

Wildfire Exceptional Event

A satellite image showing a large, dense plume of smoke and ash rising from a wildfire. The plume is dark and billowing, covering a significant portion of the visible area. Below the plume, the ground is a mix of brown and green, indicating a forested area affected by the fire. The overall scene is hazy and smoky.

PM2.5
July 9, 2007
Lindon

Photo from MODIS, July 8, 2007

Photos Furnished by: NASA

Purpose of Report

- UDAQ is flagging PM2.5 data for removal from regulatory consideration
 - This is the follow-up documentation for the event that was flagged and described in AQS

Regulatory Process

- Treatment of Data Influenced by Exceptional Events is covered in 40 CFR Parts 50 and 51.
- Guidance for the regulations can be found at 72 FR 55 March 22, 2007 13560-81.

Event Description

- Date: July 9, 2007
- Monitor: Lindon
- 24 hour Avg.: 44.3 $\mu\text{g}/\text{m}^3$
- AQS monitor #: 49-049-4001
- Monitor Location: UTM
 - Zone 12
 - Northing 4465406
 - Easting 430337

Event Description (Cont)

- The following slides will address each of the required elements of the exceptional events regulation regarding this data point.
- A weight of evidence will be provided that concludes this data should be removed from regulatory consideration.

Event Qualifies as an Exceptional Event

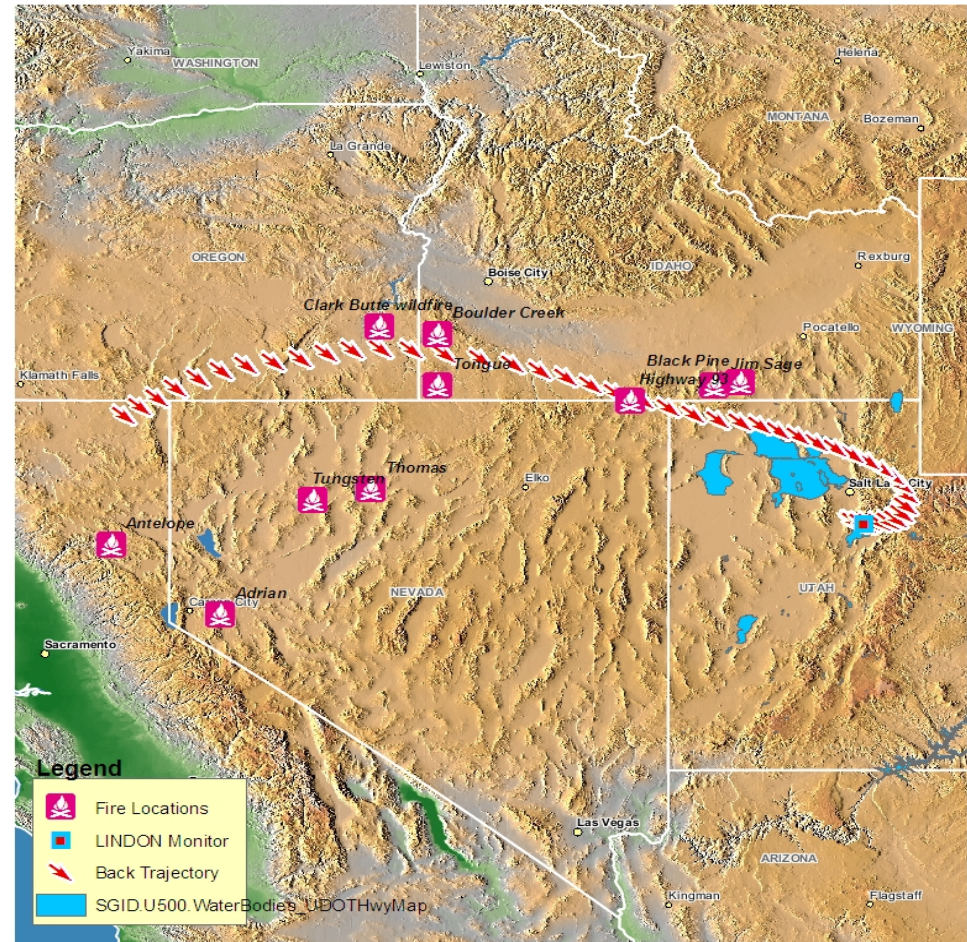
- Section IV E of the guidance (72 FR 55 March 22, 2007 13564-67) lists wildfires as a type of natural event.
- This event is a wildfire.



Clear and Causal Relationship

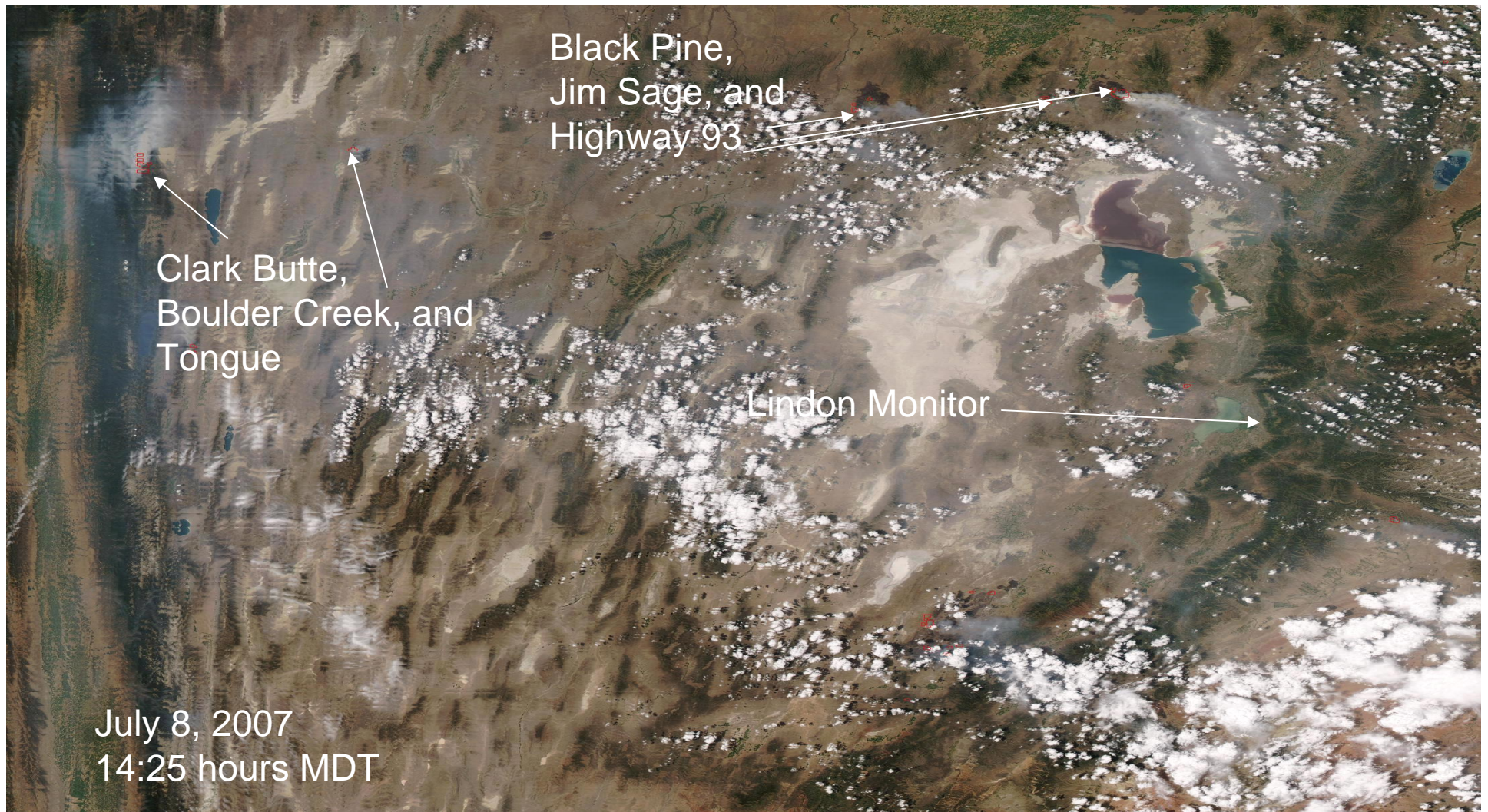
48 Hour Back Trajectory of the Air Mass
Lindon Monitor
July 9, 2007

- There were several fire complexes burning on this day that were up wind of the monitor.
- These complexes are also shown on the satellite image on the next slide.
- The back trajectory analysis uses the Hysplit model, EDAS 40 km data, and charted with GIS mapping.
 - The air mass arrived at the Lindon Monitor at 12:00 Hours MDT on July 9, 2007.
 - Each arrow represents 1 hour of elapsed travel time.



Clear and Causal Relationship

(Cont)



Clear and Causal Relationship

(Cont)

- The date of the satellite image in the previous slide is July 8, 2007 (the day before the event) and illustrates available atmospheric smoke for transport.
- The timing of the satellite image is coincident with the first half of the back trajectory analysis.

Clear and Causal Relationship

(Cont)

- The image in the next slide shows regional impact from these wildfires.
- The image is a super position of smoke plumes from all the western wildfires burning on July 9, 2007. This is based on satellite images compiled by NOAA.
- The slide illustrates the impact from smoke plumes on the majority of the state.

Satellite Fire Detections - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Print Preview Stop

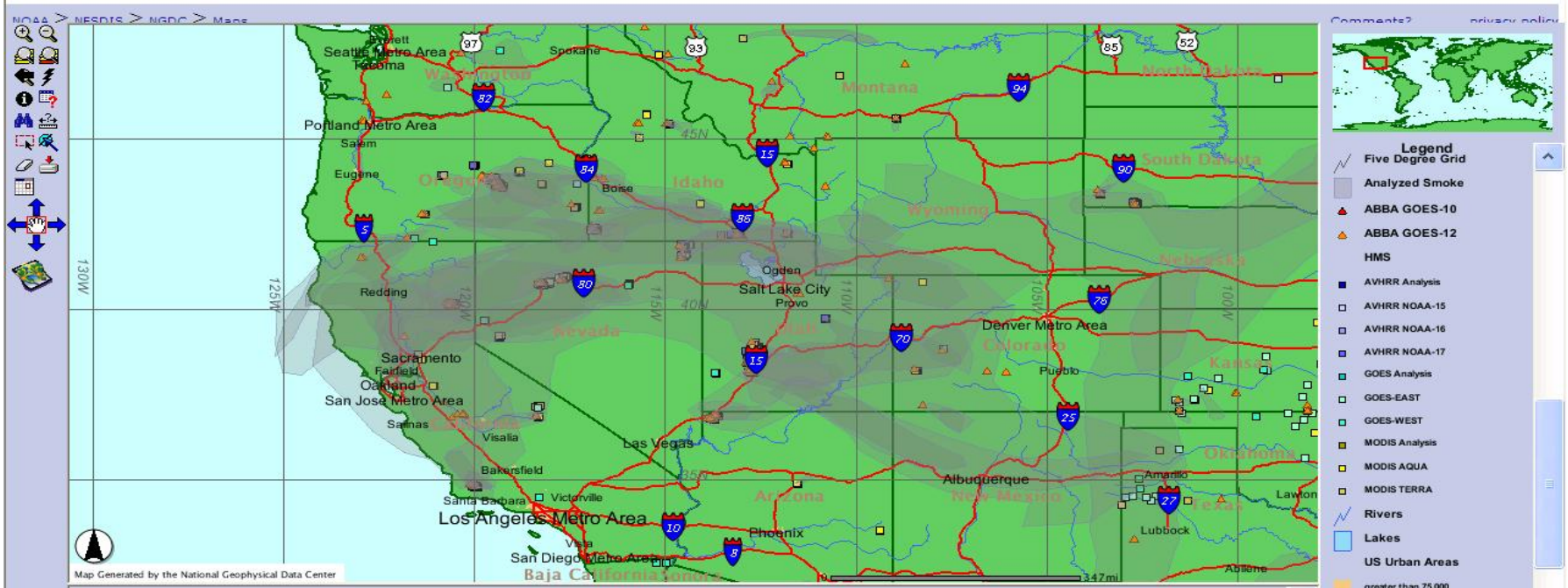
Address <http://map.ngdc.noaa.gov/website/firedetects/viewer.htm> Go Links

Google Go Bookmarks Popups okay Check AutoLink AutoFill Send to Settings

Search Web Mail My Yahoo! Shopping Games Music

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

Satellite Fire Detections
National Geophysical Data Center



Date Constraint

From: 2007 Jul 9 To: 2007 Jul 9

custom range

Pan -118.08 , 32.25 About this project Help ? idle

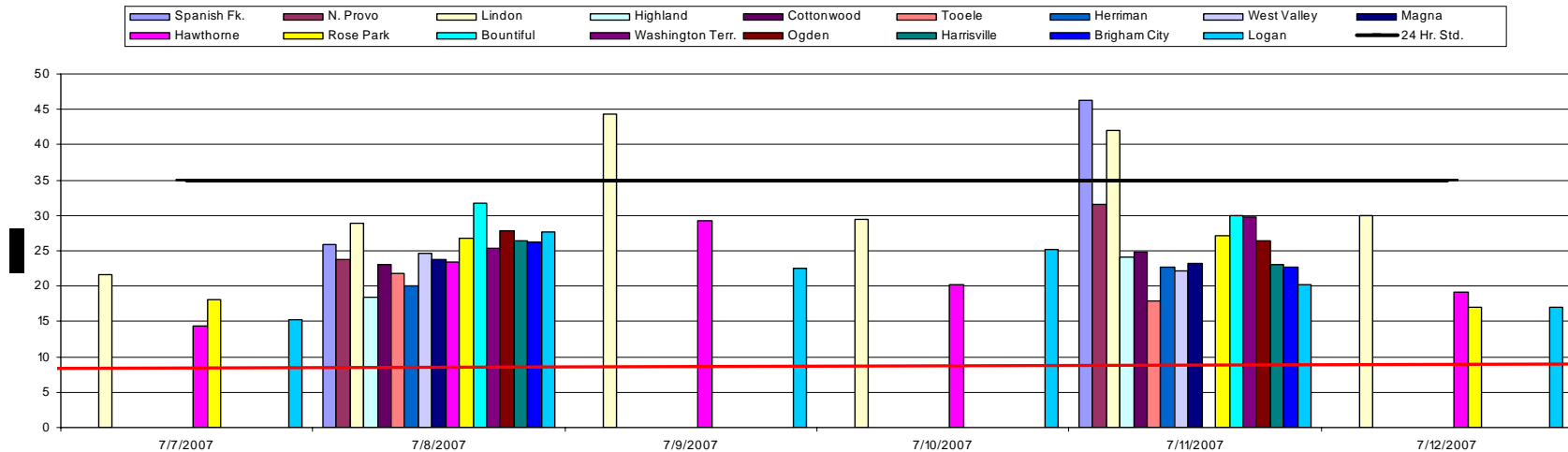
Done Internet

start DE... No... 2 \ 18 2 I Desktop Links 4:31 PM

Clear and Causal Relationship

(Cont)

Wasatch Front
PM2.5 24 Hr. Measured Filter Values
July 7 to 12, 2007



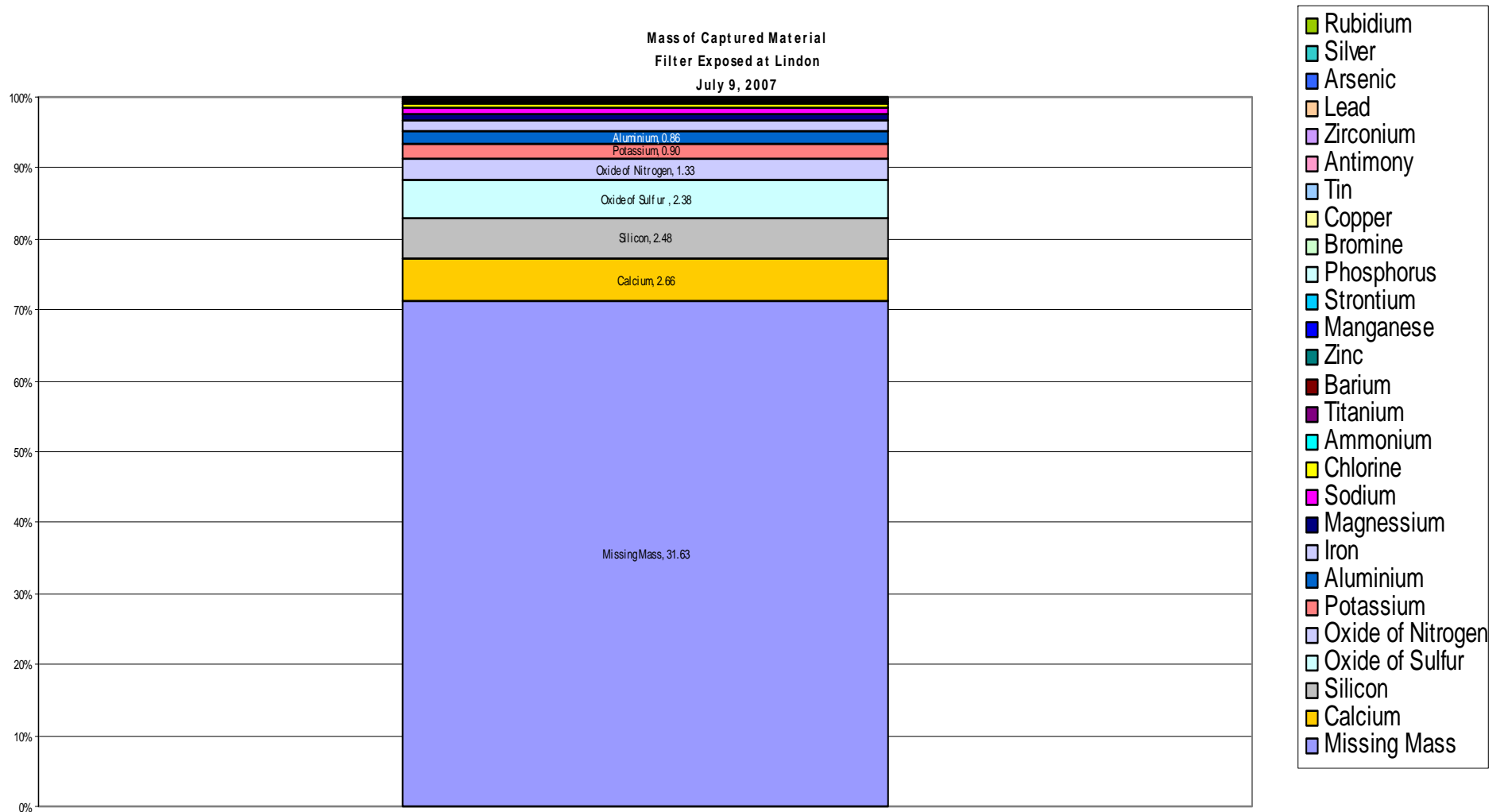
- This chart shows data collected from the entire network area, and shows that all the values were elevated on several days surrounding the event.
- A more typical value ($8.8 \mu\text{g}/\text{m}^3$) for this season, including normal historical fluctuations is indicated by the red line (see slides 17 through 19 for more information).

Clear and Causal Relationship (Cont)

Additional evidence comes from the filter analysis (see next slide).

- This sample is dominated by missing mass
- It is not distinguishable from the Teflon filter on which it was collected
- Most of this mass is carbon, due to the smoke from the fires
- A more typical filter would contain some missing mass (carbon), but not nearly as much
- Speciated data from Lindon suggests that missing mass on a typical day in this season would be roughly $5.9 \mu\text{g}/\text{m}^3$
 - Estimated as: [(Elemental Carbon) + 1.4 X (Organic Carbon)]

Clear and Causal Relationship (Cont)



Concentration in Excess of Normal Fluctuations

Statistics from this event reveal the following:

- The geometric mean value could be used to describe a background concentration
- The geometric mean was calculated to be $7.2 \mu\text{g}/\text{m}^3$.
 - Ten-years of historical data was used for the calculation.
 - All data points from June 1 through August 31 for the years 1998 through June 30, 2007 were included.
 - This is statistically characteristic of the summer air quality season.
- Normal historical fluctuation might be described as one geometric standard deviation above or below the geometric mean. The upper bound of this fluctuation for the Lindon monitoring site would then be $8.7 \mu\text{g}/\text{m}^3$.

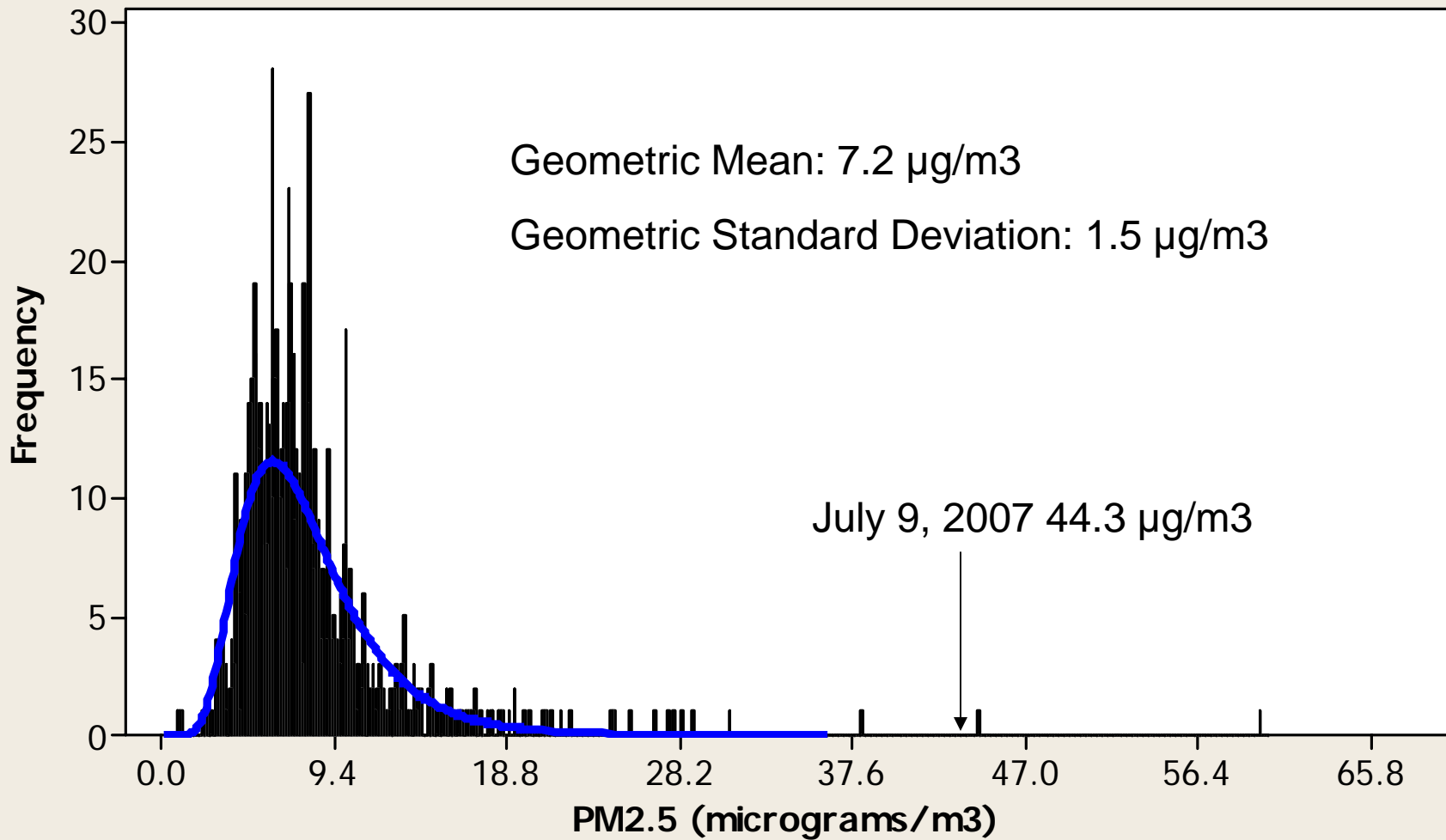
Concentration in Excess of Normal Fluctuations (Cont)

The measured concentration associated with this event is shown in the graph on the next slide.

- Clearly the measured concentration exceeds $8.7 \mu\text{g}/\text{m}^3$
- From June 1998 through June of 2007, only 5 days have been above the 24-hour NAAQS, these days were influenced by either fireworks or forest fires. Summertime exceedances of the 24-hour NAAQS are therefore not seen in the normal variation of the Lindon data.
- In fact, it fall above the 99th percentile of all summertime values measured at this site.
- Guidance found at 72 FR 55 March 22, 2007 13560-81, says 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.)

Lindon June 1, 1997-June 30, 2007

Lognormal



No Exceedance or Violation “but for” the Event

- For the time period surrounding this event one might have expected a background concentration (geometric mean) of 7.2 $\mu\text{g}/\text{m}^3$.
 - Calculation of the geometric mean was already described in slide 15.
- This is well below the current 24-hour PM_{2.5} NAAQS standard.

No Exceedance or Violation “but for” the Event (Cont)

- Measured concentration associated with the event was $44.3 \mu\text{g}/\text{m}^3$.
- The difference between the measured concentration and the expected background is $37.1 \mu\text{g}/\text{m}^3$.
- This difference could be considered the amount of impact from the event.

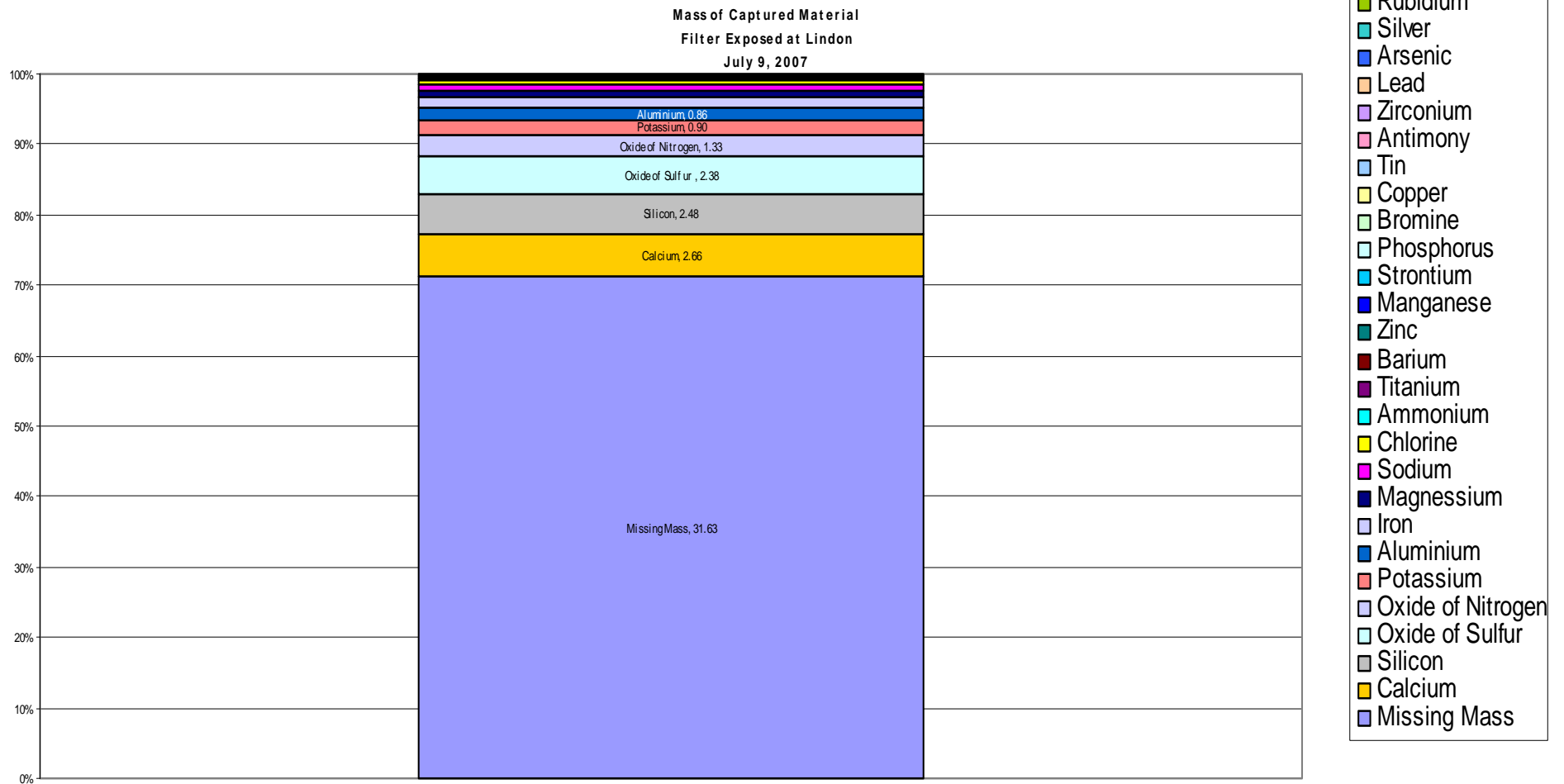
No Exceedance or Violation “but for” the Event (Cont)

- However, to account for typical fluctuations we must subtract a representative amount.
 - Again, this might be described by one geometric standard deviation above the mean.
 - In this case one geometric standard deviation equates to $1.5 \mu\text{g}/\text{m}^3$.
- Hence, the amount of concentration that would be attributable to the event using this approach is **$35.6 \mu\text{g}/\text{m}^3$** .

No Exceedance or Violation “but for” the Event (Cont)

- Analysis of filter chemistry reveals that $31.6 \mu\text{g}/\text{m}^3$ is associated with the missing mass.
- As explained on slide 13 the majority of the missing mass is likely attributable to smoke from wildfire.
- Assuming a typical filter would contain roughly $5.9 \mu\text{g}/\text{m}^3$ carbon compounds one could still attribute **$25.1 \mu\text{g}/\text{m}^3$** of this missing mass to the wildfire event.

No Exceedance or Violation “but for” the Event (Cont)



No Exceedance or Violation “but for” the Event Summary

- Using the statistical approach discussed in slides 15-20 the concentration attributable to the event is **37.1 $\mu\text{g}/\text{m}^3$** .
- Using the filter analysis approach discussed in slides 21-22 the concentration attributable to the event is **25.1 $\mu\text{g}/\text{m}^3$** .
- Both numerical approaches suggest that a sufficient concentration was attributed to the wildfire event and that the measured concentration would not have exceeded the PM_{2.5} 24-hour NAAQS **but for** the impact of emissions from the wildfire complexes!

Mitigation of Event

State Action included:

- A Smoke management rule and plan that helps minimize smoke from other sources during the event.
 - The rule and plan state that new prescribed fires and new wildland fire use events would not be approved if there was a potential to exceed the NAAQS.
- A news release during the episode that advised citizens of the potential health impacts of smoke from wildfires.
 - Staff also participated in interviews with news media (both print and TV).
- A series of websites (see next slide) about emissions from wildfire were posted on the web during the event.
- Specifically they covered the following items:
 - The health impacts of PM
 - The actions a person could take to minimize exposure to PM.

Mitigation of Event (Cont)

DEQ Utah.gov
Utah Department of Environmental Quality

Division of Air Quality

Salt Lake/Davis County 3 - Day Forecast

Friday	Saturday	Sunday
Good	Good	Good

Current Conditions

Learn more about the impact of fire and smoke: www.deq.utah.gov/wildfire

Would you like to be personally notified when air along the Wasatch Front is beginning to approach unhealthy levels? If so, click here to sign up on our Listserve. It's simple and free. All it takes is a few moments of your time and an e-mail account. Join today and be automatically notified by e-mail when unhealthy air pollution levels are forecasted. Your name and e-mail account remain protected and confidential. This service is especially valuable for those who are most vulnerable to air pollution: people with lung and heart disease, senior citizens and children. If you'd like information on steps you can take to improve our air quality, visit our Choose Clean Air website.

- Things you can do to make a difference
- Air Quality guidelines for everyone

Choose Clean Air: What is Smoke?

What is Smoke?

Wildfire smoke is mostly small particles, gases and water vapor and includes trace amounts of hazardous air pollutants. Particles from smoke is a mixture of solid particles - pieces of wood and other solids that are burning - and liquid droplets. It tends to be very small, generally less than 2.5 micrometers in diameter. (For comparison, a human hair is about 100 micrometers.) These small particles are more of a health concern than the coarse particles that typically make so much dust because they can be inhaled more deeply into the lungs. To learn more about particulate matter, click here.

The incomplete burning of wood or other organic materials produce carbon monoxide, the gas in smoke. Its levels are highest during the smoldering stages of a fire. To learn more about carbon monoxide, click here.

Learn more about the impact of fire and smoke:

- Fire Smoke and Your Health
- What is Smoke?
- Managed Burns
- Impact to You and Air Quality

Clean Air Homepage | DEQ Homepage | Air Quality Homepage | Air Monitoring Center | Top of page

Powered by the Utah Department of Environmental Quality

Choose Clean Air: Wildfires

Choose Clean Air

Fire Smoke And Your Health

Fire has been a part of the landscape for thousands of years and is an essential component of most ecosystems in the West. Past land management practices, such as livestock grazing and fire suppression, have changed the frequency and intensity of fires. As a result, wildfires are becoming larger in size and the smoke generated from wildfires can pose a major health risk.

Learn more about the impact of fire and smoke:

- Fire Smoke and Your Health
- What is Smoke?
- Managed Burns
- Impact to You and Air Quality

Clean Air Homepage | DEQ Homepage | Air Quality Homepage | Air Monitoring Center | Top of page

Powered by the Utah Department of Environmental Quality

Choose Clean Air: Wildfires Impact at a Glance

Choose Clean Air

Wildfires Impact at a Glance

The Air Monitoring Center reports the Air Quality Index for particulate matter along the Wasatch Front. In other areas of the state, a visibility index provides a way to judge smoke levels on a continual basis. As the smoke gets worse, the index changes and so do the guidelines for protecting yourself. Smoke concentrations tend to be very high for a few hours, then drop off dramatically. Research has shown that the "lighter" may be what cause some of the most harmful effects. Since smoke is such a good scatterer of light, visibility changes drastically as smoke concentrations increase.

To judge visibility:

- Face away from the sun
- Determine the level of your visibility range by looking for targets at known distances (miles) Visible range is that point at which even the high contrast objects totally disappear
- After determining visibility in miles, use the chart to determine health effect and appropriate cautionary statement

Learn more about the impact of fire and smoke:

- Fire Smoke and Your Health
- What is Smoke?
- Managed Burns
- Impact to You and Air Quality
- Wildfires Impact at a Glance (Chart)

Clean Air Homepage | DEQ Homepage | Air Quality Homepage | Air Monitoring Center | Top of page

Powered by the Utah Department of Environmental Quality

Public Review and Comment

- UDAQ established a 30-day comment period from November 1, 2007 through December 1, 2007. No comments were received.
 - The announcement of the comment period was published in the Salt Lake Tribune and Deseret News on October 22, 2007. See the Affidavit of Publication to the right.

4770 S. 5600 W.
P.O. BOX 794005
WEST VALLEY CITY, UTAH 84170
FED. TAX ID.# 87-0212664

The Salt Lake Tribune **MEDIAOne** **Morning News**

PROOF OF PUBLICATION CUSTOMERS COPY

CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
UT ST DEPT OF ENV QUALITY, DIVISION OF AIR QUALITY PO BOX 144820 SALT LAKE CITY UT 84114	1001399880	10/23/2007

UTAH AIR QUALITY DIVISION
NOV 9 2007

ACCOUNT NAME		NOTICE	
UT ST DEPT OF ENV QUALITY		Federal regulations (40 Code of Federal Regulations, CFR Part 50) are used to evaluate air quality data. If the data are not available, a "Provisional Air Quality Standard" (P-AQS) is used. A "Provisional Air Quality Standard" (P-AQS) is used to evaluate air quality data. If the data are not available, a "Provisional Air Quality Standard" (P-AQS) is used. A "Provisional Air Quality Standard" (P-AQS) is used to evaluate air quality data. If the data are not available, a "Provisional Air Quality Standard" (P-AQS) is used.	
TELEPHONE	ADORDER# / INVOICE NUMBER		
8015364000	6000166276 /		
SCHEDULE			
Start	10/22/2007	End	10/22/2007
CUST. REF. NO.			
DAQPN-008-07			
CAPTION			
NOTICE Federal regulations (40 Code of			
SIZE			
77	Lines	2.00	COLUMN
TIMES		RATE	
4			
MISC. CHARGES		AD CHARGES	
TOTAL COST			
263.72			

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY CORPORATION LEGAL BOOKER, I CERTIFY THAT THE ATTACHED NOTICE: Federal regulations (40 Code of _____ FOR _____ (UT ST DEPT OF ENV QUA) 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.

PUBLISHED ON Start 10/22/2007 End 10/22/2007

SIGNATURE *Stacy Crest*

DATE 10/23/2007

NOTARY PUBLIC
ELIZABETH G. CORDOVA
6462 West 4200 South
West Valley City, Utah 84118
My Commission Expires
January 16, 2010
STATE OF UTAH

Elizabeth G. Cordova

THIS IS NOT A STATEMENT BUT A "PROOF OF PUBLICATION"
PLEASE PAY FROM BILLING STATEMENT

Public Review and Comment (Cont)

- To aid in the public review and comment period, a website was developed to post the justification documentation for this event.

The screenshot shows the Utah Division of Air Quality website in Microsoft Internet Explorer. The page title is "Utah Division of Air Quality - Microsoft Internet Explorer". The address bar shows the URL: <http://www.airquality.utah.gov/Public-Interest/Public-Comment-Hearings/Exceptional-Events/Exceptional-Events.htm>. The website header includes "DEQ utah.gov" and "Utah Department of Environmental Quality". The main content area is titled "Exceptional Events" and contains the following text:

Exceptional events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques tribal, state or local air agencies may implement in order to attain and maintain the National Ambient Air Quality Standards. Exceptional events are events for which the normal planning and regulatory process established by the Clean Air Act (CAA) is not appropriate.

One type of exceptional event is a natural event. 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. Federal regulations (40 Code of Federal Regulations Part 50.14 (h)(2)) also allow states to exclude data from regulatory determinations on a case-by-case basis for monitoring stations whose exceedances or violations are caused by emissions from fireworks displays.

The EPA has issued a rule (2013 kb) that will govern the review and handling of air quality data influenced by exceptional events. This rule became effective on May 21, 2007.

Below the text is a photograph of a landscape with a large fire in the background, likely a wildfire.

The page also features a section titled "Current Exceptional Events out for Public Comment:" with the following text:

The new federal exceptional events regulations (40 CFR Part 50.14 (c) (3)(i)) requires all relevant flagged data be made available by the State for a 30-day public review and comment period. The following are current exceptional events out for public comment.

A table titled "Exceptional Events out for Public Comment" lists the following data:

Dates of Flagged Data	Monitor	Value	Pollutant	Type of Exceptional Event	Event Demonstration	Comment Period
July 4, 2007	Rose Park	78.1 $\mu\text{g}/\text{m}^3$	$\text{PM}_{2.5}$	Fireworks	Available (525 kb)	November 1- December 1, 2007
July 5, 2007	West Valley	50.7 $\mu\text{g}/\text{m}^3$	$\text{PM}_{2.5}$	Fireworks	Available (507 kb)	November 1- December 1, 2007
July 9, 2007	Lindon	44.3 $\mu\text{g}/\text{m}^3$	$\text{PM}_{2.5}$	Wildfire	Available (2,584 kb)	November 1- December 1, 2007
July 11, 2007	Lindon	42.1 $\mu\text{g}/\text{m}^3$	$\text{PM}_{2.5}$	Wildfire	Available (1,077 kb)	November 1- December 1, 2007