values, consistent with the surface wind and aerosol analyses that indicate smoke was predominately driven to the far northern Utah stations.

Figure 2 – Hourly PM2.5 Values



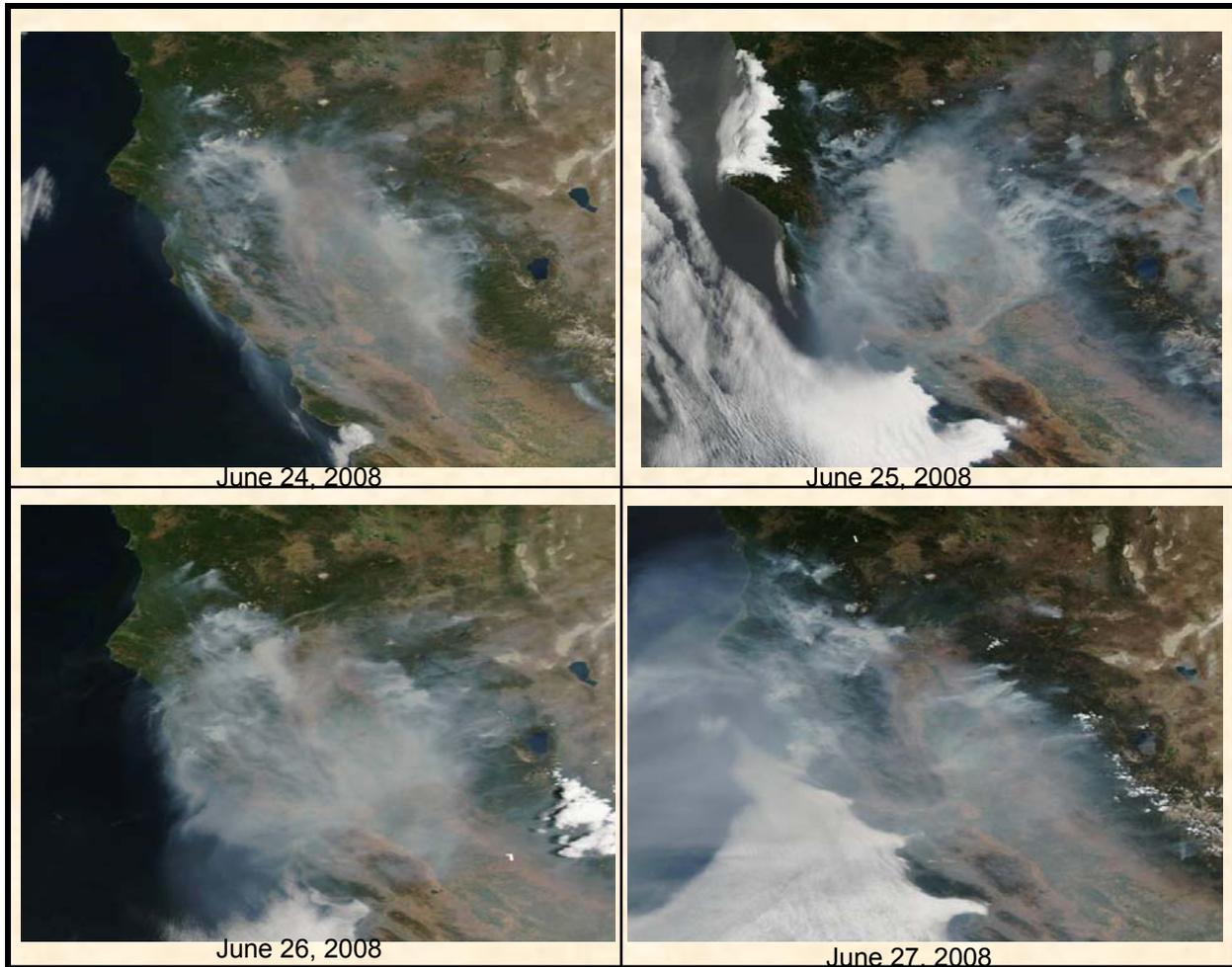
Not Reasonably Controllable or Preventable & Natural Event

The Exceptional Events Rule defines a wildfire as an unplanned, unwanted wildland fire “such as fires caused by lightning...” The summer 2008 California and Nevada fires were caused by lightning and therefore qualify as wildfires under the Rule. Lightning ignition is an uncontrollable natural event, and is not reasonably controllable or preventable.

The MODIS Active Fire Mapping Program, compiled at the USDA Forest Service Remote Sensing Applications Center, provides geospatial overview of the wildland fire situation at regional and national scales. Locations of fires and the extent of previous fire activity are ascertained using satellite imagery acquired by the MODIS sensor. This information is utilized by fire managers to assess active fire situation and serves as a decision support tool in strategic decisions regarding fire suppression resource allocation. These images were taken during the wildfires in California and Nevada

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during June 2008 (labeled as local time). Each image shows the primary source of the fires in northern California and portions of Nevada. Wafting smoke into Utah presented in these images, explains the erratic hourly PM_{2.5} readings presented in Figure 2.



Normal Historical Fluctuation (40 CFR 50.14)

Normal historical fluctuation was determined by aligning all historical PM_{2.5} values from each monitoring station from least to greatest. The location of the effected value in relation to the rest of the historically values is expressed as a %ile.

Second, a box plot analysis was preformed on the historical data. The interquartile range (IQR) was calculated. This was then compared to the event value.

Third, a lognormal distribution analysis was preformed on the historical data. The geometric mean, geometric standard deviation, and the 1st, 2nd, and 3rd geomantic standard deviations above the geometric mean where calculated. These where then compared to the event value.

Ranking

Guidance found at 72 Federal Register 55 March 22, 2007, pages 13560-81, states that a lesser amount of documentation would likely be necessary for “extremely high” concentrations (e.g. > 95th%ile) than for concentrations that were closer to “typical levels” (e.g. < 75th%ile.).

The data ranking for the Brigham City monitoring station data collected from 2000 through 2008 verifies that the PM_{2.5} concentration on June 26, 2008, is above the 95th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Interquartile Range

The IQR is a measure of statistical dispersion, and is a “robust statistic.” Robust statistics seek to provide methods that emulate classical methods, but which are not unduly affected by outliers or other small departures from model assumptions. The IQR was calculated on a quarterly basis and on a yearly basis.

The following is the IQR for all Brigham City data:

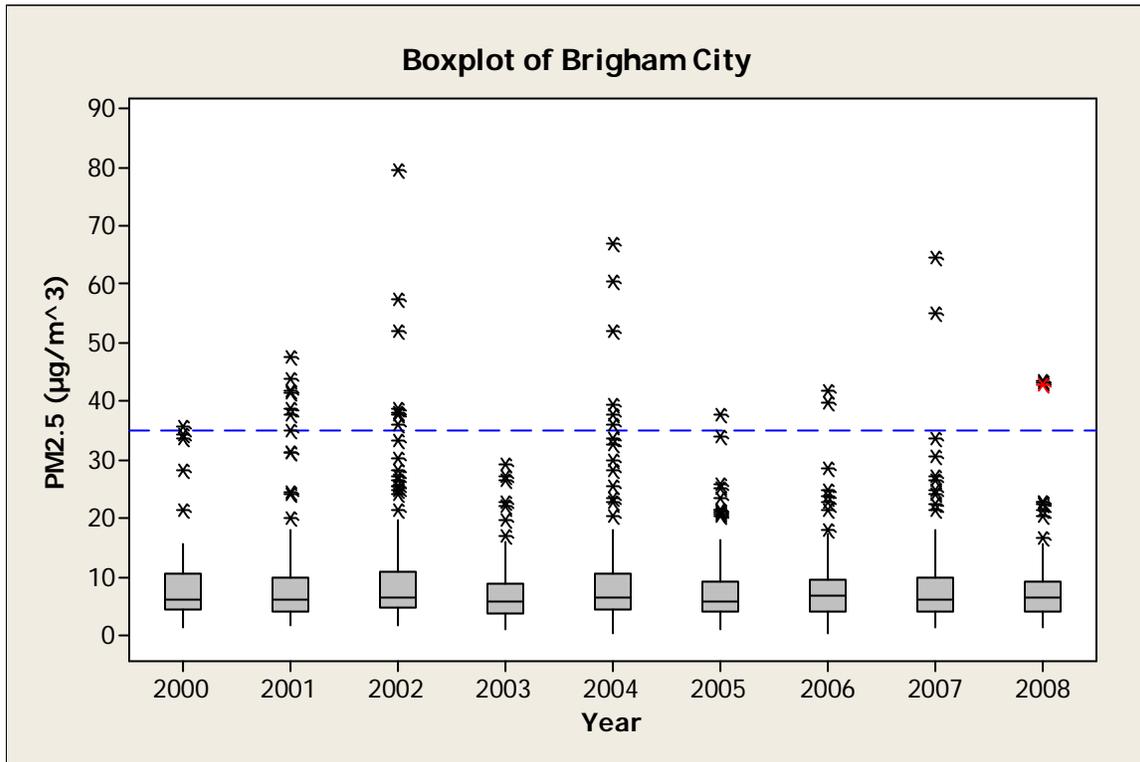
First Quartile (Q1): 4.0 µg/m³
Median (Q2): 6.2 µg/m³
Third Quartile (Q3): 9.5 µg/m³
IQR: 5.5 µg/m³

The IQR was calculated on a quarterly basis (shown in Table 1) along with the annual.

Table – 1 Brigham City Interquartile ($\mu\text{g}/\text{m}^3$)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	244	4.7	11.7	23.3	18.6
2	240	3.1	4.8	6.9	3.8
3	243	5.2	6.5	8.8	3.6
4	264	3.8	5.7	7.9	4.1
All	991	4.0	6.2	9.5	5.5

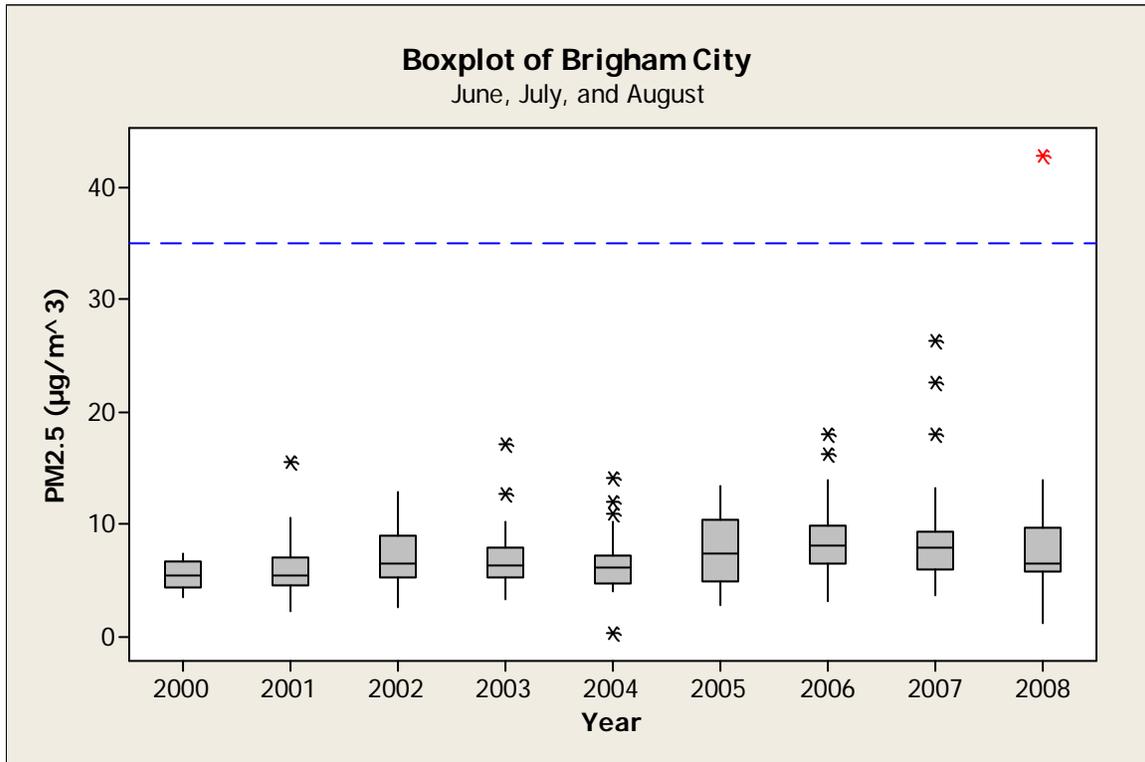
The boxplot presents the historical PM2.5 values, by year; the event value is marked in red. The blue dashed line represents the current PM2.5 standard.



The boxplot whiskers extend to points (events) that are statistically considered to be outliers from the sample population, typically 1.5 times the IQR above the third quartile (Q3).

Because this event occurred during the third quarter, it may be more valuable to only focus on other PM2.5 values during the same time of the year, June-August. The revised boxplot presents the historical PM2.5 values, by year, during the 3rd quarter

(June-August) of each year. The event value is marked in red. The blue dashed line represents the current PM2.5 standard.



The June 26th event is the only exceedance of the current PM2.5 standard during the third quarter.

Analysis of the boxplot graphs permit us to conclude that the event concentration is outside of normal historical variation.

Lognormal Distribution

Lognormal distribution analysis was conducted to establish the normal historical fluctuations for the Bingham City station (inclusive of exceptional event results). Lognormal distribution was selected because of its ability to accurately describe the distribution of measured concentrations of PM2.5. The geometric mean was calculated on a quarterly basis and on an annual basis. The annual basis provides the greatest number of data points and is sufficiently similar to the summer quarterly value thus; the annual geometric mean is used to reflect the normal historical values for the four stations.

Table 2 - Geometric Mean of PM2.5

Location	Quarter	N Quarterly	μ_{geo} ($\mu\text{g}/\text{m}^3$)	Annual μ_{geo} ($\mu\text{g}/\text{m}^3$)
Bingham City 08/8/2000 to 12/31/2008	1	244	10.06	6.39
	2	240	4.62	
	3	243	6.62	
	4	264	5.50	

The annual value is far below the June 26 event of $42.7 \mu\text{g}/\text{m}^3$.

The following are the calculations for the geometric mean, geometric standard deviation, and the upper boundary of the 1st, 2nd, and 3rd standard deviations from the geometric mean.

Geometric Mean (μ_{geo}): $\text{Exp}(\text{Loc}) = 6.39$

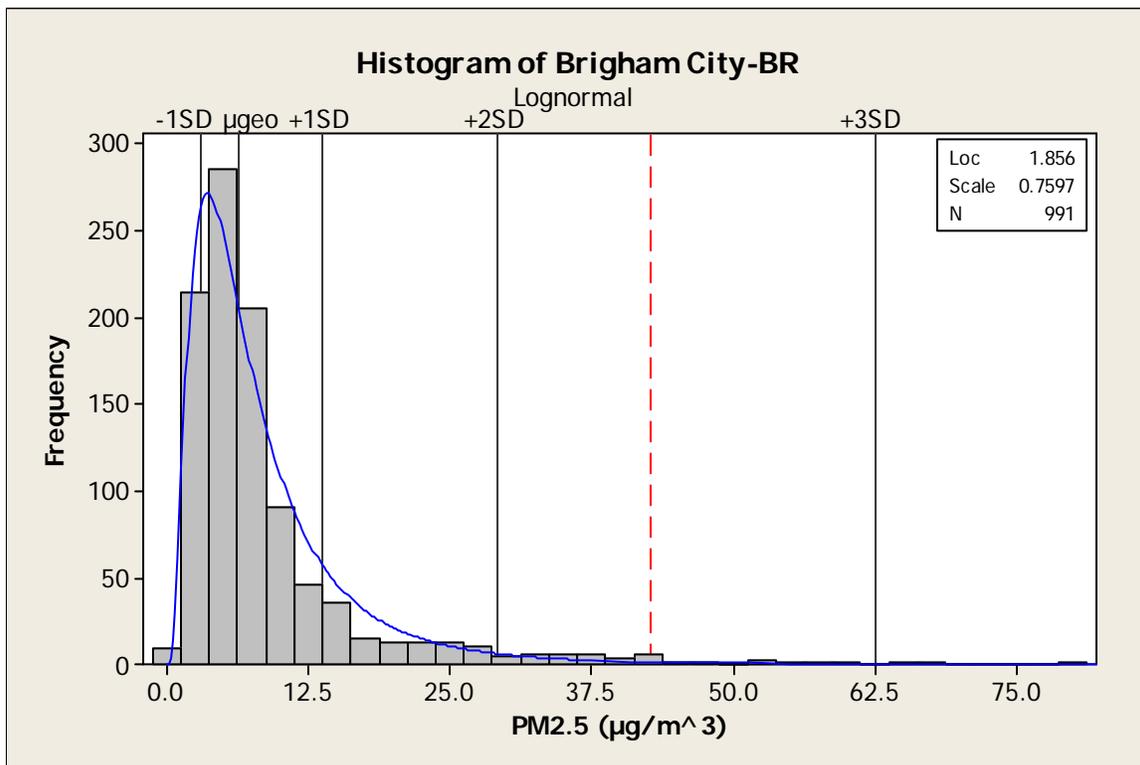
Geometric Standard Deviation (σ_{geo}): $\text{Exp}(\text{Scale}) = 2.13$

+1 Standard Deviation (+1SD): $\text{Exp}(\text{Loc} + \text{Scale}) = \mu_{geo} * \sigma_{geo} = 13.67$

+2 Standard Deviation (+2SD): $\text{Exp}(\text{Loc} + 2 * \text{Scale}) = \mu_{geo} * (\sigma_{geo})^2 = 29.23$

+3 Standard Deviation (+3SD): $\text{Exp}(\text{Loc} + 3 * \text{Scale}) = \mu_{geo} * (\sigma_{geo})^3 = 62.49$

The histogram presents the historical values and the event value with a red dashed line. The blue line is a fitted line overlay of a lognormal distribution.

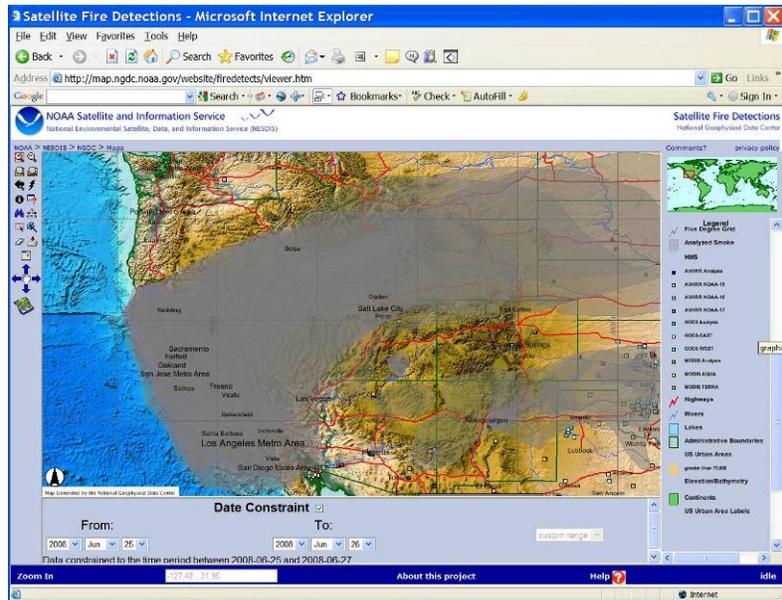


Noting that the normal historical values fall within the lognormal distribution, it is reasonable to utilize plus or minus 2SD above or below the geometric mean as the bounds of normal PM10 values. The event value **exceeds 2SD**. The event value is clearly outside the normal historical fluctuation.

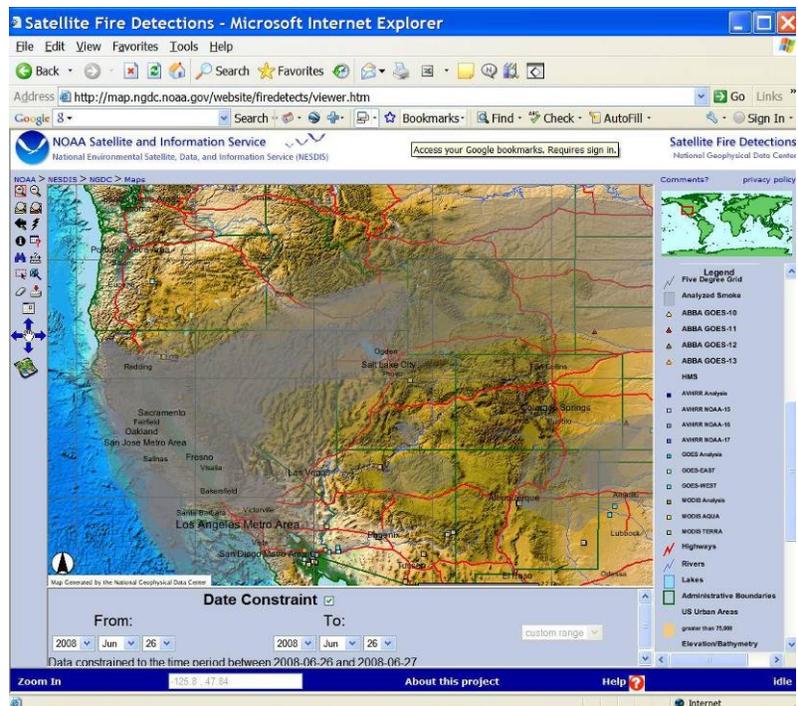
Clear Causal Relationship (40 CFR 50.14)

Trajectory and Impacted Area

NOAA projected heavy smoke coverage over northern Utah on June 25. Actual smoke coverage was light as reflected in Figure 2, erratic hourly PM2.5 values.

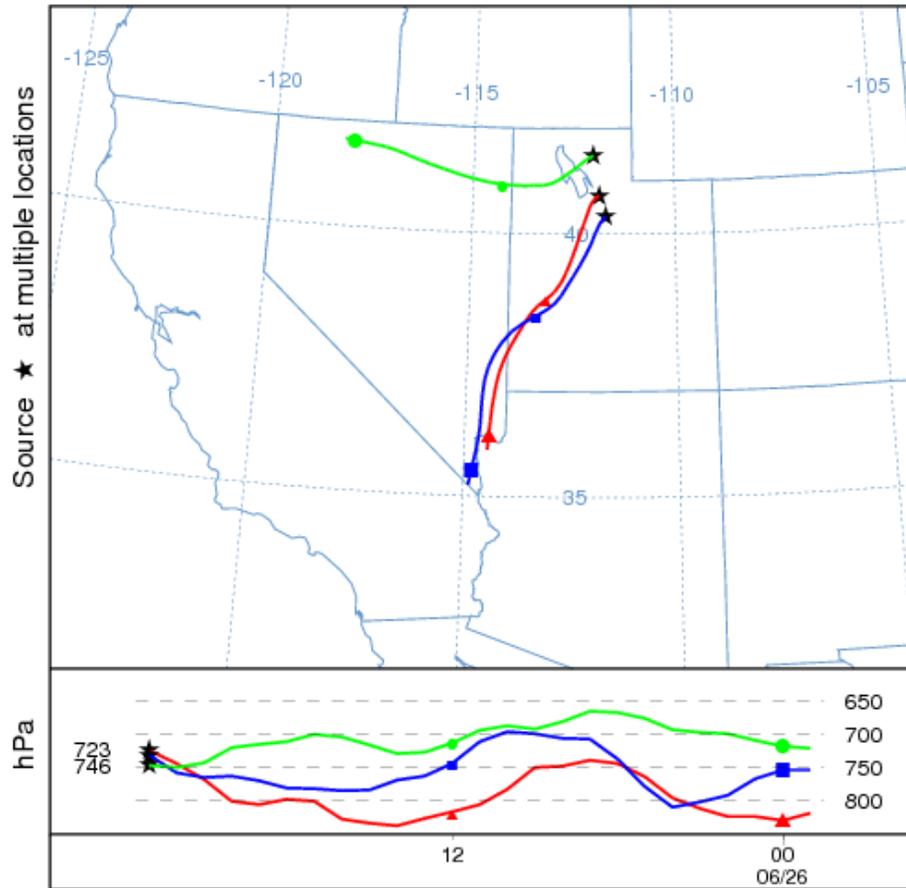


NOAA projected lighter smoke plume coverage over northern Utah on June 26, the day of the event. The MODIS satellite visible image, aerosol imagery and PM2.5 analyses confirm this projection.



The Hysplit 24 hour back trajectory at steering height winds of 1000 meters for Brigham City, Hawthorne and Lindon, confirms that the Brigham City monitoring station received smoke from the Nevada fires as seen in the MODIS visible image. Lindon and Hawthorne back trajectories are from the southwest, where NOAA projected no smoke and the aerosol imagery confirmed low concentrations or no smoke.

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 26 Jun 08
EDAS Meteorological Data

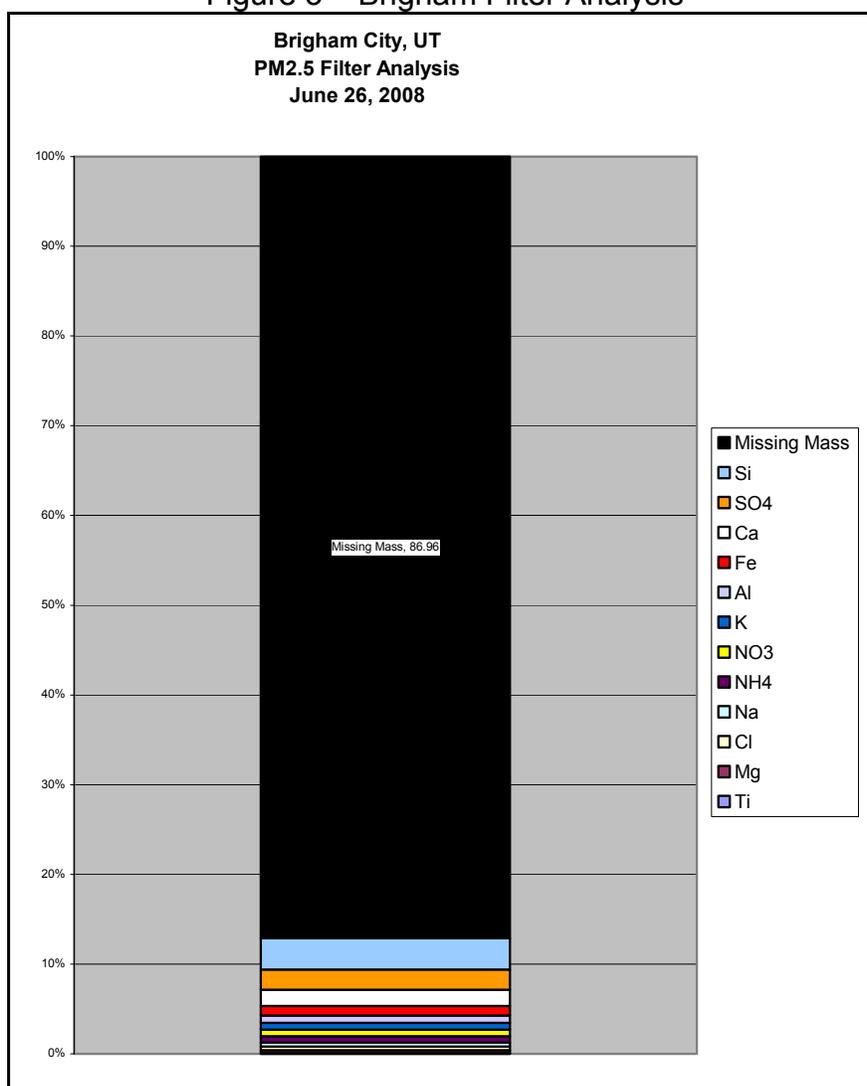


These trajectories, wind vector analysis, along with the NOAA forecast and varied imagery, demonstrate clear and casual relationship of the smoke from wildfires in Nevada to the Brigham City monitoring station. This trajectory further explains why the remaining stations did not exceed the PM_{2.5} 24hr standard.

Speciation

Clear and causal relationship evidence may be evaluated from the filter analysis, which is dominated by 87% missing mass (due to sampling protocol), as shown in Figure 3. The mass is not distinguishable from the Teflon filter on which it was collected. Most of this mass is carbon (organic and elemental forms) due to the smoke from the fires. Typical filters contain some missing mass in the form of carbon, but not nearly to this extent. Past speciation data from the Lindon monitoring station during the same season showed a missing mass to be about 5.9 $\mu\text{g}/\text{m}^3$ (Exceptional Event Report to EPA July 9, 2007) compared to 37.2 $\mu\text{g}/\text{m}^3$ in this case (speciation data in Appendix B).

Figure 3 – Brigham Filter Analysis



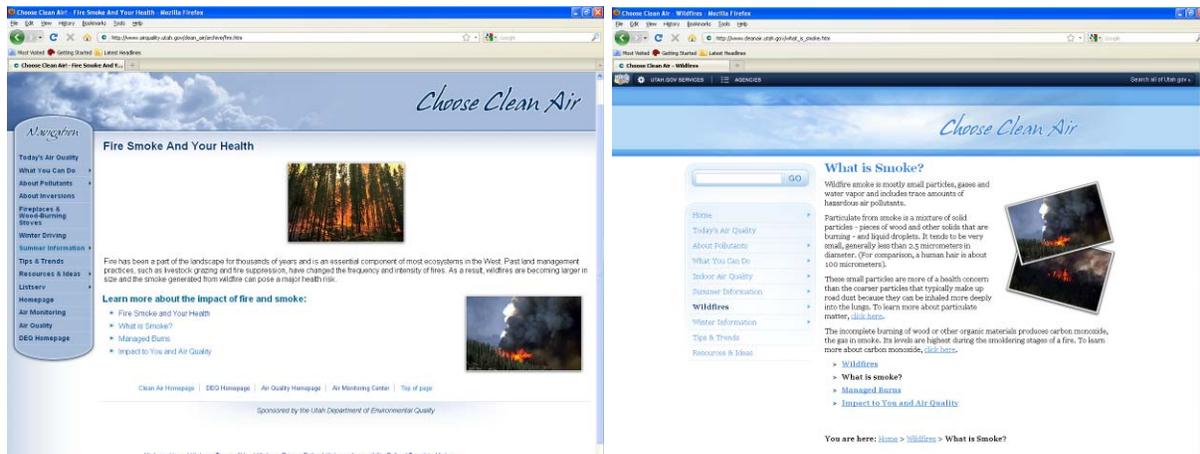
No Exceedance or Violation But For the Event

1. Background concentration of PM_{2.5} can be described as with in the whiskers on a boxplot (0.2-17.75 $\mu\text{g}/\text{m}^3$). This is well below the 24-hr PM_{2.5} NAAQS standard of 35 $\mu\text{g}/\text{m}^3$.
2. Background concentration can also be described as two standard deviations above or below the geometric mean, equivalent to a 95th percentile prediction interval. The upper boundary of this fluctuation for the Brigham City monitoring station would then be 29.23 $\mu\text{g}/\text{m}^3$. The difference between the measured concentration and the upper boundary of the normal historical fluctuation is 13.47 $\mu\text{g}/\text{m}^3$. This difference can be considered the amount of impact from the wildfire smoke event.

3. Filter chemistry analysis reveals that $37.2 \mu\text{g}/\text{m}^3$ is associated with missing mass likely attributed to smoke from the wildfires.
4. Using the IQR approach the measured concentration would not have exceeded the PM_{2.5} 24-hr NAAQS ($42.7 - 17.75 = 24.95 \mu\text{g}/\text{m}^3$). Using the lognormal approach, the measured concentration would not have exceeded the PM_{2.5} 24-hr NAAQS ($42.7 - 29.1 = 13.6 \mu\text{g}/\text{m}^3$). Using the filter analysis approach would also result in a value that would not exceed the NAAQS ($42.7 - 37.2 = 5.5 \mu\text{g}/\text{m}^3$). All computation methods support that a substantial concentration was attributable to the wildfire event and if not but for the event, an exceedance would not have occurred.

Mitigation (40 CFR 51.930)

1. Utah rule R302-202 prohibits open burning and burning of waste materials.
2. A smoke management rule and plan (R307-204) helps minimize smoke from other sources during an event. The rule and plan states that new prescribed fires and new wildland fire use events would not be approved if there was a potential to exceed the NAAQS.
3. A news release during the episode advised citizens of the potential health impacts of smoke from wildfires. Extensive news coverage existed during the event.
4. A series of web sites about emissions from wildfire were posted on the DEQ web site during the event. They covered the health impacts of PM and actions a person could take to minimize exposure to PM.



Public Comment (Preamble V.G.)

The DEQ established a 30-day comment period from _____ through _____. The announcement of the comment period was published in the Salt Lake Tribune and Deseret News on _____.

Affidavit of publication will be inserted in final documentation.

All comments received will be inserted in the final documentation.

Appendix 1

Hourly PM2.5 Concentrations

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

		Ogden - Hrly	N. Salt Lake - Hrly	Hawthorne (SLC) - Hrly	Lindon - Hrly	N. Provo - Hrly
6/25/08 0:00	0:00	31.2	68.4	33.6	37.1	35.8
6/25/08 1:00	1:00	39.8	40.6	34.6	29.1	34.2
6/25/08 2:00	2:00	48.9	34.7	29.5	39.5	27
6/25/08 3:00	3:00	34.7	37.9	31.3	55.4	26.1
6/25/08 4:00	4:00	49	46.8	40.8	44.1	28.2
6/25/08 5:00	5:00	58.6	71.8	30.4	82.1	27.3
6/25/08 6:00	6:00	66.6	107.2	47.7	58.7	33.7
6/25/08 7:00	7:00	40.5	168.1	25.6	28	46.6
6/25/08 8:00	8:00	12.2	44.6	33.6	8	21
6/25/08 9:00	9:00	21.1	62.7	24.5	16.3	17.6
6/25/08 10:00	10:00	24.4	132.2	25.8	25.1	48.7
6/25/08 11:00	11:00	14.2	69	19.4	17.8	20.9
6/25/08 12:00	12:00	20.3	58.1	19.6	10.2	11
6/25/08 13:00	13:00	18.6	33.5	22.6	10.4	6.5
6/25/08 14:00	14:00	5.9	20.2	22	19.4	28.9
6/25/08 15:00	15:00	5.5	23.2	23.5	35.7	41.7
6/25/08 16:00	16:00	6.2	26.6	25.4	29.1	39.2
6/25/08 17:00	17:00	6.6	21	22	32.9	51.1
6/25/08 18:00	18:00	7.2	32.8	17.4	28.6	61.1
6/25/08 19:00	19:00	44.8	74.2	24.6	31.2	42.9
6/25/08 20:00	20:00	26.9	58	20.4	30	45.3
6/25/08 21:00	21:00	46.4	49.4	25.5	29.8	49.7
6/25/08 22:00	22:00	22.7	134.3	26.4	34.2	51.5
6/25/08 23:00	23:00	23.7	278.3	38	35.6	48.5
6/26/08 0:00	0:00	23.8	67.8	29.8	30.4	44.2
6/26/08 1:00	1:00	12.9	39.7	25.5	12.9	37.3
6/26/08 2:00	2:00	34.2	25.6	13.9	7.3	32.9
6/26/08 3:00	3:00	31.9	30.2	14	9	26.1
6/26/08 4:00	4:00	47	37.9	14.9	15.1	20.9
6/26/08 5:00	5:00	61.9	29.9	22.4	13.4	17.8
6/26/08 6:00	6:00	60.9	36.7	25.4	20	19.8
6/26/08 7:00	7:00	23.3	44.2	25.5	12.6	33.5
6/26/08 8:00	8:00	15.5	37.6	24.5	9.9	65.9
6/26/08 9:00	9:00	24.5	26.6	16.7	13.9	38.1
6/26/08 10:00	10:00	15.5	28.1	17.3	17.6	9.5
6/26/08 11:00	11:00	12.8	26.6	16.5	16.4	17.5

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

6/26/08 12:00	12:00	9.2	18	13.8	16.6	19.4
6/26/08 13:00	13:00	15.8	20.9	15	17.2	15.8
6/26/08 14:00	14:00	8.7	23.2	14.7	27	14.4
6/26/08 15:00	15:00	5.8	34.1	18.6	27.8	53.6
6/26/08 16:00	16:00	5.9	22.6	20.7	27.6	40
6/26/08 17:00	17:00	11.3	40.4	15.7	18.2	53.3
6/26/08 18:00	18:00	9.9	49.6	17.3	19.5	25.5
6/26/08 19:00	19:00	54.1	80	23.7	28.6	33.4
6/26/08 20:00	20:00	48.2	90.2	19.4	19.3	34
6/26/08 21:00	21:00	38.3	108.1	22.8	24.7	29
6/26/08 22:00	22:00	16.8	90.8	30	40.4	24.6
6/26/08 23:00	23:00	21.8	53.7	46.5	39.6	27.2
6/27/08 0:00	0:00	19.9	37.3	46.8	37.6	24.5
6/27/08 1:00	1:00	28.8	45.3	37.7	20.1	23
6/27/08 2:00	2:00	32.5	66.3	28.3	22.7	29
6/27/08 3:00	3:00	31.3	51.2	31.6	35.7	26.8
6/27/08 4:00	4:00	42.9	62	35.6	46.9	24
6/27/08 5:00	5:00	64.6	55.8	40.2	60.9	25.4
6/27/08 6:00	6:00	49.9	76.1	43.5	272.7	36.2
6/27/08 7:00	7:00	45.4	19.4	45.7	38.6	43.3
6/27/08 8:00	8:00	13.7	16.2	31.8	30.9	49.9
6/27/08 9:00	9:00	15.1	17.3	24.8	38.5	42
6/27/08 10:00	10:00	24.1	47	18.2	61.5	35.4
6/27/08 11:00	11:00	16.3	28.2	19.4	40.5	35.3
6/27/08 12:00	12:00	6.9	30.7	18.7	15.8	26.2
6/27/08 13:00	13:00	6	32.8	17.1	28	22.1
6/27/08 14:00	14:00	6.1	12.5	13.4	26.2	36.3
6/27/08 15:00	15:00	5.7	13.3	11.5	26	23.3
6/27/08 16:00	16:00	5.6	17.9	10.5	27.8	39
6/27/08 17:00	17:00	3.3	8.6	8.7	12.1	29.7
6/27/08 18:00	18:00	4.2	5.2	9.4	33.6	18.4
6/27/08 19:00	19:00	16.9	11.9	17.9	31.5	15.9
6/27/08 20:00	20:00	42.4	74.4	17.5	58.6	19.2
6/27/08 21:00	21:00	39.1	34.3	13.5	43.7	36
6/27/08 22:00	22:00	40.3	32.6	12.1	40.3	32.5
6/27/08 23:00	23:00	43	31.2	10.8	38	29.3
6/28/08 0:00	0:00	26.1	33.6	9.7	43.8	25.5
6/28/08 1:00	1:00	29.4	47.7	11.2	30.5	27.3
6/28/08 2:00	2:00	42.9	32.6	12.2	14.3	25.8

Utah Division of Air Quality – High Wind Exceptional Event
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6/28/08 3:00	3:00	41.3	38.5	11.5	51.5	26.7
6/28/08 4:00	4:00	32.1	37.8	13.2	55.6	22.3
6/28/08 5:00	5:00	48.2	43.7	19.5	66.1	20.7
6/28/08 6:00	6:00	30.4	93	19.9	76.9	23.6
6/28/08 7:00	7:00	28.5	59.1	16.1	44.8	37.1
6/28/08 8:00	8:00	24.9	55.5	14.6	31.9	27.6
6/28/08 9:00	9:00	8.8	36.8	14.5	24.1	33.1
6/28/08 10:00	10:00	10.6	21.8	10.4	33.4	23.8
6/28/08 11:00	11:00	7.9	21.5	7.1	40	23.4
6/28/08 12:00	12:00	3.6	13	7.8	13	15.2
6/28/08 13:00	13:00	3.9	8.5	7.2	24.6	8.5
6/28/08 14:00	14:00	9.1	6.5	10.3	17.7	18.6
6/28/08 15:00	15:00	7.1	5.4	10.4	22.4	11.4
6/28/08 16:00	16:00	20.8	4.7	9.3	15.4	11.9
6/28/08 17:00	17:00	13.3	2.7	11	6.4	23.5
6/28/08 18:00	18:00	10	23.9	12.1	18.1	22
6/28/08 19:00	19:00	19.7	36	22.8	33.5	22
6/28/08 20:00	20:00	66.6	80.2	11.4	37.7	27.9
6/28/08 21:00	21:00	64.5	39.2	11.5	48.4	29
6/28/08 22:00	22:00	45.1	31.6	14.2	24.9	23.5
6/28/08 23:00	23:00	46.5	44.9	22	32.3	32.8
6/29/08 0:00	0:00	32.3	50.9	23.2	30.7	28.8

Appendix 2 Speciation Data

Utah Division of Air Quality – High Wind Exceptional Event
Event Date - April 19, 2008

Lab ID: 09-X784
Client ID: 8132053
Site: Brigham City (BR)
Sample Date: 6/26/08
Mass: 1026. +/- 10. ?g
Volume: 24.00 +/- 2.400 m³
Deposit Area: 11.3 cm²
Size Fraction: PM2.5

Suspended
Particulates: 42.75 +/- 4.30 ?g/m³
Analyte ?g/filter percent ?g/m³

XRF

Na 0.3865 ± 0.5345 0.0377 ± 0.0521 0.0161 ± 0.0223
Mg 3.445 ± 0.5062 0.3358 ± 0.0494 0.1436 ± 0.0255
Al 8.667 ± 0.6068 0.8447 ± 0.0597 0.3611 ± 0.0441
Si 35.73 ± 1.947 3.483 ± 0.1928 1.489 ± 0.1695
P 0.0000 ± 0.0384 0.0000 ± 0.0037 0.0000 ± 0.0016
S 7.094 ± 0.3887 0.6914 ± 0.0385 0.2956 ± 0.0337
Cl 2.907 ± 0.1695 0.2834 ± 0.0167 0.1211 ± 0.0140
K 7.734 ± 0.6803 0.7538 ± 0.0667 0.3222 ± 0.0429
Ca 18.51 ± 0.9402 1.804 ± 0.0933 0.7712 ± 0.0865
Ti 0.8611 ± 0.0475 0.0839 ± 0.0047 0.0359 ± 0.0041
V 0.0215 ± 0.0090 0.0021 ± 0.0009 0.0009 ± 0.0004
Cr 0.0090 ± 0.0079 0.0009 ± 0.0008 0.0004 ± 0.0003
Mn 0.2011 ± 0.0147 0.0196 ± 0.0014 0.0084 ± 0.0010
Fe 10.71 ± 0.5390 1.044 ± 0.0535 0.4464 ± 0.0500
Co 0.0000 ± 0.0237 0.0000 ± 0.0023 0.0000 ± 0.0010
Ni 0.0475 ± 0.0158 0.0046 ± 0.0015 0.0020 ± 0.0007
Cu 0.1322 ± 0.0170 0.0129 ± 0.0017 0.0055 ± 0.0009
Zn 0.2656 ± 0.0192 0.0259 ± 0.0019 0.0111 ± 0.0014
Ga 0.0000 ± 0.0090 0.0000 ± 0.0009 0.0000 ± 0.0004
Ge 0.0000 ± 0.0079 0.0000 ± 0.0008 0.0000 ± 0.0003
As 0.0000 ± 0.0124 0.0000 ± 0.0012 0.0000 ± 0.0005
Se 0.0000 ± 0.0068 0.0000 ± 0.0007 0.0000 ± 0.0003
Br 0.2712 ± 0.0158 0.0264 ± 0.0016 0.0113 ± 0.0013
Rb 0.0181 ± 0.0068 0.0018 ± 0.0007 0.0008 ± 0.0003
Sr 0.0983 ± 0.0090 0.0096 ± 0.0009 0.0041 ± 0.0006
Y 0.0124 ± 0.0090 0.0012 ± 0.0009 0.0005 ± 0.0004
Zr 0.0667 ± 0.0124 0.0065 ± 0.0012 0.0028 ± 0.0006
Mo 0.0079 ± 0.0158 0.0008 ± 0.0015 0.0003 ± 0.0007
Pd 0.1130 ± 0.0475 0.0110 ± 0.0046 0.0047 ± 0.0020
Ag 0.0588 ± 0.0497 0.0057 ± 0.0048 0.0024 ± 0.0021
Cd 0.0678 ± 0.0531 0.0066 ± 0.0052 0.0028 ± 0.0022
In 0.0429 ± 0.0588 0.0042 ± 0.0057 0.0018 ± 0.0025
Sn 0.0678 ± 0.0701 0.0066 ± 0.0068 0.0028 ± 0.0029
Sb 0.0271 ± 0.1379 0.0026 ± 0.0134 0.0011 ± 0.0057
Ba 0.1446 ± 0.0475 0.0141 ± 0.0046 0.0060 ± 0.0021
La 0.0000 ± 0.0373 0.0000 ± 0.0036 0.0000 ± 0.0016
Hg 0.0000 ± 0.0170 0.0000 ± 0.0017 0.0000 ± 0.0007
Pb 0.0599 ± 0.0181 0.0058 ± 0.0018 0.0025 ± 0.0008

IC

Cl 4.070 ± 0.2035 0.3967 ± 0.0059 0.1696 ± 0.0190
Br 0.0000 ± 0.5000 0.0000 ± 0.0069 0.0000 ± 0.0208
NO3 7.400 ± 0.3700 0.7212 ± 0.0092 0.3083 ± 0.0345
SO4 23.13 ± 1.156 2.254 ± 0.0243 0.9638 ± 0.1078
Na 4.570 ± 0.2285 0.4454 ± 0.0064 0.1904 ± 0.0213
NH4 7.250 ± 0.3625 0.7066 ± 0.0090 0.3021 ± 0.0338
K 3.060 ± 0.1530 0.2982 ± 0.0048 0.1275 ± 0.0143

Certification

I, Joel Karmazyn, Environmental Scientist III for the Utah Division of Air Quality, do hereby certify that the public comment period held to receive comments regarding PM2.5 Exceptional Event - Wildfire - June 26, 2008, was held in accordance with the information provided in each published public notice and as defined in Utah Code 19-2-109.

Signed this 17 day of August 2010.