Utah Division of Air Quality

PM10 & PM2.5 Exceptional High Wind Event

Cottonwood, Hawthorne, Lindon, North Salt Lake, & North Provo Monitoring Stations

Event Date – April 19, 2008

Millard County, Utah
Taken By Don Halterman June 2009

Table of Contents

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(c)(3)(iv-v) 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 event meets the above criteria and provides analyses to demonstrate that:

I. The natural dust event was not reasonably controllable or preventable;
II. Reasonable controls, based on EPA guidance, are in place for anthropogenic sources through regulatory structures and programs sponsored by state, federal and local agencies as described in the Mitigation Section;
III. There is a clear-causal connection between the high wind event and the exceedances at the Wasatch Front monitoring stations;
IV. The measured PM10 and PM2.5 concentrations, as well as high winds, were beyond normal historical levels; and
V. The exceedances would not have occurred "but for" the high winds.

On April 19, 2008, Utah experienced a natural high wind meteorological event associated with the passage of a storm pattern. This exceptional natural event entrained particulates into the air by the high winds through a mechanism of surface erosion occurring in various locations up-wind and southwest of the Wasatch Front PM10 and PM2.5 monitoring network.

The Salt Lake Tribune carried a full feature article on April 20, 2008 on the wind storm. The article included an interview with a Division of Environmental Quality (DEQ) meteorologist who attributed the storm to a dry line that passed over the salt desert playa regions of the Sevier Lake Bed, followed by a slow tracking cold front.

Storm kicks up dust, sets off health advisory
By Brian Maffly
The Salt Lake Tribune
Article Last Updated: 04/20/2008 01:14:49 AM MDT

High winds on Saturday afternoon filled the Wasatch Front's air with enough dust to trigger a health advisory for the second time this week. Warm 50 mph gusts out of the south and west carried dust off the Sevier Lake Bed, 100 miles southwest of Salt Lake City, said Kent Bott, air pollution meteorologist with the Utah Division of Air Quality. "The whole west desert looks like it's giving us a lot of stuff," Bott said. "This is not uncommon in the spring when these vigorous cold fronts come in after things dry out." Saturday's winds preceded a slow-moving front approaching Utah from the northwest. The front was expected to pass over Salt Lake by early today, ushering wind changes that should clean out the valley's choked air. Like Tuesday's dust event, Saturday's windstorm followed pleasant weather that brought people into Salt Lake Valley's parks to enjoy the arrival of spring. The Department of Environmental Quality issued a "red" air quality alert for Salt Lake, Weber and Davis counties Saturday afternoon as dust concentrations obliterated Salt Lake City's skyline and mountain vistas and choked the air with dangerous levels of particulates. Fortunately for thousands of runners, the Salt Lake City Marathon was winding down by the time the breathing conditions became unhealthy. Public health officials recommended people avoid strenuous exercise outdoors and those with vulnerable respiratory systems were advised to stay indoors. While strong gusts and poor visibility complicated driving conditions, Utah Highway Patrol reported no weather-related accidents on Wasatch Front freeways. Today is expected to be cool and damp, with highs in the upper 40s, 20 mph winds out of the northwest and a 30 percent chance of snow.

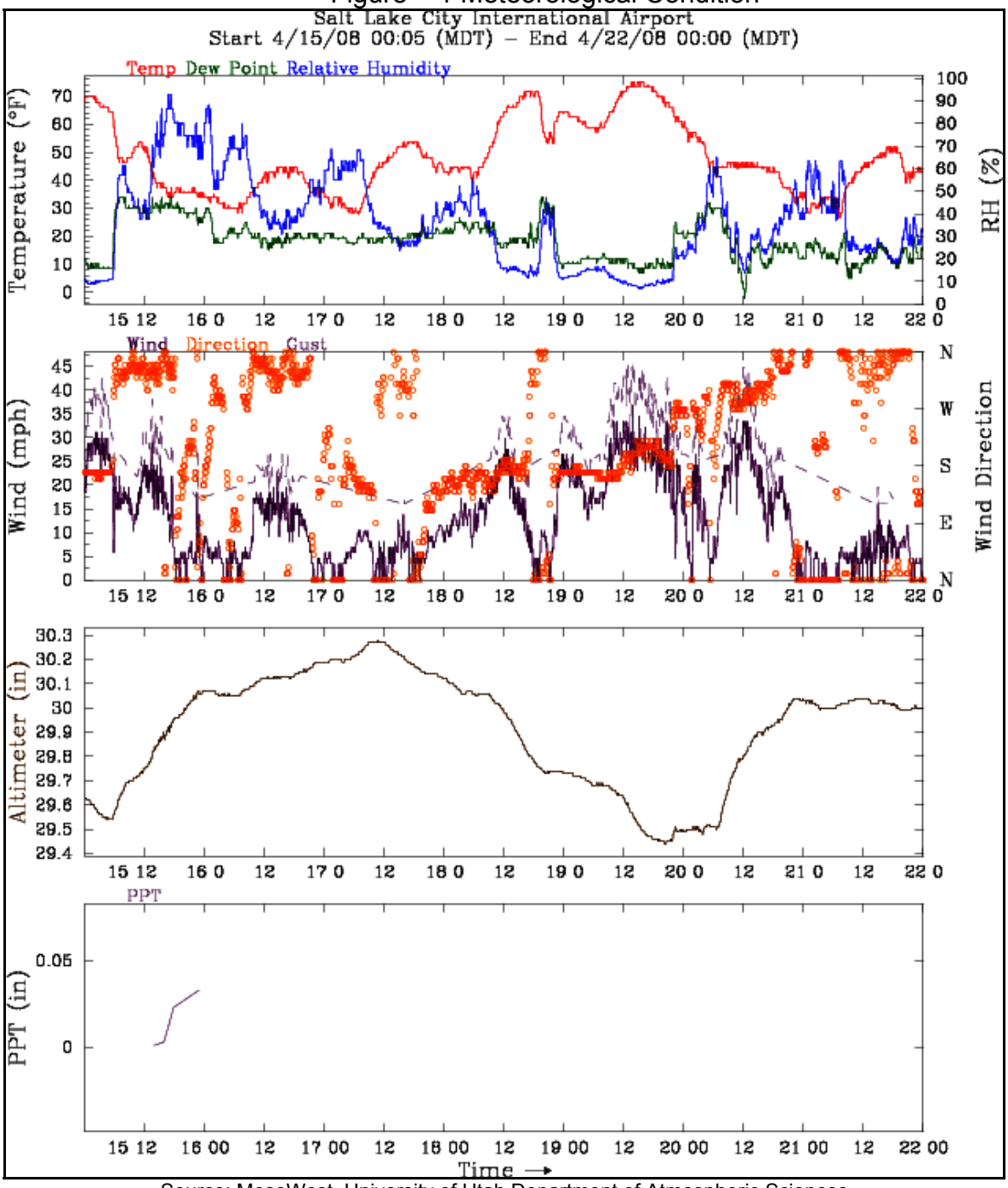
Windy weather expected to dissipate, but red-air alert will continue
By Derek P. Jensen
The Salt Lake Tribune
Article Last Updated: 04/20/2008 01:59:00 PM MDT

Posted: 2:00 PM-Winds that have whipped dust across the Salt Lake Valley should continue through the afternoon, but taper off after sunset. And tomorrow, cool but calmer weather should prevail, according to the National Weather Service. "We're seeing it gradually relaxing," meteorologist Monica Traphagan said about the northwest winds. The storm front, she says, is "actually behind us," despite some snow in the Logan and Cache County area. Traphagan says the storm system skirting the Utah-Idaho border is not carrying much precipitation. Expect just a 20 percent chance of rain this afternoon, she said, which will subside by evening. Despite blowing dust, Utah Highway Patrol reports no weather-related problems on roadways. Meantime a "red" air quality alert has been issued by the Utah Department of Environmental Quality for Salt Lake, Davis, Weber and Utah counties because of blowing dust. Children, the elderly and those with respiratory or heart disease should avoid prolonged outdoor exposure until the winds wane. The "red" air quality condition could be in effect for the next 12 hours, though the forecast calls for improving conditions during the day. A "moderate" air quality alert also has been issued by the Bear River Health Department for Cache County.

The first article describes two storms taking place between April 15 and 19. The metrological data for that period is shown in Figure – 1. Warm weather preceded each cold front. Only the first storm on April 15 produced any meaningful precipitation, which is important because January through April were below normal precipitation months in southwest Utah (in the path of the dust storm) (Appendix 1). Both events produced

wind gusts between 45-50 mph, including high wind gusts in between events (35-50 mph on April 17).

Figure – 1 Meteorological Condition



Source: MesoWest, University of Utah Department of Atmospheric Sciences

These events typically occur when high winds are from the south-southwest where they pass over dry lake beds, in this case, the Sevier Lake bed and the Milford Flats, based on satellite images provided and interpreted by Jim Steenburgh, Chairman of the

Department of Atmospheric Science at the University of Utah. "One can see the dust pouring off the Sevier lake bed. There also appears to be a source just to the east--the color contrast is not as good, but it is there. The Sevier plume at this time zeros in on the Oquirrhs and Tooele Valley, whereas the other plume, which clearly has differing radiative characteristics (and perhaps composition) extends across Utah Lake and then into the Salt Lake Valley. If you look around, you will see other dust sources, including one from what appears to be a lake bed just NW of the Sevier." Dr. Steenburgh was referring to the circled area on the image (drawn by Dr. Steenburgh).

Image 1 – Satellite Image Highlighting Dust Storm

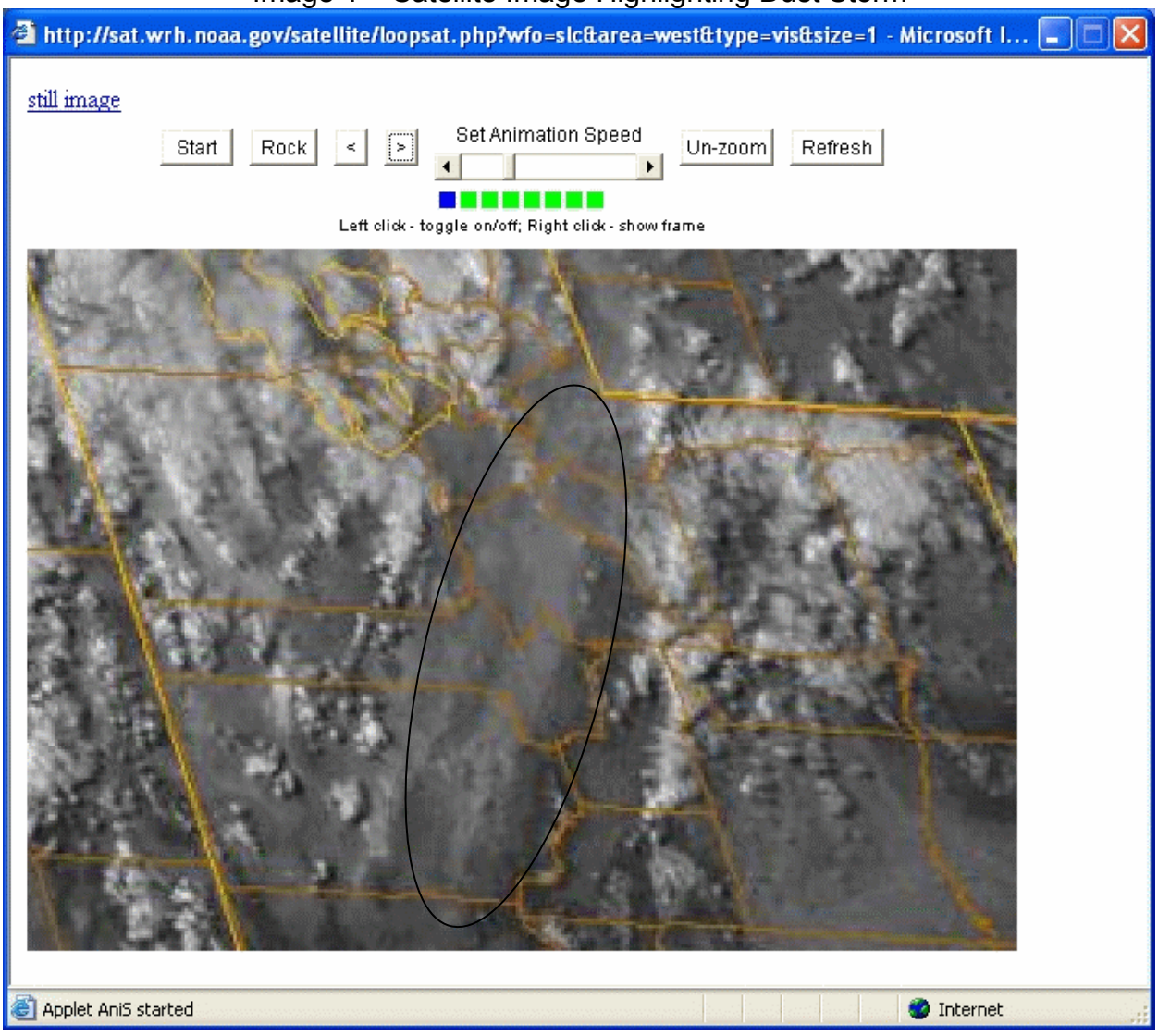


Image 2 is the MODIS satellite image for April 19, 2008. The grayish white clouds south and south-west of the Great Salt Lake are dust clouds.

Image 2 – MODIS Satellite Image

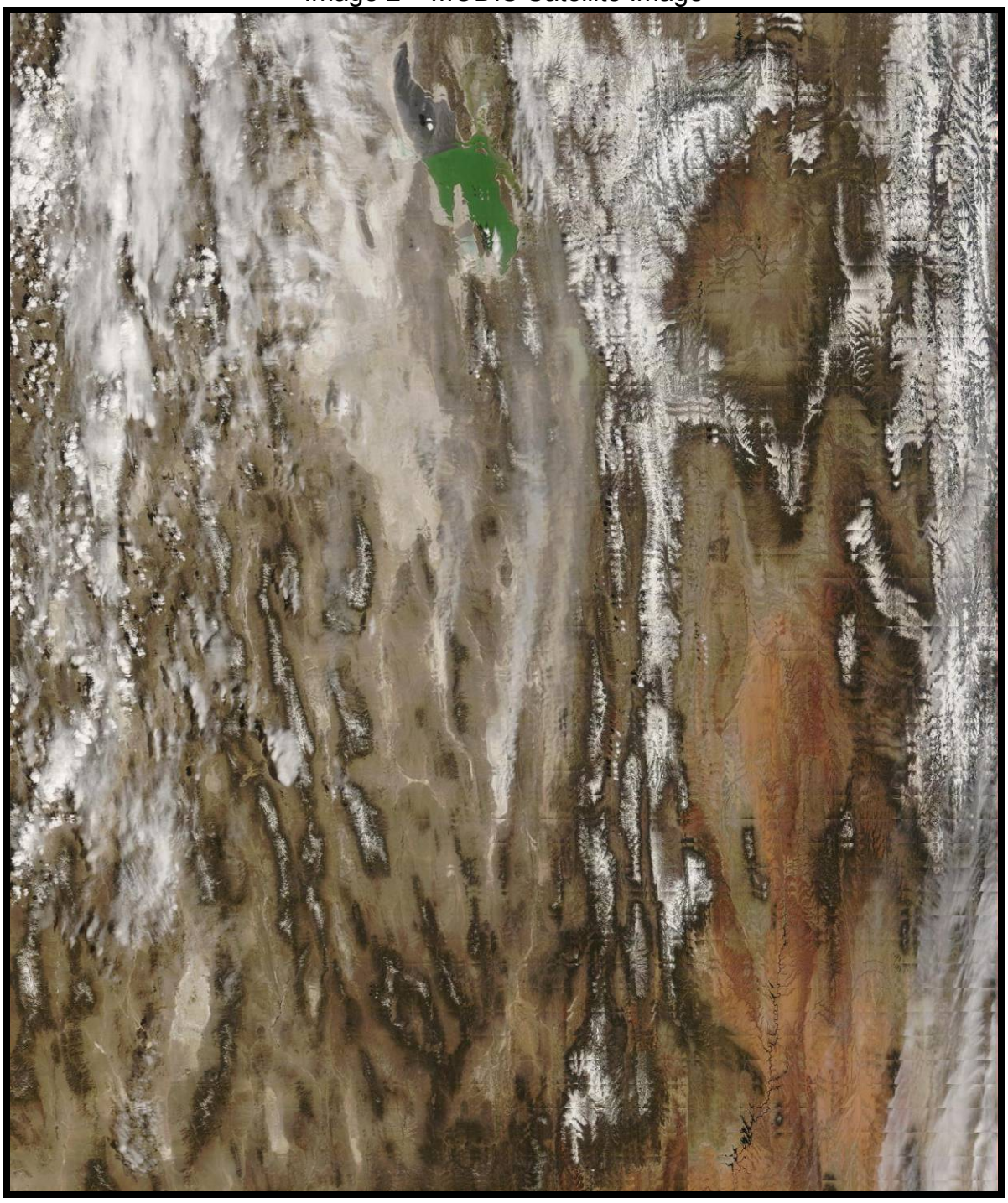
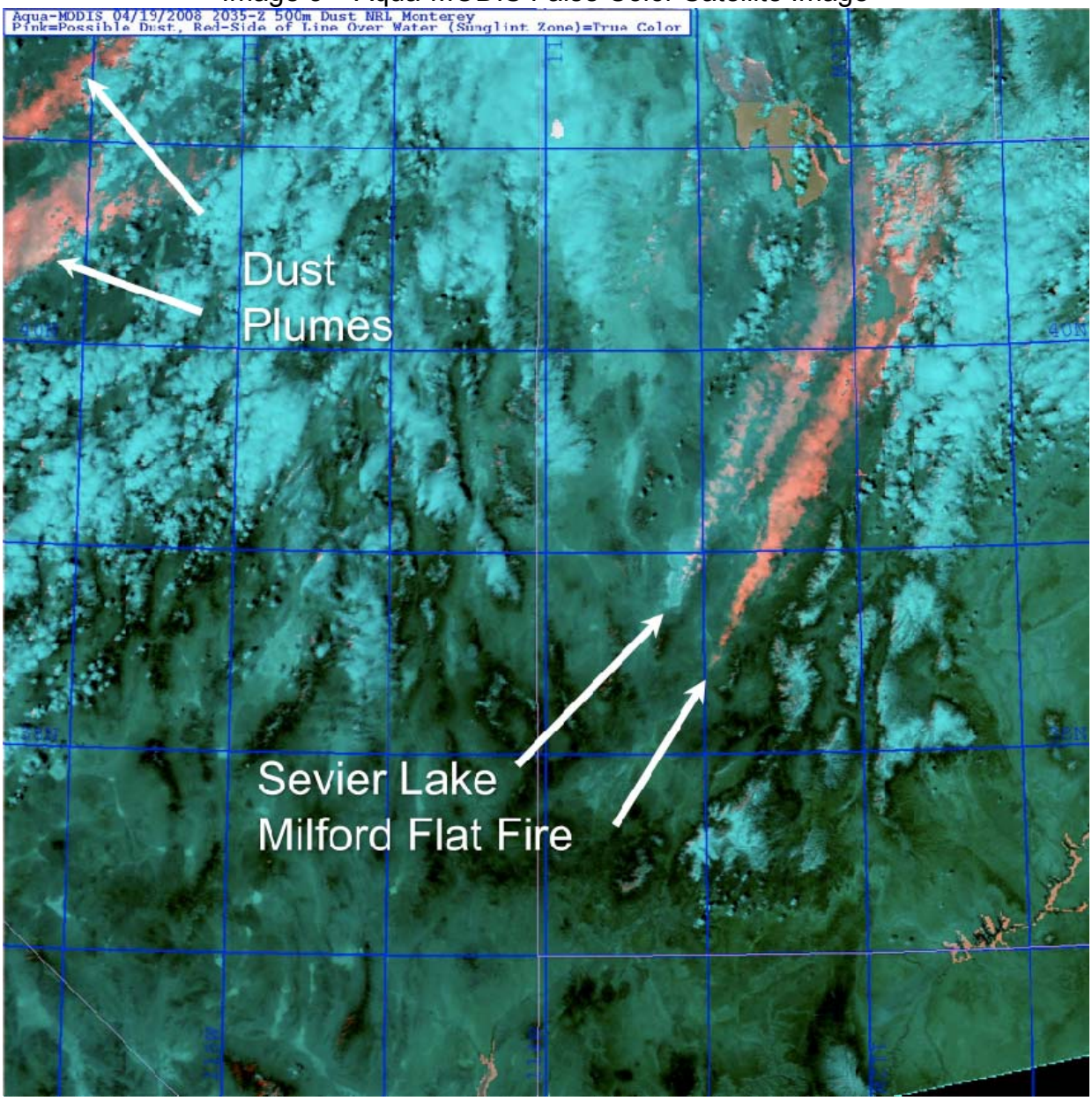


Image 3 – Aqua-MODIS False Color Satellite Image



The false color image was interpreted by the U.S. Geological Services for DEQ (provided by Richard L. Reynolds, USGS). According to their interpretation, sources of the dust clouds include the Sevier Lake and Milford Flat. The false color imaging allows us to see the dust plumes emanating from these desert playa regions and extending into the Salt Lake valley.

Study Area Background

Soil Resources

Soil resources within the study area have formed within one Major Land Resource Area (MLRA); MLRA 28A – The Great Salt Lake Area (USDA 2006).

MLRA 28A consists of the following soil orders: Aridisols, Entisols, and Mollisols. Aridisols are soils that develop in dry arid ecosystems. Entisols lack soil development and typically are shallow or sandy. Mollisols have a thick, dark, fertile surface layer (USDA 2006).

The Great Salt Lake Area is comprised of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes, and are not well dissected because of low rainfall. **A large salt desert playa is located south and west of Great Salt Lake** (prone to erosion). **Most of the valleys are closed basins containing sinks or playa lakes.** The soils in this area generally are well drained or somewhat excessively drained, loamy or loamy skeletal (lacking soil horizons and rocky), and very deep. Soils in this area commonly contain high calcium carbonate contents. Alkalinity commonly increases with depth. Soils along alluvial fans, lake plains, and flats often have high concentrations of salts and sodium (USDA 2006).

Climate

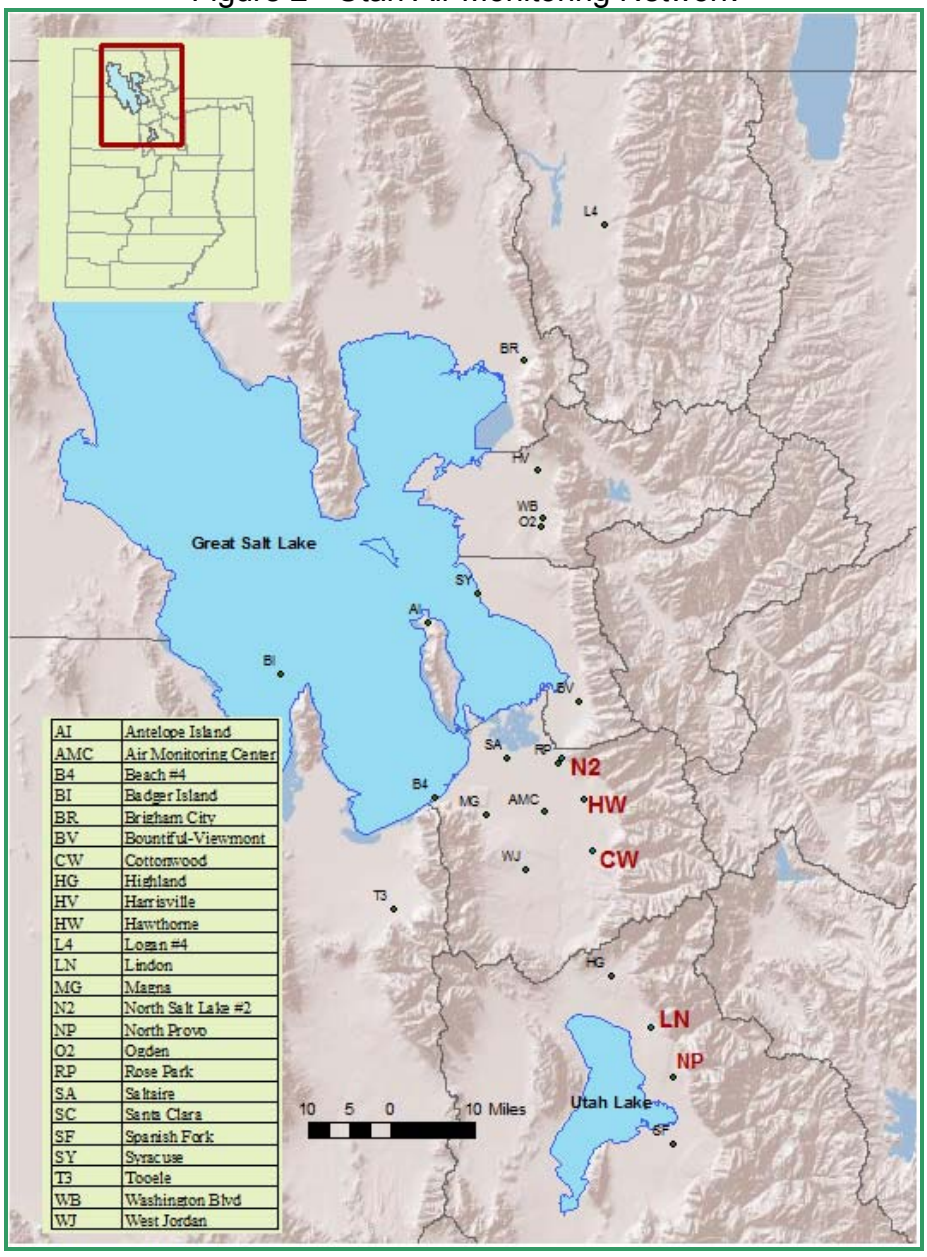
The average annual precipitation is 5 to 12 inches in the valleys. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The driest period is from midsummer to early autumn. Precipitation in winter typically occurs as snow (USDA 2006).

The Delta weather station is located near the Sevier Lake bed, a region that contributed dust to the storm. Precipitation at Delta for March and April of 2008 was: March 2008 0.51 in., 60% of normal; and April 2008 0.10 in., 12% of normal (NOAA). Similarly, below normal precipitation occurred in February and January as well (Appendix 1). Dry conditions enhance wind erosion conditions.

Affect Air Quality

The Wasatch Front experienced a dust storm resulting in PM10 and PM2.5 levels in excess of the 24-hour National Ambient Air Quality Standards (NAAQS), affecting the 95th percentile values at some locations. PM10 exceedances were measured at the North Salt Lake, Hawthorne, and Lindon air monitoring stations. PM2.5 exceedances were measured at North Provo and Cottonwood monitoring stations. Figure 2 shows the locations of these monitoring stations, as well as the entire Utah monitoring network. The stations with exceedances are highlighted in red.

Figure 2 - Utah Air Monitoring Network



The NAAQS exceedances on April 19, 2008, are shown in Table 1, Figure 3, and Figure 4.

Table 1 – NAAQS Exceedances

Monitor	PM10 ($\mu g/m^3$)	PM2.5 ($\mu g/m^3$)	AQS Mon. #	Lat.	Long.
Lindon	**181**		49-049-4001	40.33952	-111.71344
Cottonwood		**36**	49-035-0003	40.64405	-111.84976
Hawthorne	**191**		49-035-3006	40.73436	-111.87201
North Salt Lake	**181**		49-035-0012	40.80536	-111.92101
North Provo		**49.6**	49-049-0002	40.25336	-111.66328

Figure 3 - PM2.5 24 Hour Values Measured in the Utah Monitoring Network April 17 - 21, 2008

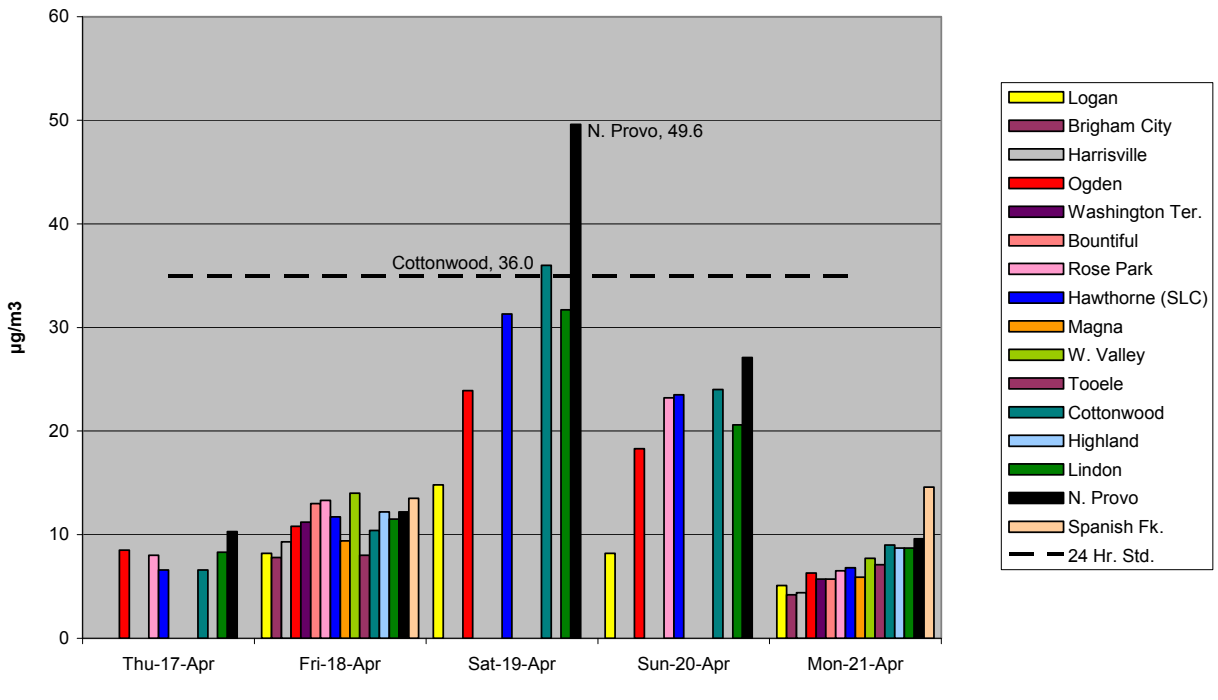
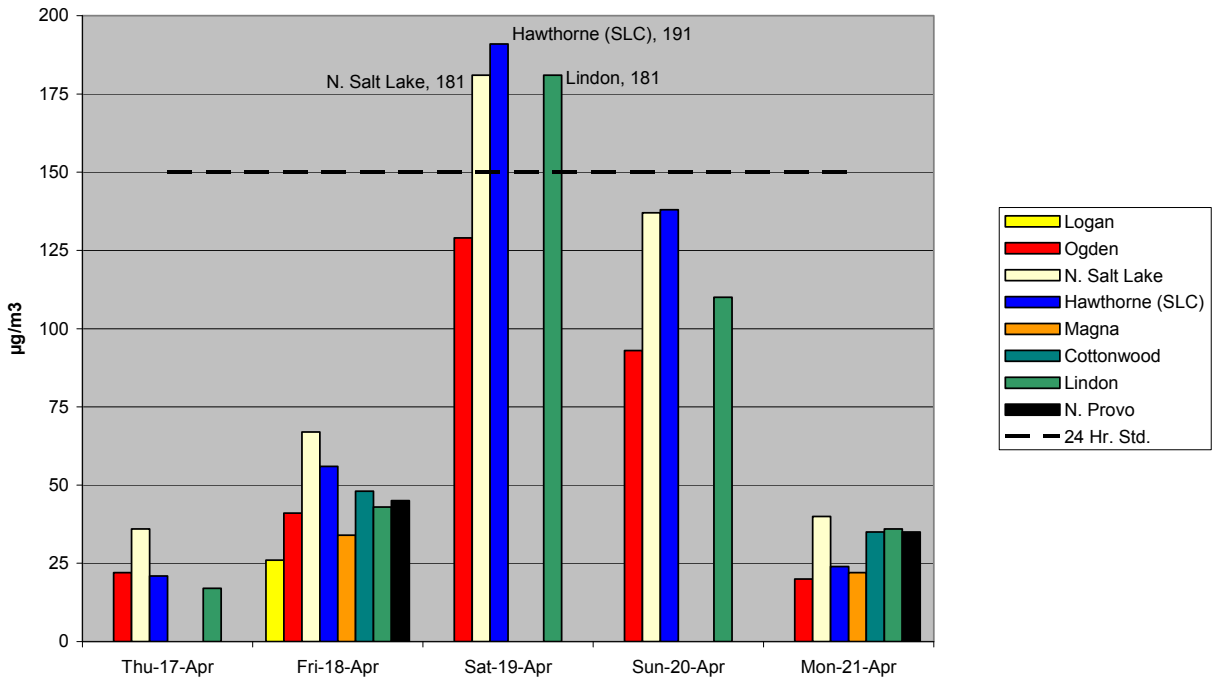
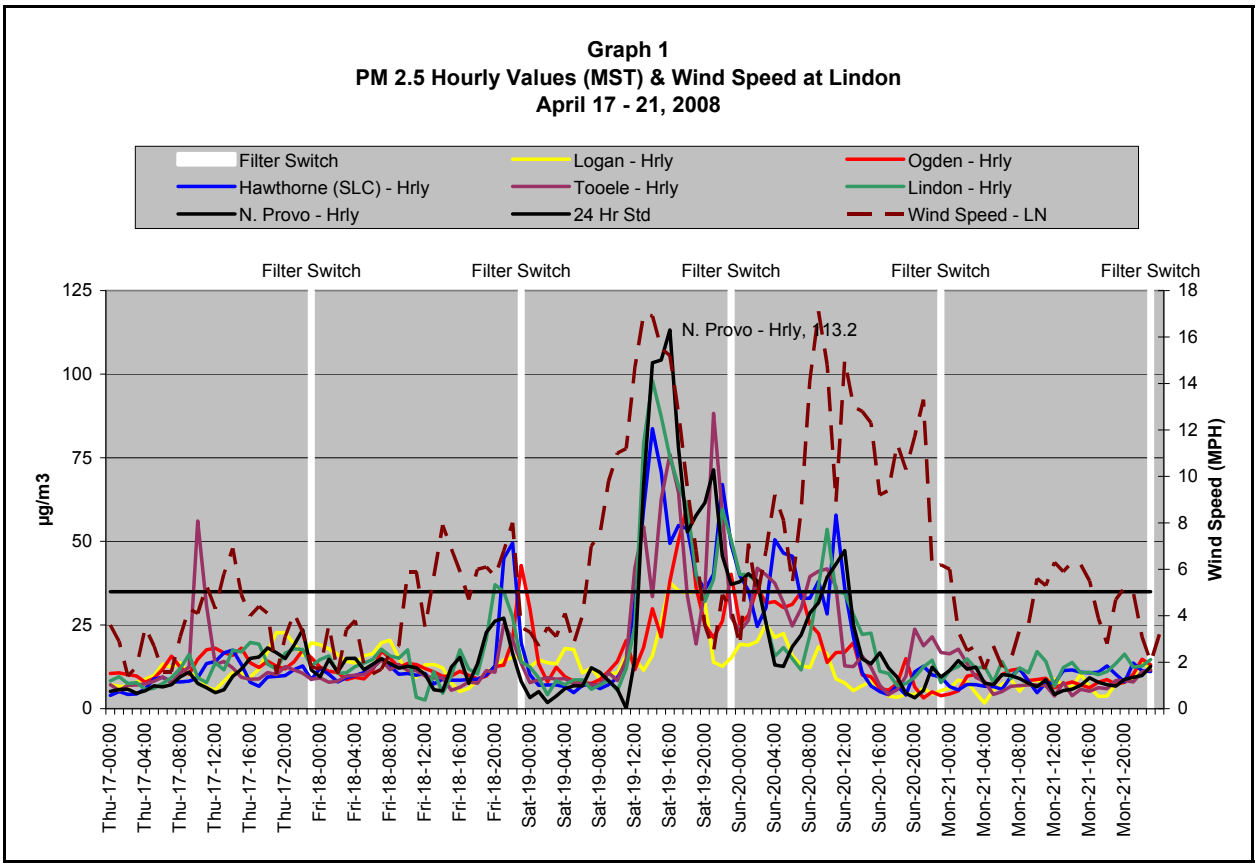


Figure 4 - PM10 24 Hour Values Measured in the Utah Monitoring Network April 17 - 21, 2008

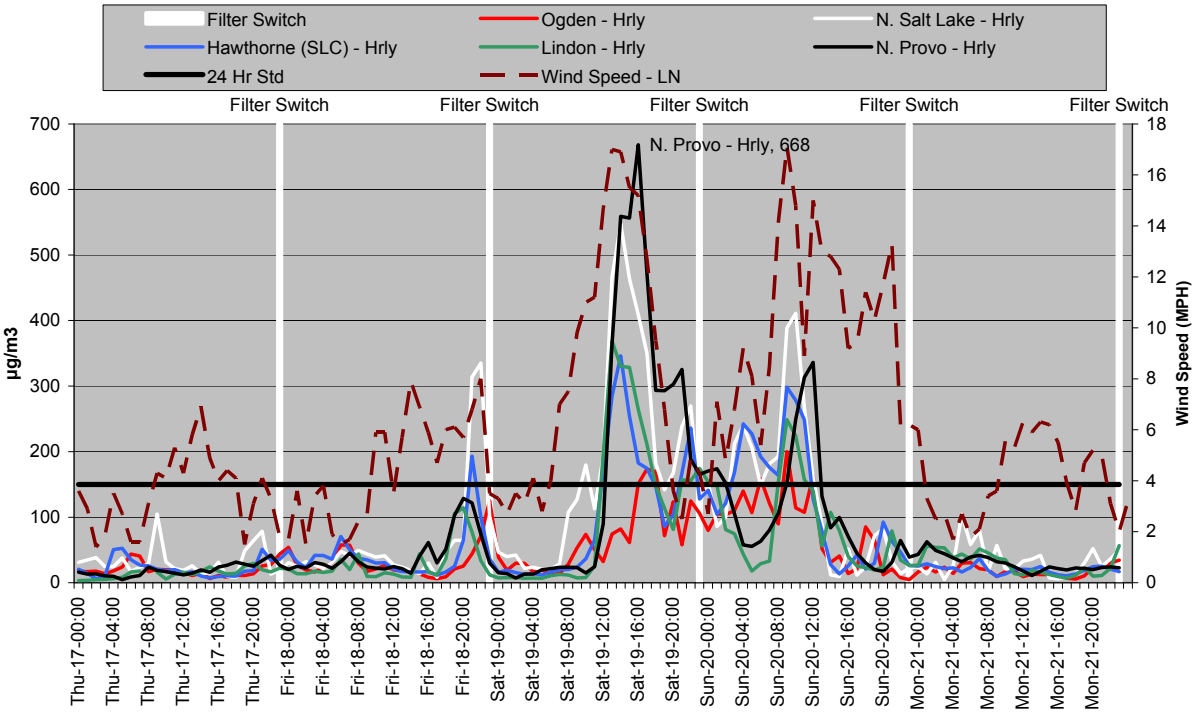




Graph 1 shows the hourly measurements for PM2.5, at available TEIOM monitors, and wind speed, measured at the Lindon station, beginning on Thursday April 17, 2008 through Monday April 21, 2008. Graph 2 presents the measurements for PM10 for the same timeframe. The hourly data is presented in Appendix 2.

It is evident from both graphs that particulate matter closely tracked wind pattern. Particulate matter was slightly elevated Thursday to late Friday night in response to rising and gusting winds and surface drying of the precipitation on April 15. High winds mid-morning Saturday caused spiking particulate levels by mid-day. Declining winds on Sunday likely permitted entrained particles to settle out before winds speed picked up again late Sunday night.

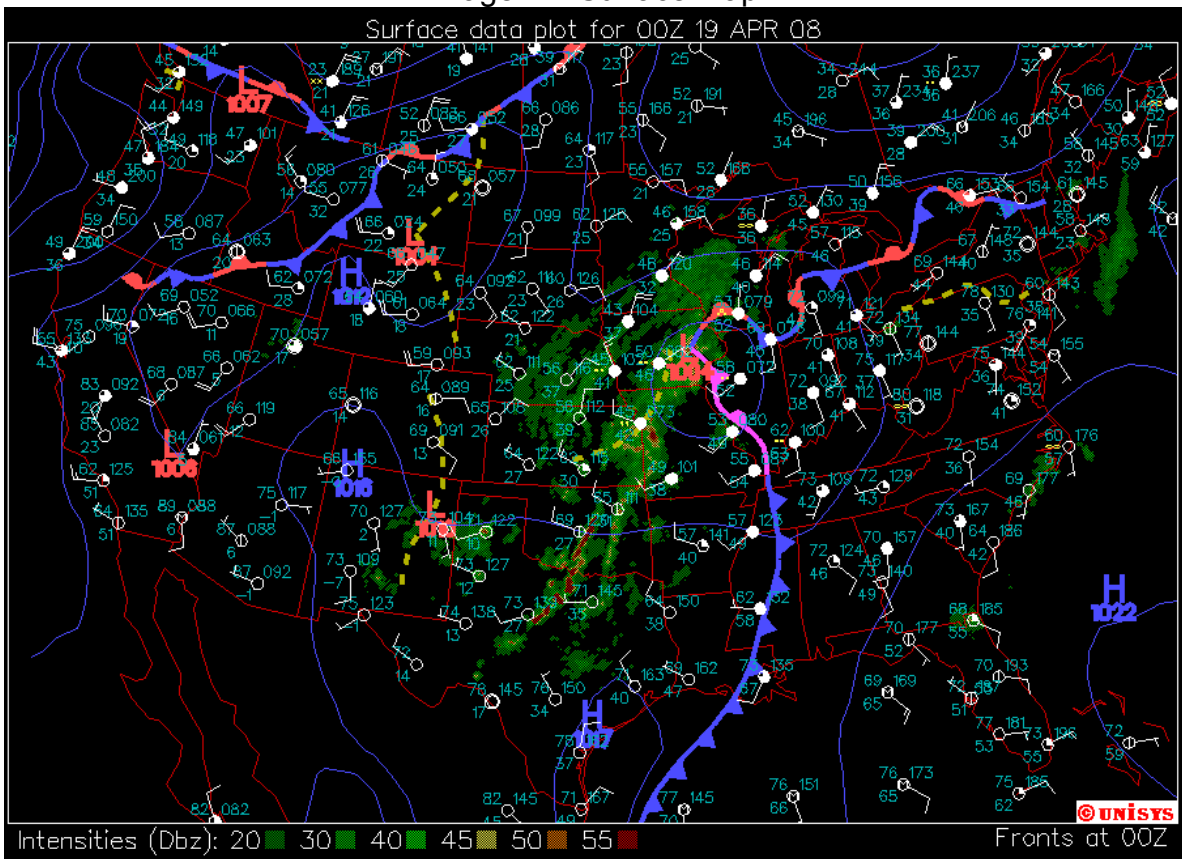
Graph 2
PM 10 Hourly Values (MST) & Wind Speed at Lindon
April 17 - 21, 2008



Not Reasonably Controllable or Preventable & Natural Event

Rapidly developed cold fronts produce strong winds and dramatic temperature gradients over the Intermountain West (Shafer and Steenburgh 2008). As such, these storms are natural events. This seasonal spring occurrence creates the potential for wind eroded surface soils in the Utah desert regions. Soil particles are susceptible to erosion when rapid heating releases it's adhesion to the strata and surface wind velocities are sufficient to suspend them into the air mass.

Image 4 – Surface Map



The Unisys composite surface map for April 18, 2008 at 1800 shows a cold front heading towards Northern Utah. The winds at this point were out of the south at 20.7-25.3 mph. This natural event could not be reasonably controllable or preventable.

Image 5 – Salt Lake Valley on April 18

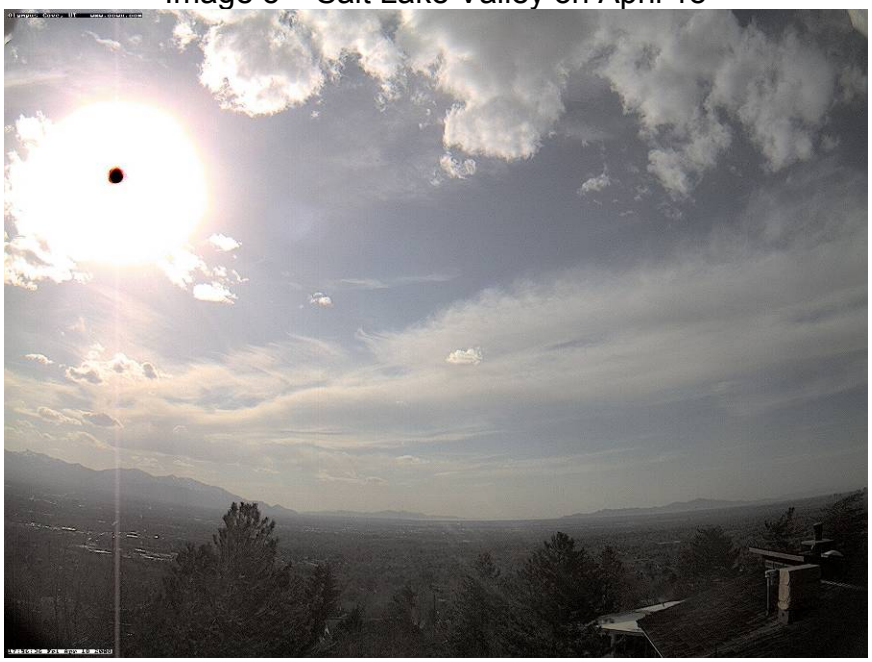
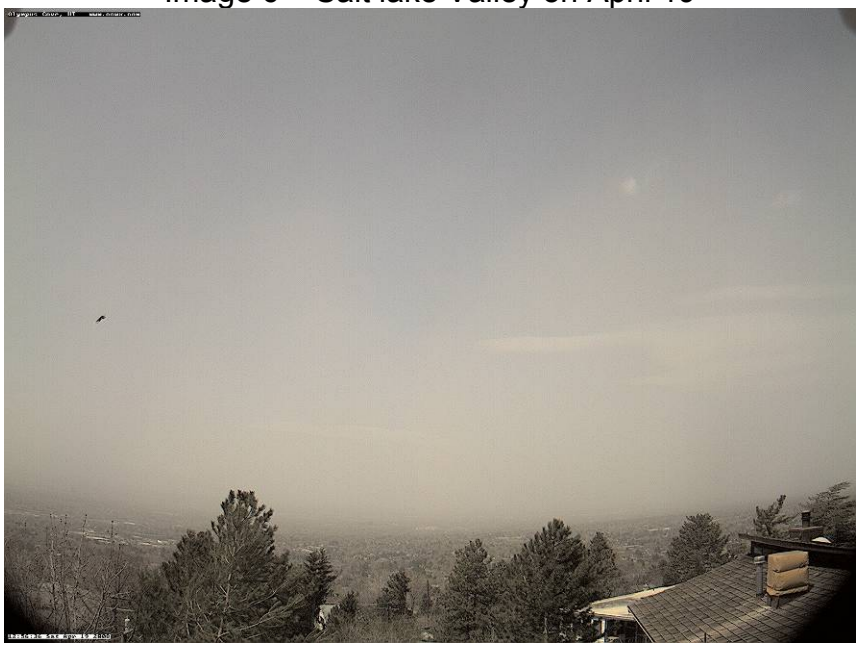


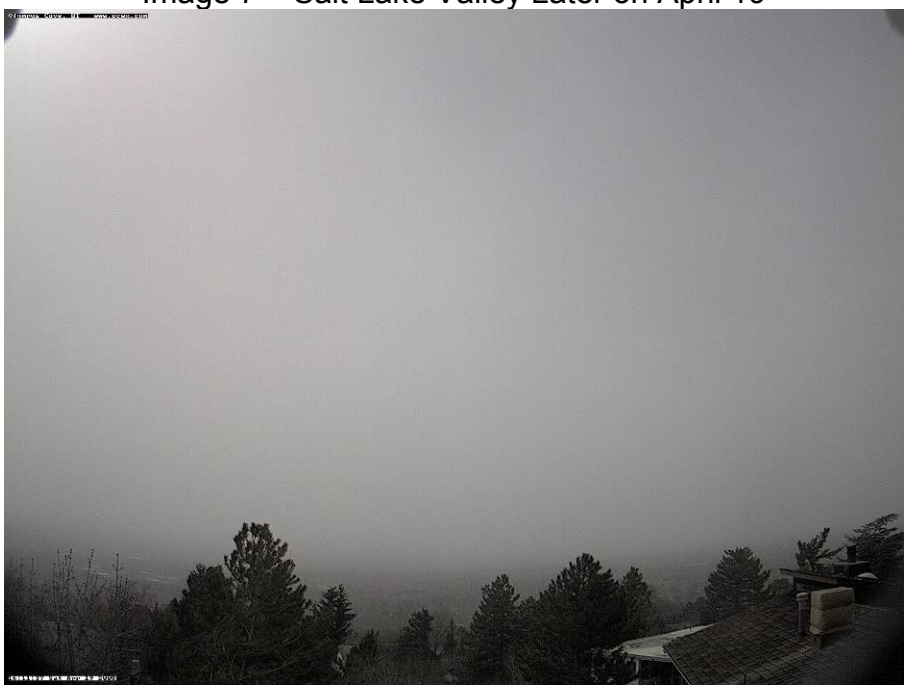
Image 5 is a photo of Salt Lake Valley, taken by the Meteorological Solutions Incorporated at Olympus Cove at 6 p.m. on April 18, 2008. A haze is already evident.

Image 6 – Salt lake Valley on April 19



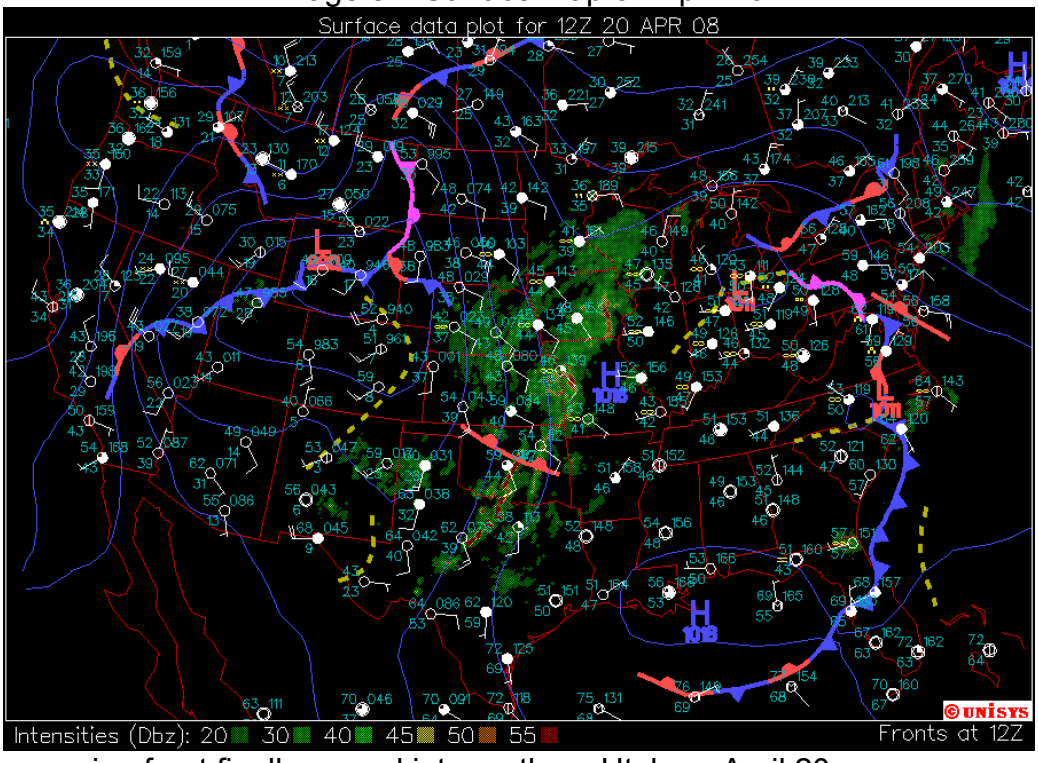
The photo in Image 6 was taken around 6 p.m. on the 19th showing airborne dust. Image 7 was taken only 15 minutes after Image 6. Notice the intensity of the dust storm.

Image 7 – Salt Lake Valley Later on April 19



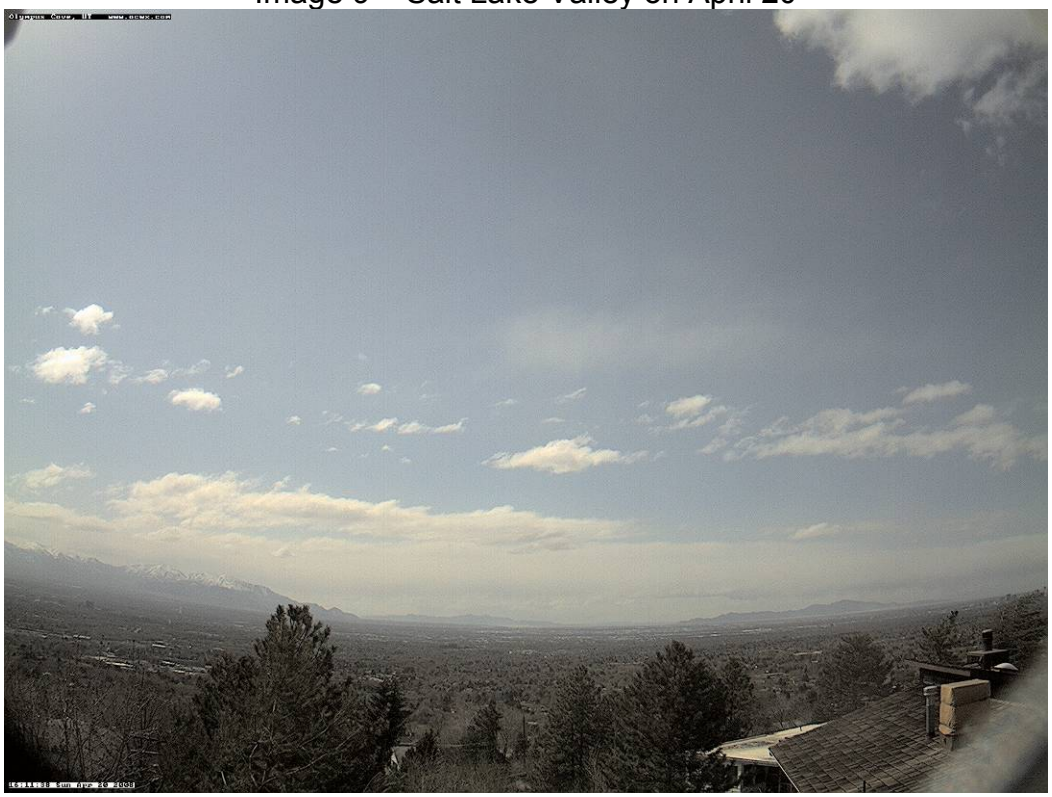
Airborne dust around the peak of the hourly maximums, the Valley was barely visible.

Image 8 – Surface Map on April 20



The slow moving front finally moved into northern Utah on April 20.

Image 9 – Salt Lake Valley on April 20



Visibility had greatly improved and particulate matter levels were near normal levels by late afternoon on April 20.

Normal Historical Fluctuation (40 CFR 50.14)

Utah experiences naturally occurring wind storms, predominantly in the spring. These storms are typically caused by the passage of a cold front resulting in high winds passing over desert playa soils that are entrained in the wind and transported into the Salt Lake City valley causing elevated particulate levels. These natural events are included in the Exceptional Event rule even though they are recurring because they generate **unpreventable** and **uncontrollable** high wind.

PM2.5

Normal historical fluctuation for PM2.5 was computed in a three-step process in order to assess whether an observed value is in excess.

First, all historical PM2.5 values from each monitoring station were aligned 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).

Cottonwood - CW - 49-035-0003

The data ranking for the Cottonwood monitoring station data collected from 1999 through 2008 verifies that the PM2.5 concentration on April 19, 2008, is above the 94th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

North Provo - NP - 49-049-0002

The data ranking for the North Salt Lake monitoring station data collected from 1999 through 2008 verifies that the PM2.5 concentration on April 19, 2008, is above the 99th%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.

Cottonwood - CW - 49-035-0003

The following is the IQR for all Cottonwood data:

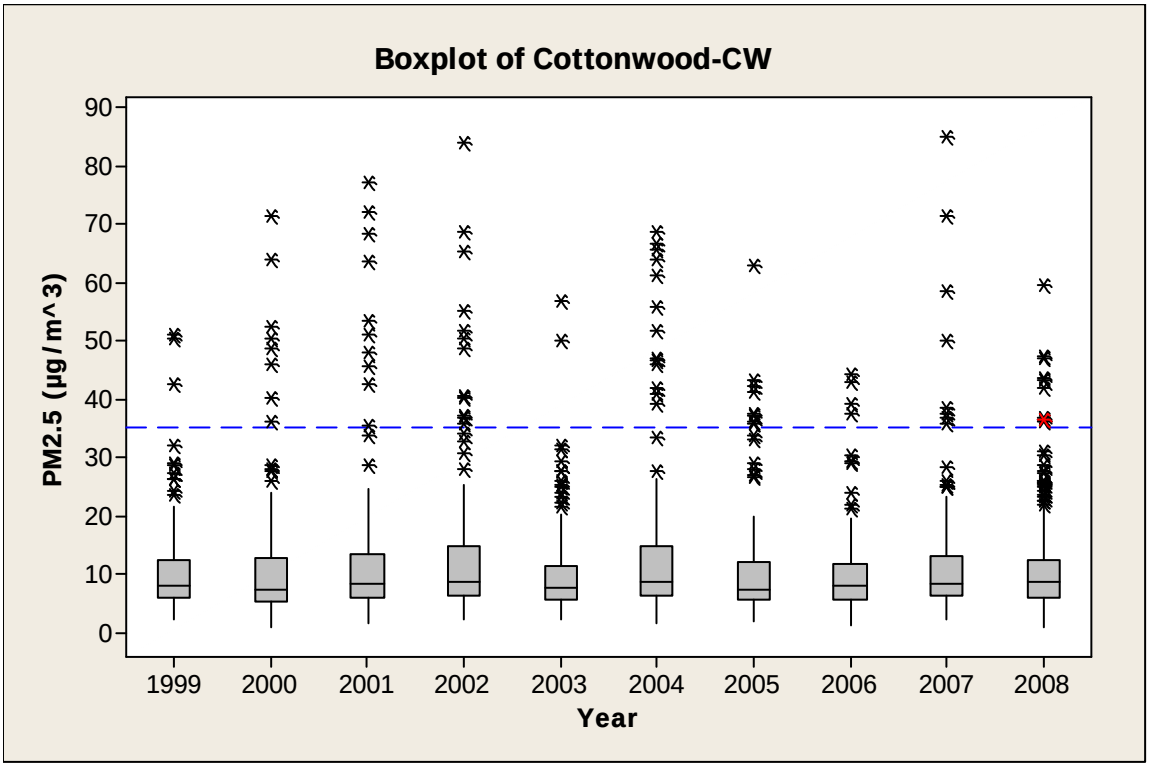
First Quartile (Q1): 5.7 µg/m^3
Median (Q2): 8.1 µg/m^3
Third Quartile (Q3): 12.5 µg/m^3
IQR: 6.8 µg/m^3

The IQR was calculated on a quarterly basis (shown in Table 2) along with the annual.

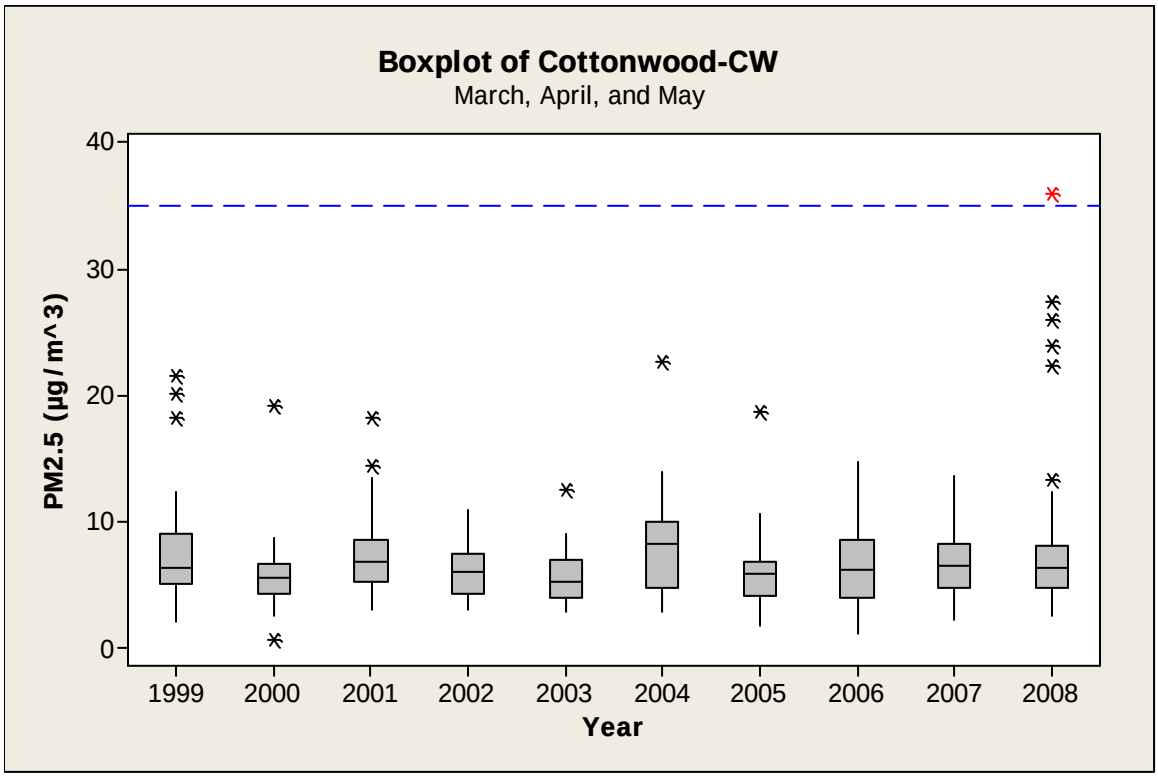
Table – 2 Cottonwood Interquartile (µg/m^3)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	354	7.7	14.65	27.45	19.75
2	358	4.6	6.2	8.1	3.5
3	359	6.3	8.1	10.7	4.4
4	357	6.1	8.2	12.3	6.2
All	1428	5.72	8.1	12.5	6.77

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.



Because this event occurred during the second quarter, it maybe more valuable to only focus on other PM2.5 values during the same time of the year, March-May. The revised boxplot presents the historical PM2.5 values, by year, during the 2nd quarter (March-May) of each year. The event value is marked in red. The blue dashed line represents the current PM2.5 standard.



The only event that exceeds the current PM2.5 standard is associated with the high wind event.

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

North Provo - NP - 49-049-0002

The following is the IQR for all North Provo data:

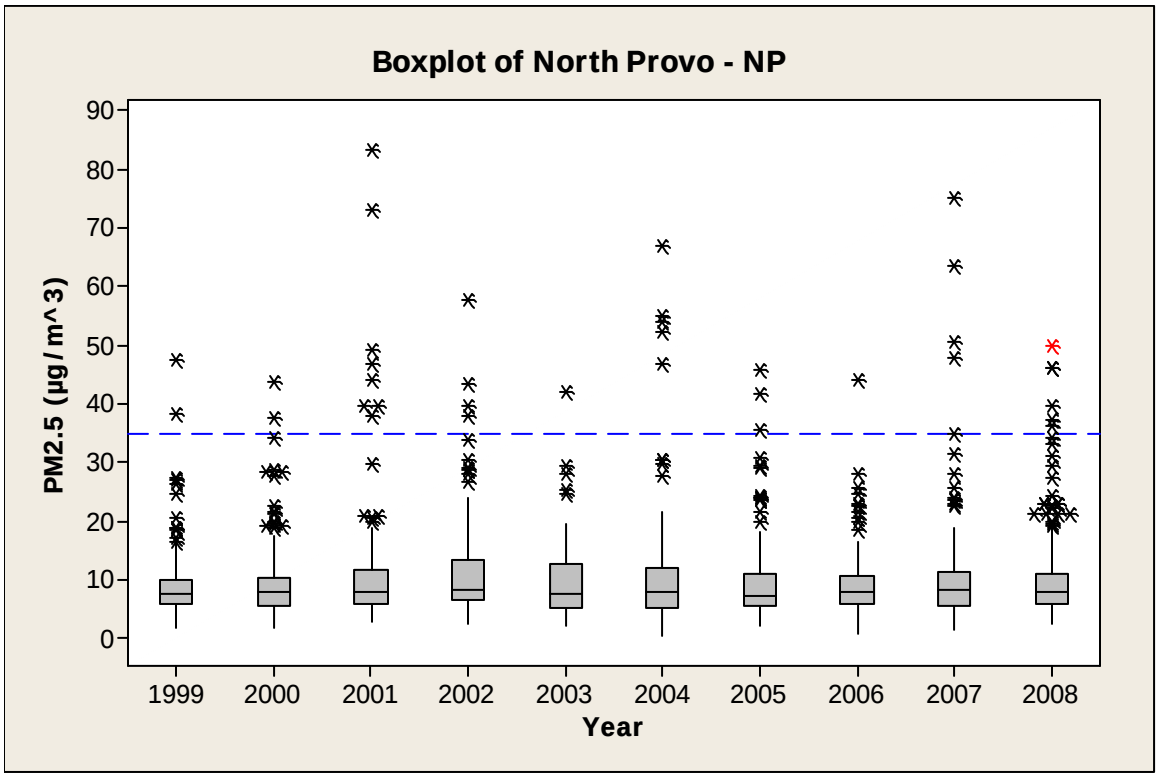
Q1: 5.7 µg/m^3
Q2: 7.7 µg/m^3
Q3: 11 µg/m^3
IQR: 5.3 µg/m^3

The IQR was calculated on a quarterly basis (shown in Table 3) along with the annual.

Table – 3 Cottonwood Interquartile (µg/m^3)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	329	7.8	12.1	20.5	12.7
2	357	5.0	6.4	8.4	3.4
3	350	8.8	7.7	10.1	3.9
4	353	5.5	7.4	10.0	4.5
All	1389	5.7	7.7	11.0	5.3

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.



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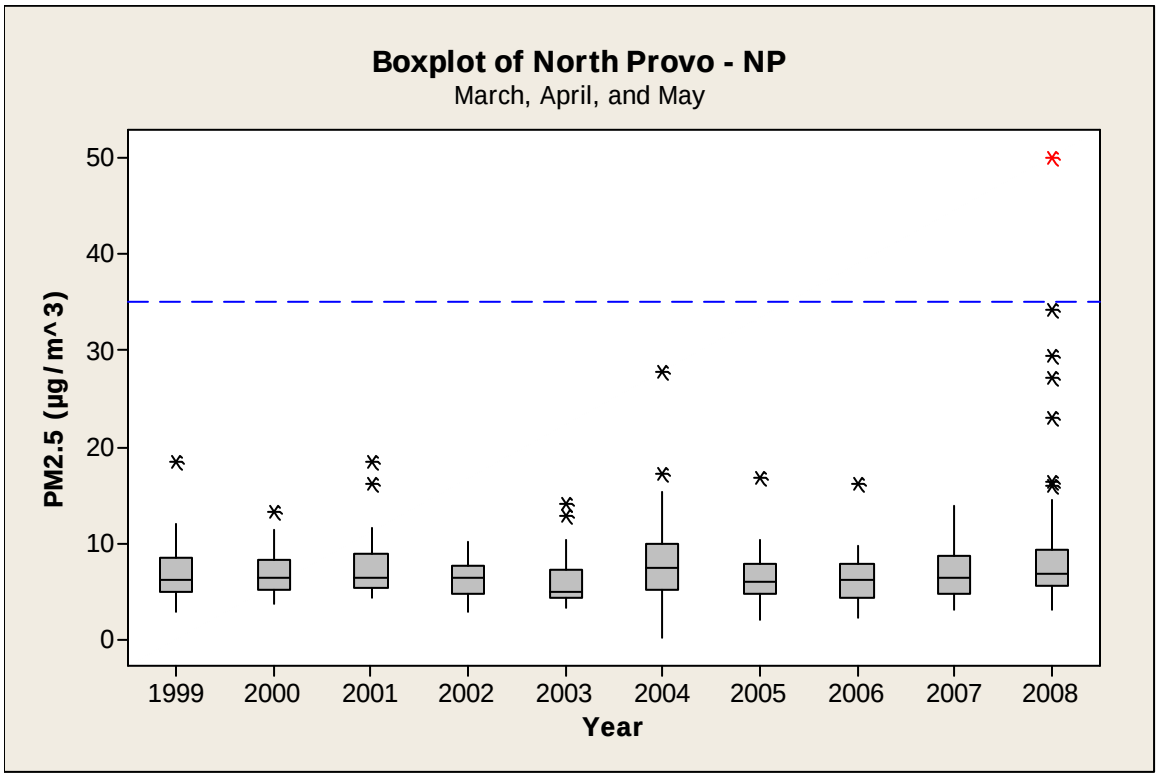


The only exceedance of the current PM2.5 standard is associated with this high wind event.

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

Lognormal Distribution

Lognormal distribution analysis was conducted to establish the normal historical fluctuations for the two subject stations (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 (µgeo) was calculated on a quarterly basis (shown in Table 4) and on an annual basis. The annual basis provides the greatest number of data points and is sufficiently similar to the spring quarterly value; thus, the annual geometric mean is used to reflect the normal historical values for the two stations.

Table 4 – Geometric Mean of PM2.5

Location	Quarter	N Quarterly	µgeo (µg/m^3)	Annual µgeo (µg/m^3)
Cottonwood 03/01/1999 to 12/31/2008	1	354	14.11	8.88
	2	358	6.12	
	3	359	8.28	
	4	357	8.723	
North Provo 01/01/1999 to 12/31/2008	1	329	12.354	8.28
	2	357	6.514	
	3	350	7.980	
	4	353	7.591	

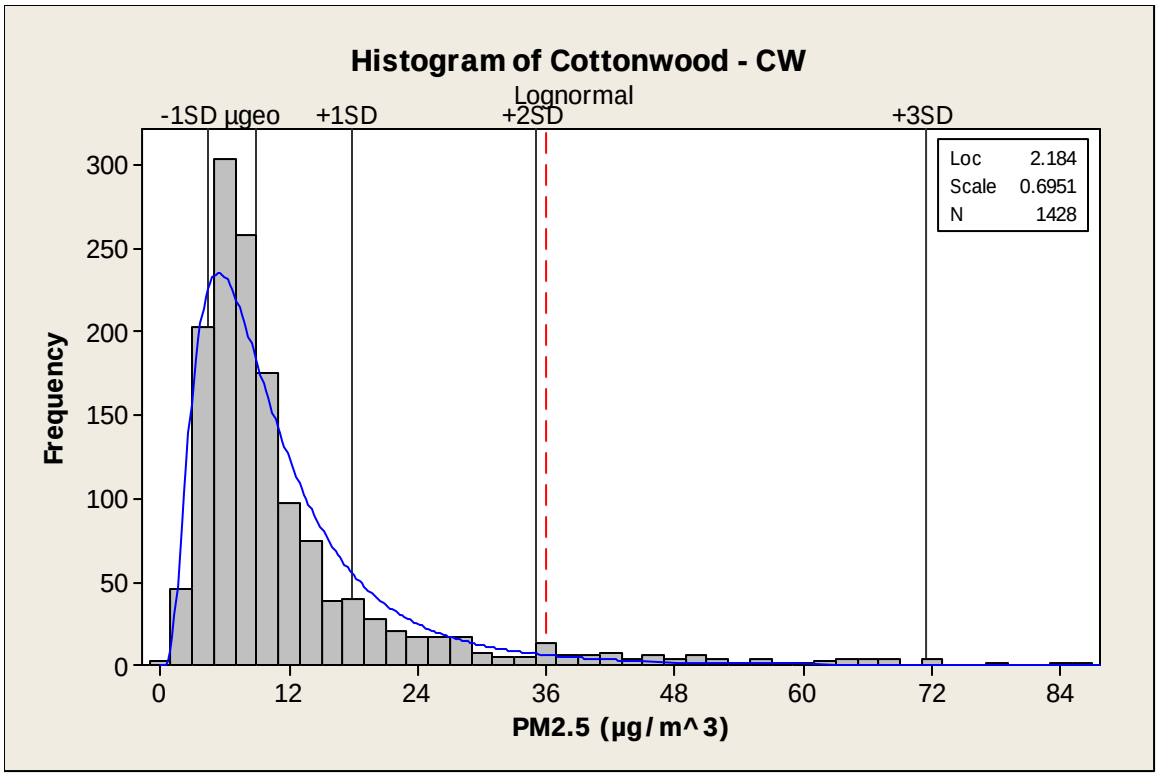
The annual values are far below the April 19th event, which ranged from 36-49.6 µg/m^3.

Cottonwood - CW - 49-035-0003

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

The following are the statistical values:
Geometric Mean (µgeo): Exp(Loc)= 8.88 µg/m^3
Geometric Standard Deviation (σgeo): Exp(Scale)= 2.003
+1 Standard Deviation (+1SD): Exp(Loc +Scale)= µgeo* σgeo= 17.79 µg/m^3
+2 Standard Deviation (+2SD): Exp(Loc +2*Scale)= µgeo* (σgeo)^2= 35.66 µg/m^3
+3 Standard Deviation (+3SD): Exp(Loc +3*Scale)= µgeo* (σgeo)^3= 71.47 µg/m^3

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.



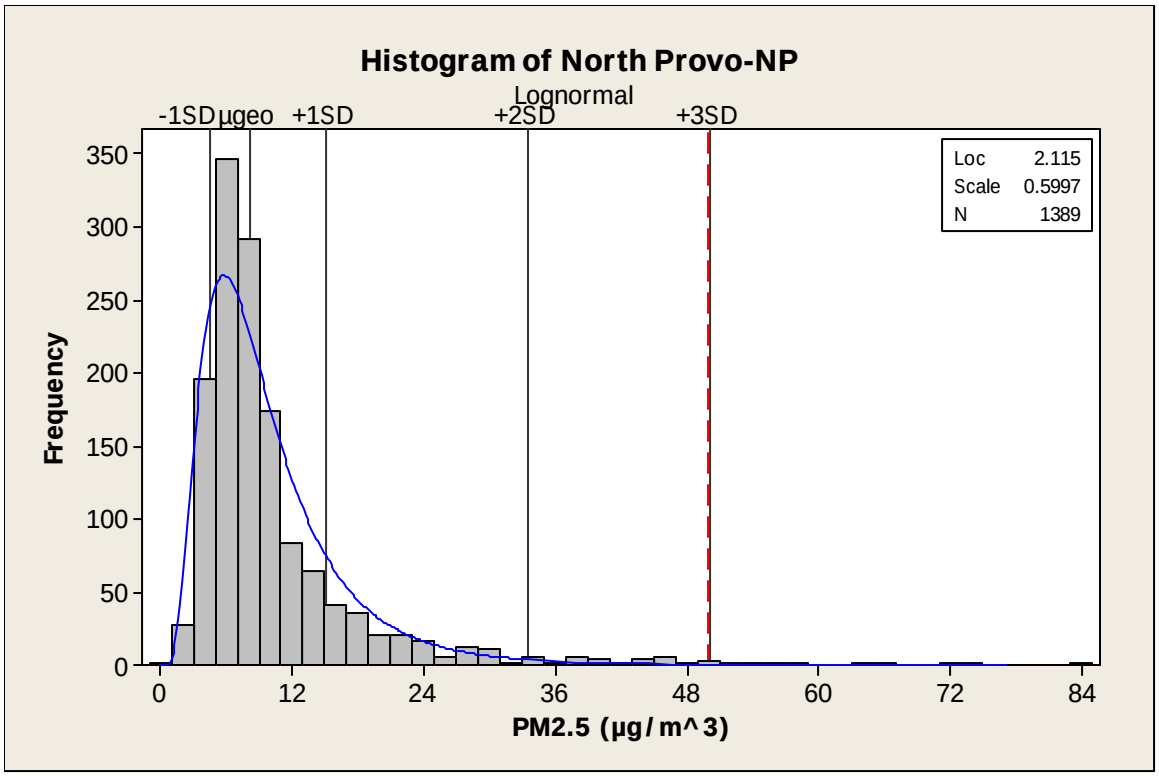
Noting that the normal historical values fall within the lognormal distribution, it is reasonable to utilize plus or minus 2SD above or below the geometric mean as the bounds of normal PM2.5 values. The event value **exceeds 2SD.** The event value is clearly outside the normal historical fluctuation.

North Provo - NP - 49-049-0002

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

The following are the statistical values:
µgeo = 8.28 µg/m^3
σgeo = 1.82
+1SD = 15.10 µg/m^3
+2SD = 33.59 µg/m^3
+3SD = 50.10 µg/m^3

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 PM2.5 values. The event value **approaches 3SD**. The event value is clearly outside the normal historical fluctuation.

PM10

Normal historical fluctuation for PM10 was computed in a three-step process in order to assess whether an observed value is in excess.

First, all historical PM10 values from each monitoring station were aligned 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).

Lindon - LN - 49-049-4001

The data ranking for the Lindon monitoring station data collected from 1993 through 2008 verifies that the PM10 concentration on April 19, 2008, is above the 99th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Hawthorne - HW - 49-035-3006

The data ranking for the Hawthorne monitoring station data collected from 1997 through 2008 verifies that the PM10 concentration on April 19, 2008, is above the 99th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

North Salt Lake - N2 - 49-035-0012

The data ranking for the North Salt Lake monitoring station data collected from 1993 through 2008 verifies that the PM10 concentration on April 19, 2008, is above the 99th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Interquartile Range

The IQR was calculated on a quarterly basis and on a yearly basis.

Lindon - LN - 49-049-4001

The following is the IQR for all Lindon data:

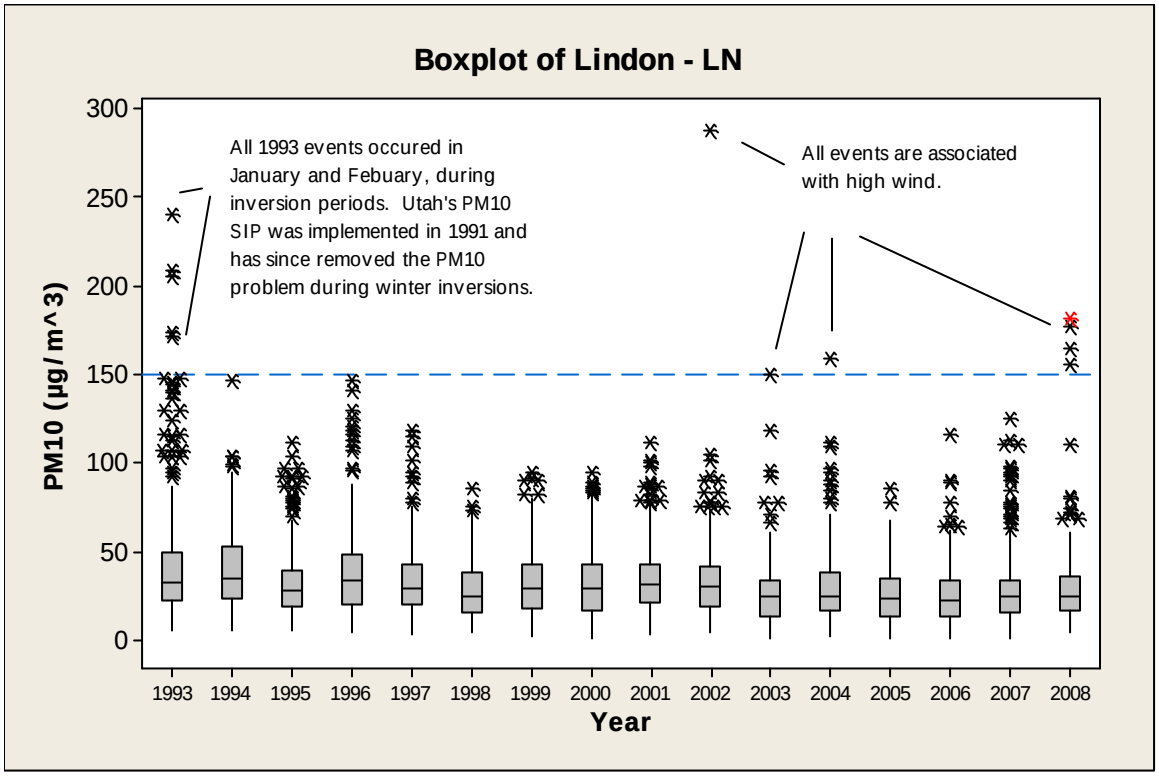
First Quartile (Q1):	17 µg/m^3
Median (Q2):	27 µg/m^3
Third Quartile (Q3):	40 µg/m^3
IQR:	23 µg/m^3

The IQR was calculated on a quarterly basis (shown in Table 5) along with the annual.

Table – 5 Lindon Interquartile (µg/m^3)

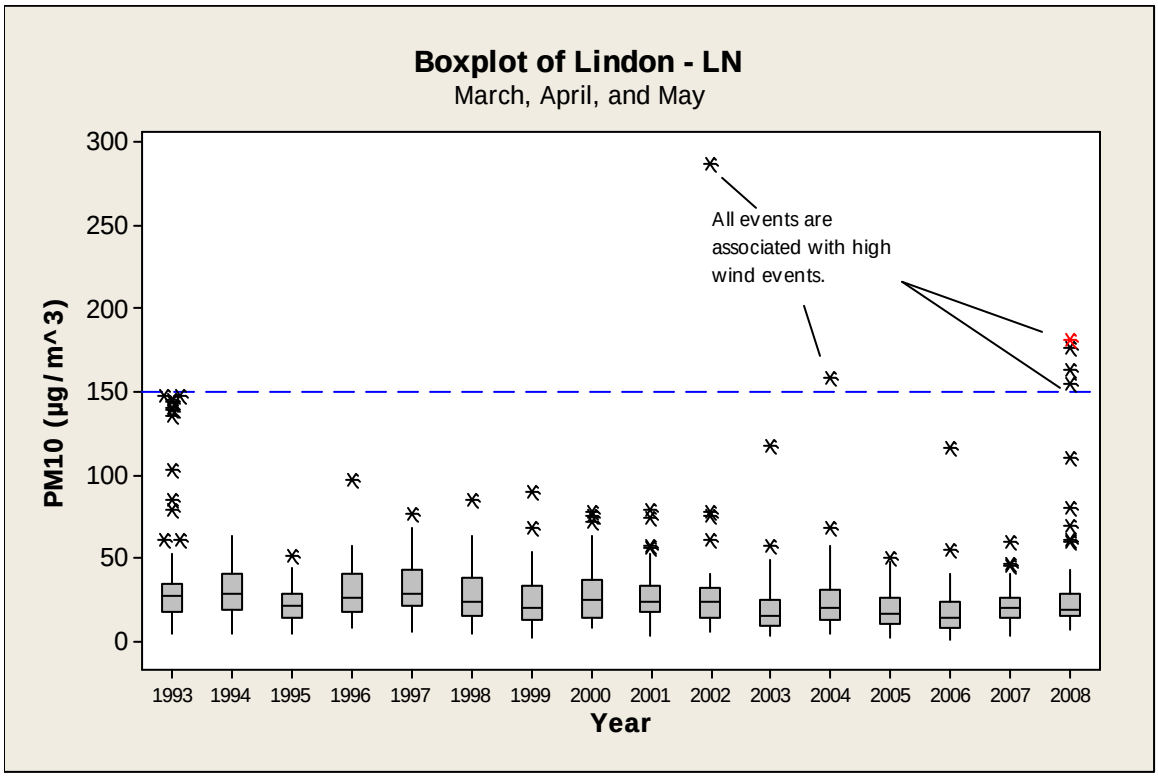
Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	1366	15	27	49	34
2	1423	14	22	32	18
3	1357	25	33	43	18
4	1300	17	26	38	21
All	5446	17	27	40	23

The boxplot presents the historical PM10 values, by year; the event value is marked in red. The blue dashed line represents the current PM10 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). All outliers that exceed the 24hr PM10 standard since 1994 are associated with high winds.

Because this event occurred during the second quarter, it maybe more valuable to only focus on other PM10 values during the same time of the year, March-May. The revised boxplot presents the historical PM10 values, by year, during the 2nd quarter (March-May) of each year. The event value is marked in red. The blue dashed line represents the current PM10 standard.



Again, all events that exceed the current PM10 standard are associated with high wind events.

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

Hawthorne - HW - 49-035-3006

The following is the IQR for all Hawthorne data:

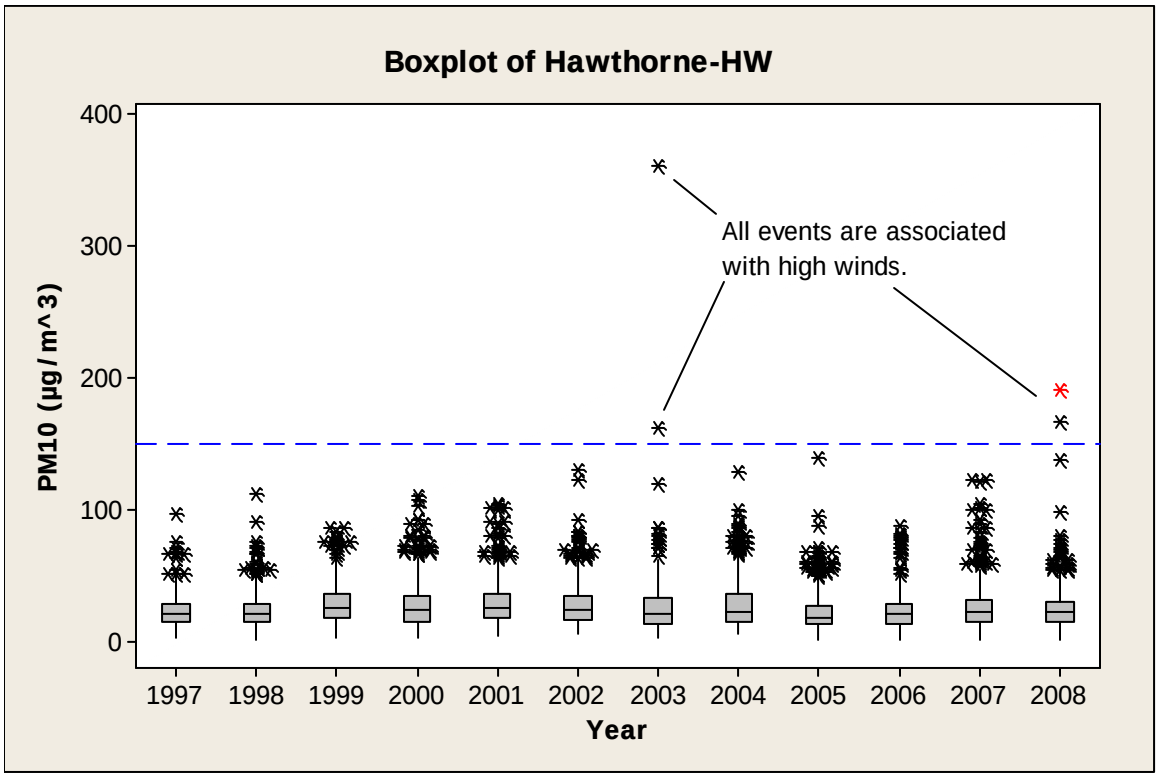
Q1: 16 µg/m^3
Q2: 23 µg/m^3
Q3: 32 µg/m^3
IQR: 16 µg/m^3

The IQR was calculated on a quarterly basis (shown in Table 6) along with the annual.

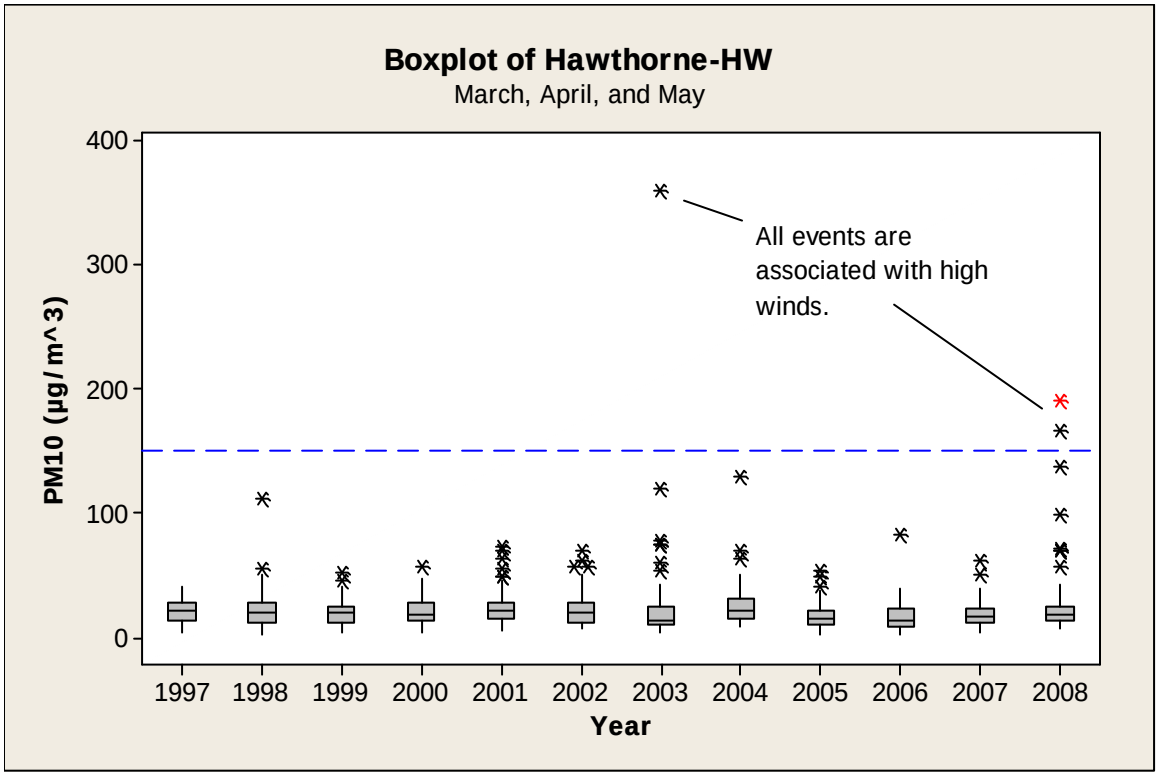
Table – 6 Hawthorne Interquartile (µg/m^3)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	954	17	29	51	34
2	1034	12	18	26	14
3	1039	18	23	30	12
4	1012	16	24	32	16
All	4039	16	23	32	16

The boxplot presents the historical PM10 values, by year; the event value is marked in red. The blue dashed line represents the current PM10 standard.



All outliers that exceed the 24hr PM10 standard are associated with high winds. Because this event occurred during the second quarter, it maybe more valuable to only focus on other PM10 values during the same time of the year, March-May. The revised boxplot presents the historical PM10 values, by year, during the 2nd quarter (March-May) of each year. The event value is marked in red. The blue dashed line represents the current PM10 standard.



Again, all events that exceed the current PM10 standard are associated with high wind events.

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

North Salt Lake - N2 - 49-035-0012

The following is the IQR for all North Salt Lake data:

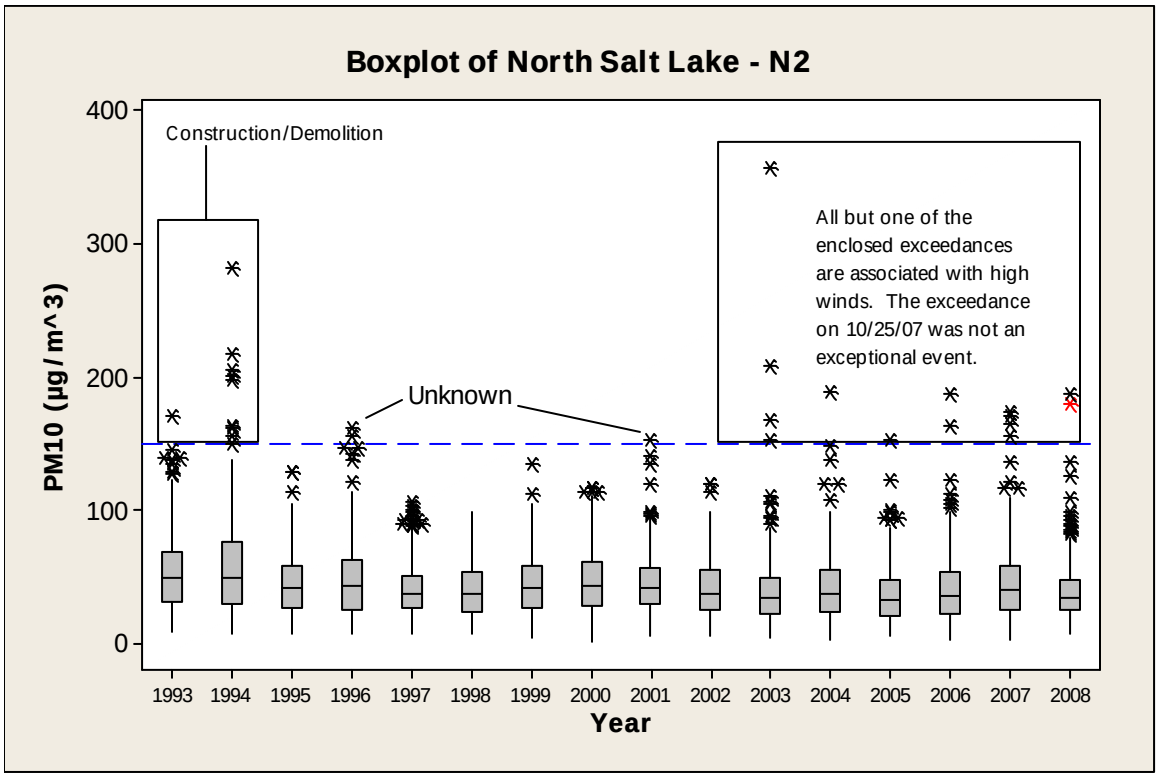
Q1: 25 µg/m^3
Q2: 40 µg/m^3
Q3: 57 µg/m^3
IQR: 32 µg/m^3

The IQR was calculated on a quarterly basis (shown in Table 7) along with the annual.

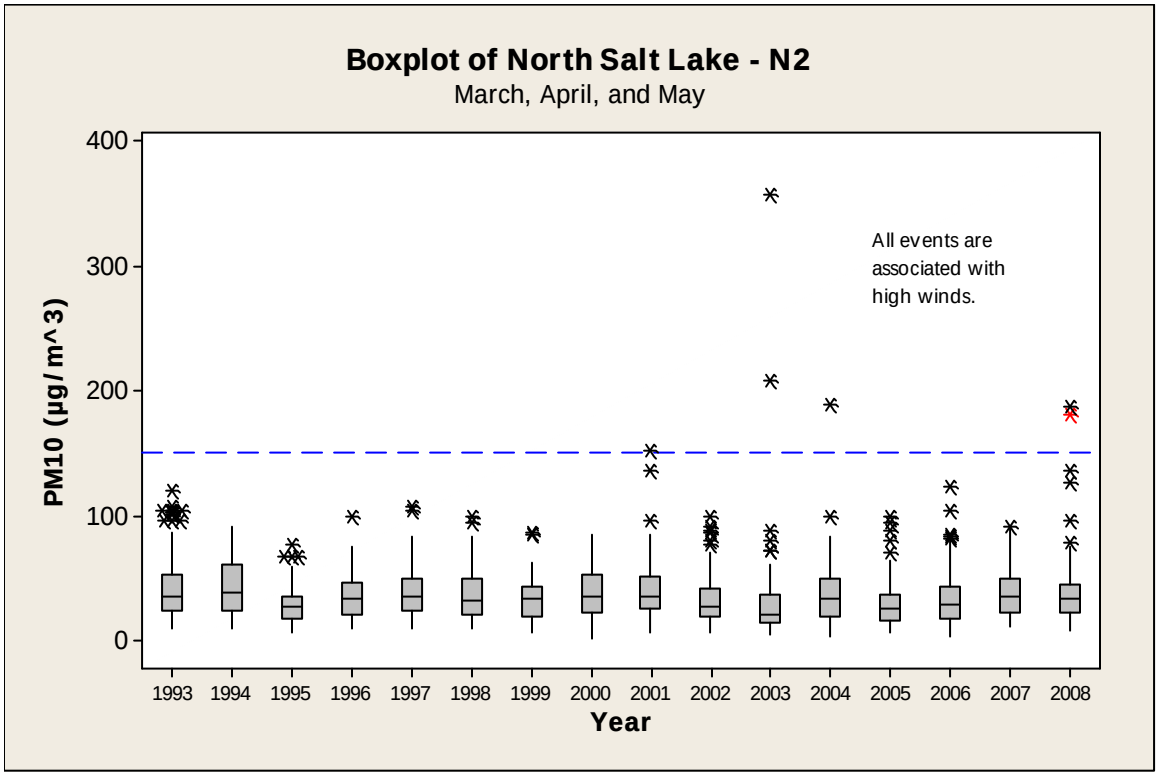
Table – 7 North Salt Lake Interquartile (µg/m^3)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	1295	23	37	59	36
2	1408	20	32	47	27
3	1380	34	46	62	28
4	1349	26	42	62	36
All	5432	25	40	57	16

The boxplot presents the historical PM10 values, by year; the event value is marked in red. The blue dashed line represents the current PM10 standard.



All but one exceedances of the 24hr PM10 standard since 2002 are associated with high winds. Because this event occurred during the second quarter, it maybe more valuable to only focus on other PM10 values during the same time of the year, March-May. The revised boxplot presents the historical PM10 values, by year, during the 2nd quarter (March-May) of each year. The event value is marked in red. The blue dashed line represents the current PM10 standard.



All exceedances of the current PM10 standard since 2002 are associated with high wind events.

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

Lognormal Distribution

Lognormal distribution analysis was conducted to establish the normal historical fluctuations for the four subject stations (inclusive of exceptional event results). The geometric mean (μgeo) was calculated on a quarterly basis (shown in Table 8) and on an annual basis. The annual basis provides the greatest number of data points and is sufficiently similar to the spring quarterly value; thus, the annual geometric mean is used to reflect the normal historical values for the four stations.

Table 8 – Geometric Mean of PM10

Location	Quarter	N Quarterly	μgeo ($\mu g/m^3$)	Annual μgeo ($\mu g/m^3$)
Lindon 01/01/1993 to 12/31/2008	1	1366	26.00	25.38
	2	1423	20.72	
	3	1357	31.72	
	4	1300	24.53	
Hawthorne 03/01/1997 to 12/31/2008	1	954	28.62	22.48
	2	1034	17.57	
	3	1039	22.87	
	4	1012	22.67	
North Salt Lake 01/01/1993 to 12/31/2008	1	1295	35.87	37.42
	2	1408	30.72	
	3	1380	45.24	
	4	1349	39.37	

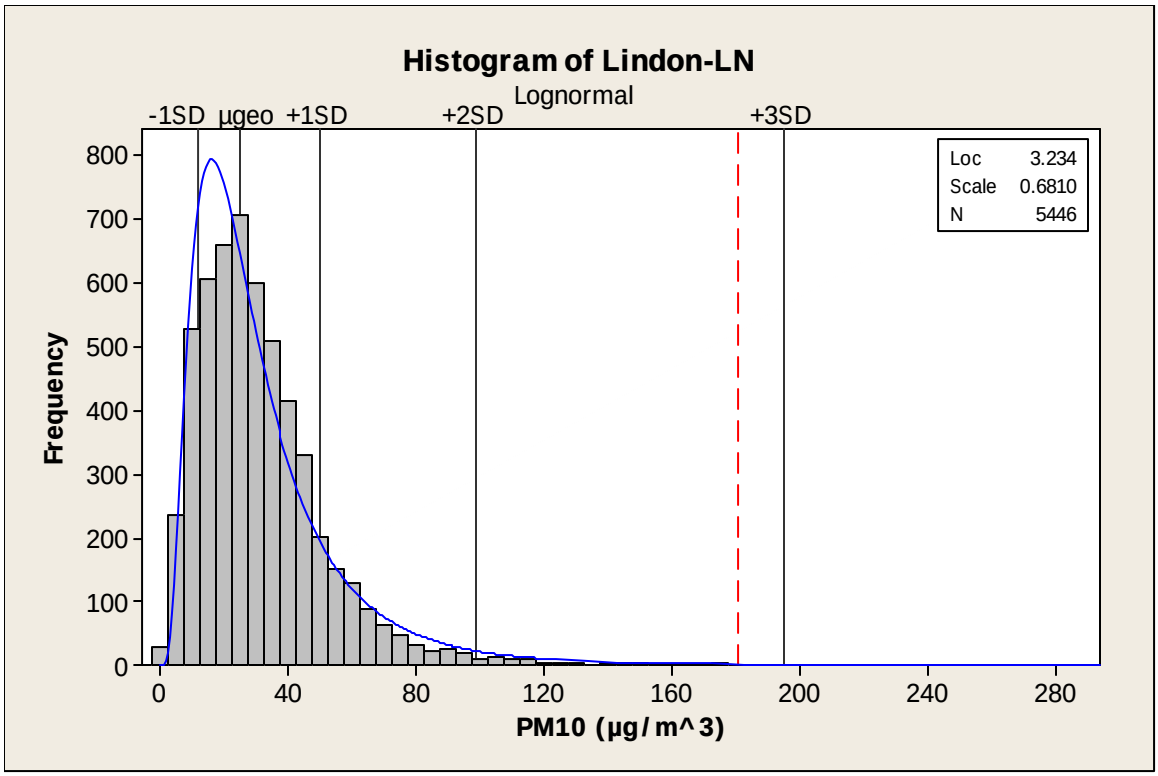
The annual values are far below the April 19th event, which ranged from 164-191 $\mu g/m^3$.

Lindon - LN - 49-049-4001

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 (μgeo): Exp(Loc)=25.38 $\mu g/m^3$
Geometric Standard Deviation (σgeo): Exp(Scale)= 1.9758
+1 Standard Deviation (+1SD): Exp(Loc +Scale)= μgeo* σgeo= 50.14 $\mu g/m^3$
+2 Standard Deviation (+2SD): Exp(Loc +2*Scale)= μgeo* $(\sigma geo)^2$= 99.08 $\mu g/m^3$
+3 Standard Deviation (+3SD): Exp(Loc +3*Scale)= μgeo* $(\sigma geo)^3$= 195.78 $\mu g/m^3$

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.



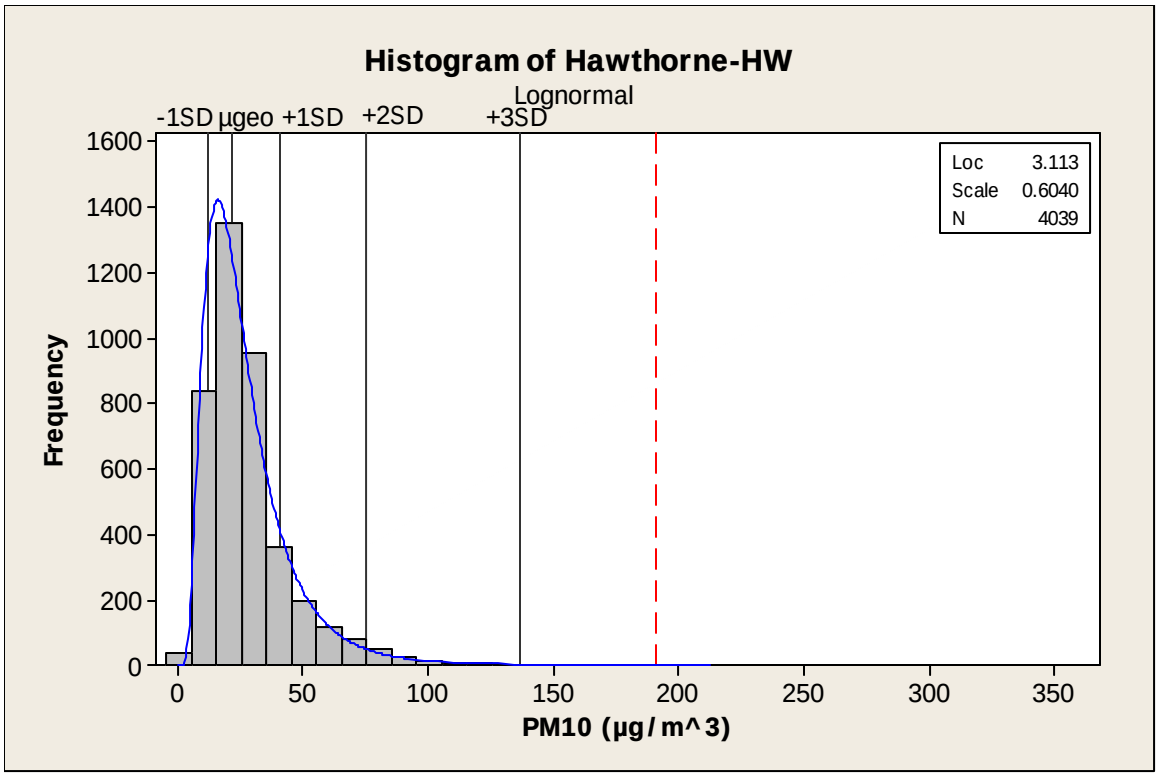
Noting that the normal historical values fall within the lognormal distribution, it is reasonable to utilize plus or minus 2SD above or below the geometric mean as the bounds of normal PM10 values. The event value **approaches 3SD.** The event value is clearly outside the normal historical fluctuation.

Hawthorne - HW - 49-035-3006

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

The following are the statistical values:
μgeo = 22.48 μg/m^3
σgeo = 1.829
+1SD = 41.14 μg/m^3
+2SD = 75.26 μg/m^3
+3SD = 137.68 μg/m^3

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.



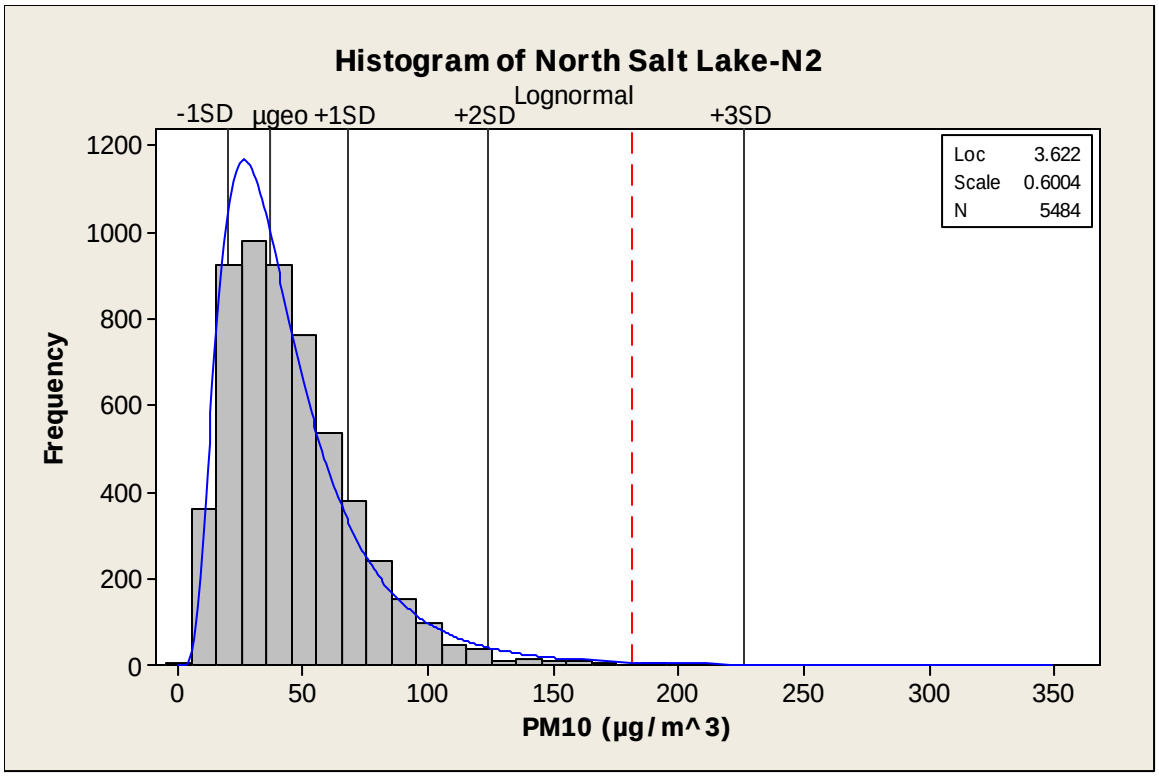
Noting that the normal historical values fall within the lognormal distribution, it is reasonable to utilize plus or minus 2SD above or below the geometric mean as the bounds of normal PM10 values. The event value **exceeds 3SD.** The event value is clearly outside the normal historical fluctuation.

North Salt Lake - N2 - 49-035-0012

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

The following are the statistical values:
μgeo = 37.42 μg/m^3
σgeo = 1.822
+1SD = 68.19 μg/m^3
+2SD = 124.33 μg/m^3
+3SD = 226.60 μg/m^3

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 **approaches 3SD**. The event value is clearly outside the normal historical fluctuation.

Wind Speed

The Exceptional Event Rule requires states to include "a historical typical wind speed levels for the season of the year that the event is claimed" (Federal Register Vol. 71, No. 55, Page 13566).

Regional Airport Data

Table 9 - Average Wind Speed in mph for 1996-2006

Station	Jan	Feb	Mar	Apr	May	Jun	Annual	MesoWest Hourly Average on 4-19-08
Provo	4.9	6.0	7.2	7.9	7.4	7.3	6.3	5.5
Salt Lake City	6.9	7.6	8.9	9.8	9.2	9.6	8.6	13.6

Data Source: Western Regional Climate Center

Ranking

A Ranked method was used to determine if the wind speed measured on April 19, 2008, was outside what is normally observed. All historical wind speeds from each monitoring station was aligned from least to greatest. The location of the effected value in relation to the rest of the historically values is expressed as a percentile (%ile). If we use the same format for wind as was used initially for particulates, it can be extrapolated that "extremely high" measurements are above the 95th%ile and that "typical levels" are closer to the 75th%ile.

Lindon - LN - 49-049-4001

The data ranking for the Lindon monitoring station for data collected since 1993 verifies that the daily maximum of the hourly wind speed measured on April 19, 2008, is above the 96th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Hawthorne - HW - 49-035-3006

The data ranking for the Hawthorne monitoring station for data collected since 1997 verifies that the daily maximum of the hourly wind speed measured on April 19, 2008, is above the 99th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

North Salt Lake - N2 - 49-035-0012

The data ranking for the North Salt Lake monitoring station for data collected since 2005 verifies that the daily maximum of the hourly wind speed measured on April 19, 2008, is above the 98th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Cottonwood - CW - 49-035-0003

The data ranking for the Cottonwood monitoring station for data collected since 1993 verifies that the daily maximum of the hourly wind speed measured on April 19, 2008, is above the 94th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

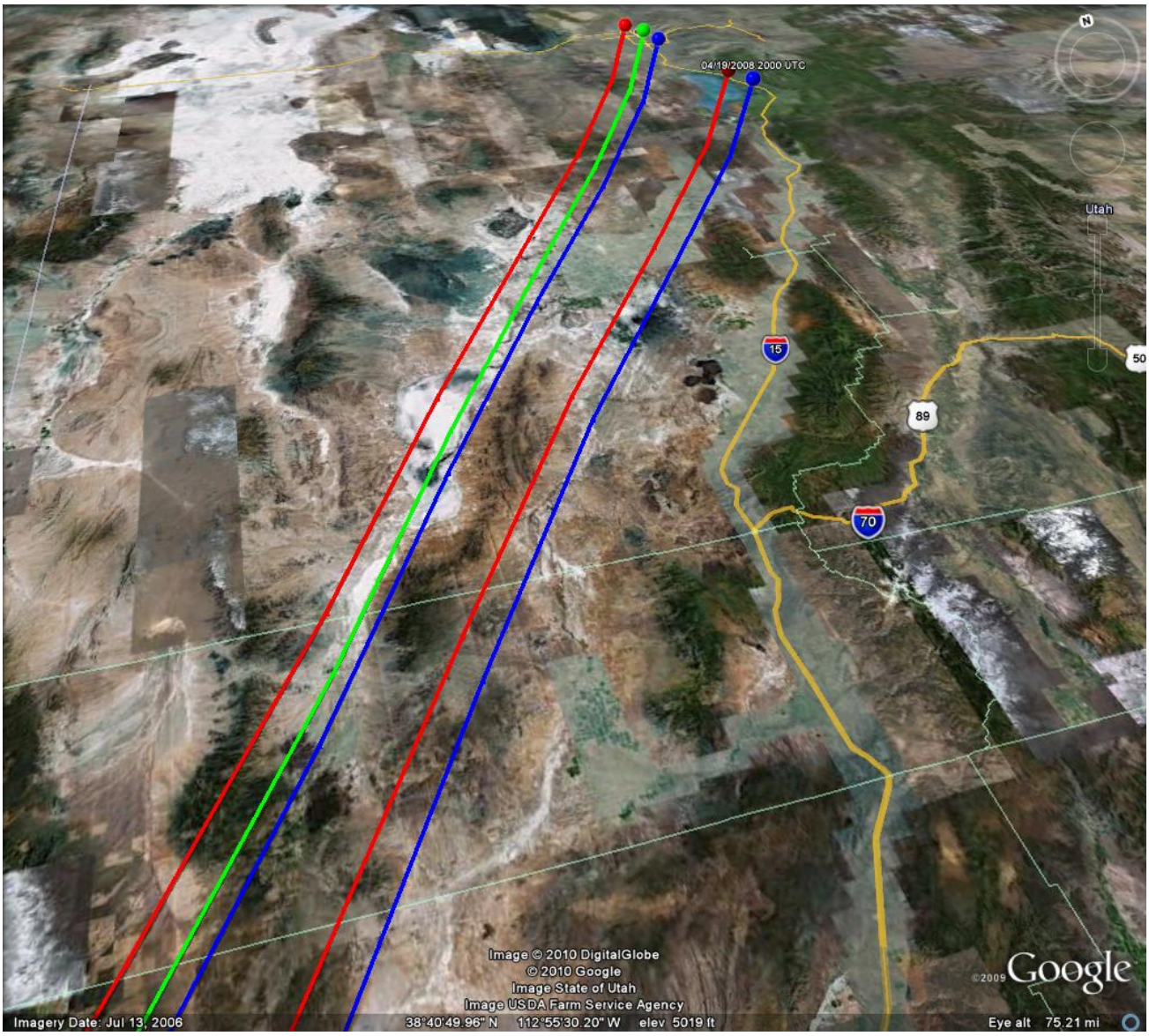
North Provo - NP - 49-049-0002

The data ranking for the North Provo monitoring station for data collected since 1993 verifies that the daily maximum of the hourly wind speed measured on April 19, 2008, is above the 99th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Clear Causal Relationship (40 CFR 50.14)

Trajectory of Impacted Area

Backwards trajectory analysis using the NOAA HYSPLIT model was used to project the winds over 12 hours with an end trajectory at the height of the hourly PM10 and PM2.5 values (04-19-08 14:00 MST). The five stations were modeled (EDAS meteorological data) at 100, 500 and 1000 meters, with similar results for all heights. The 1000 meter trajectory was plotted onto a Google Earth satellite image for visual enhancement of the salt desert playa described in the Soil Resources section.



The light colored areas are salt desert playa. The trajectory crosses Millard, Juab and Utah Counties, consistent with the satellite image of the dust storm and Dr. Steenburgh assessment.

Speciation

Coarse Mass Analysis

Studies conducted in national parks on coarse mass (2.5-10 um) indicate the composition of course mass consists of crustal minerals, carbonaceous material and salts. Sampling sites were selected to be representative of the continental United States and were operated according to IMPROVE protocol analytical procedures. Crustal minerals (soil) were reported to be the single largest contributor, followed by organic mass, nitrates and sulfates.

Crustal Minerals 34-74%
Organic Mass 20-59%
Nitrates 10-12%
Sulfates ≈ 5%
(Malm, et al, 2007).

Crustal minerals – soil minerals SiO_2, Al_2O_3, CaO, Fe_2O_3, K_2O, MgO, FeO, Na_2O, TiO_2, SO_2, P_2O_5 and Ba were tabulated using their elemental components (Pettijohn 1975).

Organic Mass – total carbon analysis is not evaluated because of the interference from the Teflon filter used for PM2.5.

Table 10 – PM2.5 Coarse Mass Analysis

	Lindon Event Day	Hawthorne Event Day	North Provo Event Day	Published Values	Lindon 04/12/08 Pre-event	Bountiful 04/12/08 Pre-event	Difference
Crustal Minerals	40%	36%	38%	34-74%	9.3%	14.8%	30.7
Nitrate	1%	0%	1%	10-12%	37.4%	38.4%	37.1
Sulfate	4%	0%	5%	≈ 5%	10.5%	18.9%	14.9

Notes: Lindon 04/12/08 flagged for holding time.

The laboratory reported zero values for the Hawthorne PM2.5 nitrate and sulfate during the event day, but reported positive values for the corresponding PM10 sample. Thus, this data is suspect; especially since the crustal fraction is in line with the other two event day sites. We assume that the true PM2.5 nitrate and sulfate values for Hawthorne event day are akin to the other sites event day values. The analytical data is presented in Appendix 3.

The last column in Table 10 shows the difference between the highest and lowest values. The differences are extensive, especially for crustal minerals (30.7) and nitrate (37.1). This is not surprising because dust storms entrain particles and nitrates and sulfates are predominately secondary species that are formed from anthropogenic emission sources that would not be present in dust whose origins are desert areas. Nitrate derived from decomposed organic matter is poorly adsorbed to soils and is readily leached. Since organic matter is limited in arid regions and because nitrate levels in soil is normally low, one would expect that arid dust associated with high wind events would be low in nitrate level. Event day nitrate levels were 1% compared to pre-event levels in the 30's.

The California Regional PM10 and PM2.5 Air Quality Study (CRPAQS), Factors Limiting the Formation of Secondary Nitrate and Sulfate, December 10, 2002, is a study of particulate matter (PM) during winter pollution episodes. The report concluded that, "analysis of the chemical composition of PM during winter pollution episodes indicates high levels of nitrate, modest levels of sulfate, and levels of ammonium sufficient for these two anions to exist primarily as ammonium nitrate and ammonium sulfate in atmospheric aerosols. The nitrate and sulfate found in PM are believed to be secondary because there are no known primary emission sources with significant emission rates of these compounds and because there are known chemical reactions that lead to their formation in the atmosphere. The chemical formation of pathways are complex and believed to be dependent on the ambient concentrations of gaseous precursors (VOC, NOx, NH3, HNO3, and SO2) and oxidants (ozone and H2O2), and meteorological factors such as temperature, humidity, fog, precipitation, sunlight, transport winds, and vertical mixing characteristics."

"As a group, the secondary inorganic species (nitrate, sulfate, and ammonium) can account for up to 70% of PM2.5 mass and up to 50% of PM10 mass in extreme wintertime pollution events in California's San Joaquin Valley (SJV). These species represent such a large portion of the PM that it is essential to characterize the factors influencing and, especially, limiting their formation."

The California study concluded that PM nitrate and sulfate are primarily associated with anthropogenic emissions. The Lindon and Bountiful April 12th data substantiates the California study. Consequently, it is reasonable to conclude the low nitrate and sulfate levels measured during this event support the premise that the dust was predominately from natural sources.

No Exceedance or Violation But For the Event

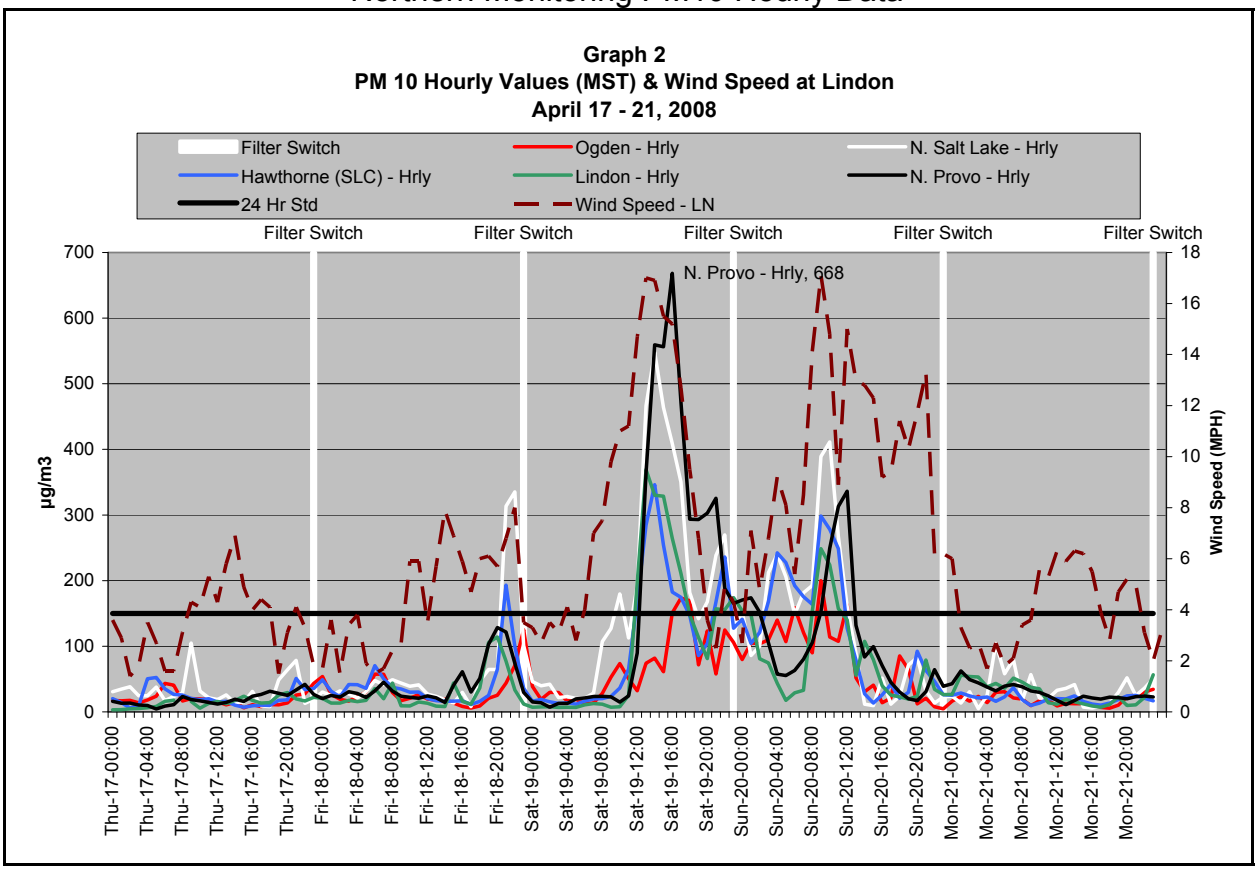
Wind Storm Event

There were no unusual local anthropogenic emissions reported before, during, and after the event. A dust storm that caused PM10 exceedance occurred on April 15. PM levels returned to normal by the 16th.

Figure 5 is a plot of the wind speed measured at the Lindon monitoring station along with the hourly values for the monitoring stations starting on April 17 through April 21, 2008 (MST). We have plotted PM10 levels before and after the event to demonstrate that PM10 levels at all of these stations were below the 24-hr standard of 150 ug/m^3. The wind speeds correlates well with the hourly particulate data (the same is true for PM2.5). If not for the wind storm from the south-southeast, crossing the salt desert playa regions, the PM10 and PM2.5 values would not have exceeded the 24-hr standards.

We substantiate the "but not for" wind storm position based on the demonstration made in the following Mitigation section, that the Utah Division of Air Quality, together with Utah counties and federal agencies, have established reasonably well-controlled dust programs, consistent with EPA guidance. Further, there were no smoke reports or other complaints at the time that would impact the network to this degree. Anthropogenic emissions remained below the 24-hr standard before and after the event with excursions directly associated with gusting winds.

Figure 5 – Lindon Station Wind Speed and
Northern Monitoring PM10 Hourly Data



Clear Causal Relationship and But For the Event Summary

A “clear and casual relationship” and “but for the event” demonstration has been made based on:

- The cold front produced storms with high winds and dust clouds that is a natural event;
- PM10 and PM2.5 concentration patterns correspond directly to the storm event winds showing a direct relationship;
- Backwards trajectory modeling is consistent with interpretations of dust cloud sources made by the Department of Atmospheric Science at the University of Utah and USGS. Dust cloud sources included the Sevier Lake bed and Milford Flat burn scar; and
- Speciation analysis for crustal matter, increase in crustal mass with reduction in nitrate and sulfate mass, is supporting evidence that the source(s) of the PM samples are primarily non-anthropogenic;

Mitigation (40 CFR 51.930)

The Exceptional Events Rule requires states to "take appropriate and reasonable actions to protect public health from exceedances or violations of the national ambient air quality standards." The intent of this section is to describe the State of Utah's dust control and public health protection programs.

Division of Air Quality State Implementation Plan

The Exceptional Events Rule Preamble states that, "where high wind events results in exceedances or violations of the particulate matter standards, EPA proposed that they be treated as natural events if…, and if anthropogenic activities which contribute to particulate matter emissions in conjunction with the high wind event are **reasonably well-controlled**."

The State of Utah has developed a comprehensive program of controls for airborne fugitive dust implemented through existing Utah Air Quality Rules, stationary source permitting, and State Implementation Plans (approved by EPA). This system of control techniques for fugitive dust has been in place since 1992 when the current Utah PM10 SIP was developed. The SIP requires control measures for both specific and general PM10 fugitive dust sources along the Wasatch Front. The SIP process introduced Reasonably Available Control Technology (RACT) and Best Available Control Measures (RACM) for sources that existed prior to the SIP process and required Best Available Control Technology (BACT) for new sources and modifications of existing sources. BACT requirements are enforced through Utah administrative rule R307-401. Since 1992, the state has implemented and continually updated two administrative rules that control fugitive dust throughout the state. R307-205 and R307-309 which, taken together, apply to all significant fugitive dust sources in the state. These rules require each significant fugitive dust source to develop and implement a site-specific fugitive dust control plan. In effect, an approved dust plan defines Best Available Control Measures (BACM) for a source, and provides a flexible mechanism for controlling airborne dust. Under the Utah SIP requirements and the Air Quality Rules, all eligible sources in Utah are subject to emission controls defined by RACT, BACT or BACM.

Control strategies contained in the SIP have been successful as evident by the fact that excluding data impacted by exceptional events, Utah would be in compliance with the PM10 NAAQS.

Utah Air Rules, Permitting

R307-205: Fugitive Emissions and Fugitive Dust

Applies statewide to all sources of fugitive emissions and fugitive dust, except for agriculture or horticultural activities. Fugitive emissions may not exceed 20% opacity. The rule applies to construction activities that disturb an area greater than 1/4 acre in size. The rule also applies to roadway emission controls, mining activities and tailings piles and ponds. While a permit, known as an Approval Order, is not required from the Executive Secretary of the Air Quality Board, steps need to be taken to minimize fugitive dust. Control measures may include; watering, chemical stabilization, synthetic cover,

vegetative cover, windbreaks, minimizing the area of disturbed tailings, restricting the speed of vehicles in and around operations and other techniques approvable by the executive secretary. These control measures are in keeping with the USEPA document titled *Fugitive Dust Background Document and Technical information Document for Best Available Control Measures*.

Treatment effectiveness is based on EPA's AP-42 Factors;

- Section 11.19.1.2 states:

"Wet suppression techniques include application of water, chemicals and/or foam, usually at crusher or conveyor feed and/or discharge points. Such spray systems at transfer points and on material handling operations have been estimated to reduce emissions 70 to 95 percent. Spray systems can also reduce loading and wind erosion emissions from storage piles of various materials 80 to 90 percent. Control efficiencies depend upon local climatic conditions, source properties and duration of control effectiveness. Wet suppression has a carryover effect downstream of the point of application of water or other wetting agents, as long as the surface moisture content is high enough to cause the fines to adhere to the larger rock particles."

- Section 13.2.4.4 "Controls", states:

"Watering and the use of chemical wetting agents are the principal means for control of aggregate storage pile emissions. Enclosure or covering of inactive piles to reduce wind erosion can also reduce emissions. Watering is useful mainly to reduce emissions from vehicle traffic in the storage pile area. Watering of the storage piles themselves typically has only a very temporary slight effect on total emissions. A much more effective technique is to apply chemical agents (such as surfactants) that permit more extensive wetting. Continuous chemical treating of material loaded onto piles, coupled with watering or treatment of roadways, can reduce total particulate emissions from aggregate storage operations by up to 90 percent."

Table B.2-3

Particle Size:	0 - 2.5	2.5 - 6	6 - 10
Efficiency: Dust suppression by water sprays	40%	65%	90%
Efficiency: Dust suppression by chemical stabilizer or wetting agents	40%	65%	90%

R307-309: Nonattainment and Maintenance Areas for PM10: Fugitive Emissions and Fugitive Dust.

Establishes minimum work practices and emission standards for sources of fugitive emissions and fugitive dust for sources listed in the State SIP or located in a PM10 nonattainment and maintenance areas to meet the reasonably available control measures for PM10. A fugitive dust control plan must be submitted to the Executive Secretary at the Utah Division of Air Quality for review and approval prior to commencement of a project.

For temporary aggregate processing projects, portable permits are issued for the specific equipment. A permit application, known as a Notice of Intent must be submitted to the Executive Secretary at the Utah Division of Air Quality before project initiation and must include a dust control plan.

Fugitive emissions from stationary sources may not exceed 15%. Opacity caused by fugitive dust must not exceed 10% at a property boundary and 20% on site, with the exclusion when wind speed exceeds 25 mph and the owner/operator is taking appropriate actions to control fugitive dust. Appropriate measures include an approved dust control plan.

Any person owning or operating a new or existing source of fugitive dust, including storage, hauling or handling operations, or engaging in clearing or leveling of land one-quarter acre or greater in size, earthmoving, excavation, or movement of trucks or construction equipment over cleared land one-quarter acre or greater in size or access haul roads, or engaging in demolition activities including razing homes, buildings or other structures shall submit a plan to control fugitive dust to the executive secretary no later than 30 days after the source becomes subject to R307-309. The plan shall address fugitive dust control strategies for the following operations as applicable:

- Material Storage;
- Material handling and transfer;
- Material processing;
- Road ways and yard areas;
- Material loading and dumping;
- Hauling of materials;
- Drilling, blasting and pushing operations;
- Clearing and leveling;
- Earth moving and excavation;
- Exposed surfaces;
- Any other source of fugitive dust;
- Strategies to control fugitive dust may include;
- Wetting or watering;
- Chemical stabilization;
- Enclosing or covering operations;
- Planting vegetative cover;
- Providing synthetic cover;
- Wind breaks;
- Reducing vehicular traffic;
- Reducing vehicular speed;
- Cleaning haul trucks before leaving loading area;
- Limiting pushing operations to wet seasons;
- Paving or cleaning road ways;
- Covering loads;
- Conveyor systems;

- Boots on drop points;
- Reducing the height of drop areas;
- Using dust collectors;
- Reducing production;
- Mulching;
- Limiting the number and power of blasts;
- Limiting blasts to non-windy days and wet seasons;
- Hydro drilling;
- Wetting materials before processing;
- Using a cattle guard before entering a paved road;
- Washing haul trucks before leaving the loading site;
- Terracing; or
- Cleaning the materials that may create fugitive dust on a public or private paved road promptly; or Preventing, to the maximum extent possible, material from being deposited onto any paved road other than a designated deposit site.

Each source must comply with all provisions of the fugitive dust control plan as approved by the executive secretary.

Any person owning, operating or maintaining a new or existing material storage, handling or hauling operation must prevent, to the maximum extent possible, material from being deposited onto any paved road other than a designated deposit site. Any such person who deposits materials that may create fugitive dust on a public or private paved road must clean the road promptly.

Any person engaging in clearing or leveling of land with an area of one-quarter acre or more, earthmoving, excavating, construction, demolition, or moving trucks or construction equipment over cleared land or access haul roads must prevent, to the maximum extent possible, material from being deposited onto any paved road other than a designated deposit site. Any such person who deposits materials that may create fugitive dust on a public or private paved road shall clean the road promptly.

Any person responsible for construction or maintenance of any existing road or having right-of-way easement or possessing the right to use the same whose activities result in fugitive dust from the road must minimize fugitive dust to the maximum extent possible. Any such person who deposits materials that may create fugitive dust on a public or private paved road must clean the road promptly.

Unpaved Roads - any person responsible for construction or maintenance of any new or existing unpaved road must prevent, to the maximum extent possible, the deposit of material from the unpaved road onto any intersecting paved road during construction or maintenance. Any person who deposits materials that may create fugitive dust on a public or private paved road must clean the road promptly.

Any person who owns or operates a mining operation shall minimize fugitive dust as an integral part of site preparation, mining activities, and reclamation operations. The fugitive dust control measures to be used may include:

- Periodic watering of unpaved roads;
- Chemical stabilization of unpaved roads;
- Paving of roads;
- Prompt removal of coal, rock minerals, soil, and other dust-forming debris from roads and frequent scraping and compaction of unpaved roads to stabilize the road surface;
- Restricting the speed of vehicles in and around the mining operation;
- Revegetating, mulching, or otherwise stabilizing the surface of all areas adjoining roads that are a source of fugitive dust;
- Restricting the travel of vehicles on other than established roads;
- Enclosing, covering, watering, or otherwise treating loaded haul trucks and railroad cars, to minimize loss of material to wind and spillage;
- Substitution of conveyor systems for haul trucks and covering of conveyor systems when conveyed loads are subject to wind erosion;
- Minimizing the area of disturbed land;
- Prompt revegetation of regraded lands;
- Planting of special windbreak vegetation at critical points in the permit area;
- Control of dust from drilling, using water sprays, hoods, dust collectors or other controls approved by the executive secretary;
- Restricting the areas to be blasted at any one time;
- Reducing the period of time between initially disturbing the soil and revegetating or other surface stabilization;
- Restricting fugitive dust at spoil and coal transfer and loading points; or
- Control of dust from storage piles through use of enclosures, covers, or stabilization and other equivalent methods or techniques as approved by the executive secretary, or Other techniques as determined necessary by the executive secretary.

Any person owning or operating an existing tailings operation where fugitive dust results from grading, excavating, depositing, or natural erosion or other causes in association with such operation must take steps to minimize fugitive dust from such activities. Such controls may include:

- Watering,
- Chemical stabilization,
- Synthetic covers,
- Vegetative covers,
- Wind breaks,
- Minimizing the area of disturbed tailings, or
- Restricting the speed of vehicles in and around the tailings operation, or other equivalent methods or techniques which may be approvable by the executive secretary.

Utah R307-202-3
Prohibits burning of trash and other waste and salvage operations by open burning. Persons/agencies wishing to open burn tree cuttings, slash in forest areas etc., must seek a permit from DEQ that include control measures.

Compliance

The seven DEQ inspectors conduct daily surveillance inspections and have been advised to include in their routes dust prone areas and areas with particularly dust prone industries, such as aggregate industries (quarries, concrete manufacturing, etc.) during the dust season. Construction sites are also subject to inspection and verification.

A Compliance Advisory Notice is delivered to sources that appear to be out of compliance and provides an opportunity for DEQ and the regulated source to discuss the findings of the inspection. If a source is issued a Compliance Advisory Notice and responds by promptly returning to compliance, a reduced penalty may be offered for their expedient cooperation (fines are $2,000-7,000 for dust violations). Dust control violations are typically quickly resolved upon receipt of a Compliance Advisory Notice. However, the DEQ is able to proceed with Notice of Violations and Order to Comply if necessary.

2009 DEQ Compliance Summary

TASK	2009
Annual Inspections Completed (19 inspectors)	978
Temporary Relocations Accepted	103
Fugitive Dust Control Plans Accepted, Mostly Construction	**57**
Complaints Received	149
VOC Inspections	73
Warning Letters	16
Notices of Violations	3
Compliance Advisories, 7 Directly Related to Dust	65
Settlements	43
Penalties Assessed	$569,543
85% Compliance measured via inspections, reports and stack testing	

Mobile Sources Particulate Reduction

Automotive Inspection Maintenance Program

Utah is required by Section 182 of the Clean Air Act to implement an inspection maintenance program in Salt Lake County that is at least as effective as the EPA's Basic Performance Standard. Salt Lake County began its program in 1984. The program exceeds the Basic inspection maintenance performance standard for all pollutants and in doing so, mitigates PM.

Utah Clean Diesel Program

Agriculture: Diesel engines are a major source of pollution, emitting particulates, amongst other pollutants. DAQ applied for and received $750,000 from the American Recovery and Reinvestment Act to replace 11 agricultural vehicles and equipment, repower 21 engines in agricultural vehicles and equipment, and install 30 Auxiliary Power Units on agricultural vehicles. DAQ collaborated with the Utah Department of Agriculture and Food and Utah State University to identify agricultural operators whose operations are negatively impacting non-attainment areas in the state. The project's scope of replacing, repowering, and installing more fuel efficient technology on agricultural vehicles and equipment will ensure that stricter emissions standards requirements are met and yield more diesel fuel conservation.

School Bus Project: In 2007, DAQ started the Utah Clean School Bus Project in conjunction with Utah Office of Education, local school districts, county and municipal governments, as well as community and non-profit organizations. This coalition is working together to secure funding sources for school districts to purchase emission reducing technologies for buses statewide. The application of these technologies is expected to reduce particulate matter by 30%. A total of 1,179 buses have been retrofitted.

Clean Diesel Trucking Initiative: DAQ initiated the Clean Diesel Grant Program to install APUs (Auxiliary Power Units) on 48 long-haul tractors that will reduce diesel emissions and fuel usage from diesel-powered, long-haul trucks that travel and idle within the non-attainment areas of the Wasatch Front. The funding was provided by a State allocation of $352,941 through EPA's National Clean Diesel Campaign and a State match of $235,294, for a total of $588,235. EPA awarded DAQ a grant in 2010 to continue installation of APUs.

Clean Fuel Vehicle Tax Credit and Loan Program

The Utah Clean Fuels and Vehicle Technology Grant and Loan Program, funded through the Clean Fuels and Vehicle Technology Fund, provides grants to assist businesses and government entities in covering:

1) The cost of converting a vehicle to operate on clean fuels.
2) The incremental cost of purchasing an Original Equipment Manufacturer (OEM) clean fuel vehicle.

3) The cost of retrofitting diesel vehicles with EPA verified closed crankcase filtration devices, diesel oxidation catalysts, and/or diesel particulate filters.

The Clean-Fuels Grant and Loan Program also provides loans for the cost of converting a vehicle to operate on a clean fuel, for the purchase of OEM clean fuel vehicle, and for the purchase of fueling equipment for public/private sector business and government vehicles. Finally, the program can provide grants and loans to serve as matching funds for federal and non-federal grants for the purpose of converting vehicles to operate on a clean fuel, purchasing OEM clean fuel vehicles, or retrofitting diesel vehicles.

Smoking Vehicles

Vehicles emitting excessive smoke contribute to airborne particles. Five local health departments (Cache, Davis, Salt Lake, Utah and Weber Counties) operate smoking vehicle education and notification programs. People who spot a vehicle producing excessive smoke can report it through their respective county health department.

In 2009, 724 vehicles were reported to Salt Lake County Health Department alone. The County issued 490 notices.

Utah Clean City

Utah's Clean Cities Coalition is one of 85 coalitions around the country that's part of the U.S. Department of Energy's strategy to reduce America's dependence on imported foreign oil. The Utah coalition sponsored Idle Free Awareness Week which included educating school bus drivers on the air quality value of limiting idling.

Variable Message Signage

The Utah Department of Transportation (UDOT), in conjunction with the DEQ air quality forecasting program, issues air quality warnings on electronic message boards placed along Utah's highways. The signage asks drivers to limit their driving on high alert days. An informal study conducted this winter by UDOT during 6-days with and without air quality alerts indicates that there was a 3-5% auto traffic reduction (per Glen Blackwelder, UDOT Traffic Operations Engineer).

Division of Air Quality Community Outreach

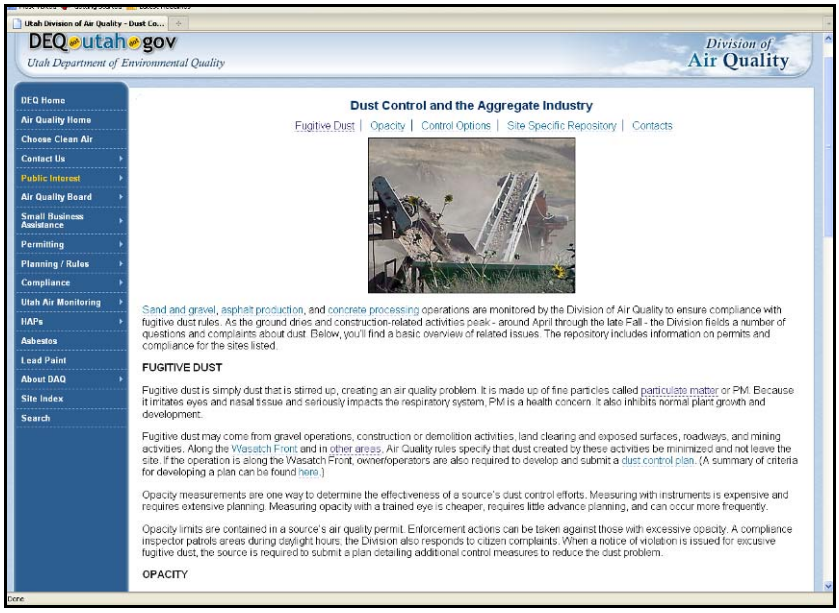
Choose Clean Air

An interactive source of information about ways individuals can help improve air quality by making smart choices in their personal lives can be found on the DEQ website. The site includes 50 suggestions for daily life.

The UDEQ also offers an electronic mail server (Listserv). Subscribers are automatically notified by e-mail when unhealthy air pollution levels are forecast for the Wasatch Front.

Dust Control Education

The DEQ website includes a page on dust control and the aggregate industry. The page is intended to educate the public about dust, control methods and community aggregate locations near them by providing links to aggregate firms Approval Orders containing fugitive dust control conditions.



Clean Utah

DEQ is committed to working with businesses to ensure the ongoing protection of public health and the environment. Clean Utah is a program that encourages and rewards business and other permit holders for going beyond compliance to preserve and protect Utah's environment. Compliance assistance include: common compliance problems, permitting information, spill reporting, small business assistance and providing tools for business, for example: pollution prevention and best management practices (please refer to sample pamphlet below).


1 Preservation of Existing Vegetation
• Minimize clearing and the amount of exposed soil.
• Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
• Protect streams, stream barriers, wild wood lands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas.
2 Construction Phasing
• Sequence construction activities so that the soil is not exposed for long periods of time.
• Schedule or limit grading to small areas.
• Install key sediment control practices before site grading begins.
• Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.
3 Construction Entrances
• Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
• Make sure that the construction entrance does not become buried in soil.
• Properly site entrance BMPs for all anticipated vehicles.
4 Silt Fencing
• Inspect and maintain silt fences after each storm.
• Make sure the bottom of the silt fence is buried.
• Securely attach the material to the stakes.
• Don't place silt fences in the middle of a waterway or use them as a check dam.
• Stormwater should not flow around the silt fence.
TOP TEN BMPs
for Pollution Prevention at the Construction Site
For More Information on Pollution Prevention and Construction BMPs contact:
Utah Department of Environmental Quality
www.deq.utah.gov/construction
Environmental Hotline: 1-800-458-0145
5 Storm Drain Inlet Protection
• Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
• Make sure the rock size is appropriate (usually 1 to 2 inches in diameter).
• If you use inlet filters, maintain them regularly.
6 Vegetative Buffers
• Protect and install vegetative buffers along waterbodies to slow and filter stormwater run-off.
• Maintain buffers by mowing or replanting periodically to ensure their effectiveness.
7 Site Stabilization
• Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.
8 Equipment Fueling and Containment
• Use offsite fueling stations as much as possible, or dedicated fueling areas onsite.
• Discourage "topping-off" of fuel tanks.
• Dedicated fueling areas should be level, protected from stormwater, and located at least 50 ft from downstream drainage facilities and watercourses.
• Protect fueling areas with berms and dikes to prevent run-on, run-off, and to contain spills.
• Use vapor recovery nozzles with automatic shutoffs to control drips as well as air pollution.
9 Waste Management
• Choose smaller containers and more frequent collection. Do not allow waste to accumulate on-site.
• Separate recyclable materials from waste.
• Conduct visual inspections of dumpsters and recycling bins and remove contaminants.
• Stockpile processed materials on-site separately. Place, grade, and shape stockpiles to drain surfacewater. Cover to prevent windblown dust.
10 Fugitive Dust Suppression
• Apply water on haul roads.
• Haul materials in properly tarped or sealed containers.
• Restrict vehicle speeds to 10 mph.
• Cover excavated areas and material after excavation activity ceases.
• Reduce the excavation size and/or number of excavations.
• Water-down equipment and excavation faces.

Resource Development Coordinating Committee (RDCC)

The RDCC is a clearinghouse for information and coordination of state response on activities affecting state and public lands (including federal lands) throughout Utah. The RDCC includes representatives from the state agencies that are involved or impacted by public lands management. The RDCC coordinates the review of technical and policy actions that may affect the physical resources of the state and facilitates the exchange of information on those actions among federal, state, and local government agencies. The types of projects that are submitted for RDCC approval include oil and gas drilling and exploration, stream alteration, natural gas pipelines, transportation and construction projects of all sorts, forest fuel management, potable water management projects and recreational project development. The DEQ is a permanent agency member of the RDCC and as such, RDCC project approvals must include DEQ concurrence. Since the vast majority of the projects submitted for RDCC approval are of substantial size and scope, most projects include soil disturbance with the potential to generate fugitive dust. The DEQ assures that all projects receiving RDCC approval with the potential to generate fugitive dust include conditions that the projects will meet Utah air quality regulations and include fugitive dust management plans.

DEQ RDCC Project Reviews

Year	Projects Reviewed
2004	533
2005	1236
2006	1245
2007	1256
2008	1251
2009	810
Total	**6331+**

Division of Water Quality

The Utah Division of Water Quality is responsible for a variety of programs that monitor, assess, and protect the surface and ground waters of the state. These programs overlap with the DEQ, to some degree, in regard to soil and sediment nonpoint sources pollution prevention.

UPDES Storm Water General Permit for Construction Activities

Utah R317-8-3.9(6)(d)(l0) and R317-8-3.9(6)(e)(l), require a Utah Pollution Discharge Elimination System (UPDES) storm water permit when construction activities disturb one or more acres of land. Permit requirements include the development and approval of a pollution prevention plan (PPP) to control and mitigate erosion and sediment migration. The PPP must include slope and wind erosion controls for material piles at construction sites.

Nonpoint Source Pollution 319 Program

Section 319 of the Clean Water Act deals with nonpoint sources (NPS) of pollution. Land use activities such as agricultural production, road and building construction, mining, and forestry operations can all potentially be NPS polluters. The 1987 reauthorization of the Clean Water Act authorized the U.S. Environmental Protection Agency to fund individual state programs designed to control and eliminate NPS problems. Utah's Nonpoint Source Task Force has spent the past decade or more setting up local areas of the state to take on demonstration projects in specific watershed areas. Some of the largest watershed efforts have taken place in the Little Bear River in Cache County, Chalk Creek in Summit County, and Otter Creek in Piute and Sevier counties.

Agriculture

Recognizing the problems associated with soil erosion on agricultural cropland, rangeland and other environmentally sensitive cropland areas, the U.S. Department of Agriculture (USDA) included conservation provisions in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The conservation provisions of the legislation are designed to assist farmers and ranchers with a number of voluntary programs including cost-share, land rental, incentive payments, and technical assistance. The conservation programs of the Farm Bill are administered by the NRCS.

The Farm Bill legislation created and reauthorized three programs that are designed to reduce erodible land:

- Conservation Reserve Program (CRP)
- Conservation Survey Program (CSP)
- Environmental Quality Incentives Program (EQIP)

The Conservation Reserve Program (CRP) encourages farmers to enter into contracts with USDA to place erodible cropland and other environmentally sensitive land into long-term conservation reserve. The reserves are generally 10 to 15 years in duration and the reserve is established by the implementation of environmental practices to reduce soil erosion.

The CRP systematically reduces soil erosion by planting vegetative cover on highly erodible lands (HEL). In Utah, HEL soils are normally on steeper valley side slopes subject to erosion from washing or open areas vulnerable to high wind events. In exchange, landowners receive annual rental payments for the land and cost-sharing assistance for the established practices. In the early years of the program, the emphasis was on HEL soils. Since 1996, there is an additional authorization to address wild life habitat and air quality. The more recent authorization includes additional conservation practices including windbreaks, riparian buffers and wetland mitigation which are instrumental in reducing soil erosion. Furthermore, the USDA and DEQ conducted an analysis of eligible parcels for the 2010 awards to preferentially select parcels that are in or adjacent to nonattainment areas in order to maximize program benefits. **There are 127,262 acres in this program in Utah**.

The Conservation Security Program (CSP) is a newer approach to agricultural land protection authorized under the 2002 Farm Bill that rewards agricultural producers who have already undertaken conservation practices and commit to additional efforts. The CSP program, unlike other conservation programs, is available on pasturland, rangelands and all types of cropland including orchards, vegetable, and dry agriculture prevalent in Utah. The program has designated three watershed areas as eligible to participate in the program including two, Lower Bear-Malad (Cashe County) and San Pitch Watershed (Sanpete County) that are within the north and south high-wind corridors identified by DAQ' source attribution model. **There are 232,847 acres in the CSP program in Utah.**

Payments to fund good stewardship

Published: Thursday, June 10, 2010 11:59 p.m. MDT

SALT LAKE CITY — Ranchers, farmers and owners of private Forest Service land are among those who can apply for payments that recognize the practice of good stewardship over the land. Authorized in the 2008 Farm Bill, the Conservations Stewardship program is a voluntary incentive to maintain good stewardship and encourage expansion of conservation practices. Applications will be scored, ranked and funded after the June 25 enrollment deadline. The program pays participants for conservation performance — the higher the performance, the higher the payment. Producers get credit both for conservation measures they have already implemented and for new measures they agree to add. The program is available to all producers, regardless of operation size, crops produced or geographic location. Eligible lands include cropland, pasture land, rangeland, nonindustrial private forest land and agricultural land under the jurisdiction of an American Indian tribe. Potential applicants are encouraged to use the program's self-screening checklist to determine whether it is suitable for their operation. The checklist — which highlights basic information about eligibility requirements, contract obligations and payments — and additional information may be obtained at www.nrcs.usda.gov/programs/new_csp/csp.html.

— Amy Joi O'Donoghue

Payments to fund good stewardship | Deseret News Page 1 of 1

http://www.deseretnews.com/article/print/700039445/Payments-to-fund-good-stewardship.... 6/14/2010

The Environmental Quality Incentives Program (EQIP) is a voluntary program that assists farmers and ranchers, who face existing soil and water resource degradation. The EQIP promotes agricultural production in a manner that allows producers to meet federal, state and local environmental requirements. Some of the stated aims of the program are as follows:

- Reduction of non-point source pollution, such as nutrients, pesticides;
- Reduction of emissions including particulate matter, nitrogen oxides, ozone precursors, and volatile organic compounds that can contribute to degradation air quality standards; and
- Reduction in soil erosion and sedimentation on agricultural lands.

In general, NRCS programs encourage agricultural practices that improve topsoil and prevent wind blown dust during high-wind events. Notable examples of techniques and practices advocated include:

- Planting of cover crops and perennials to protect agricultural soils with emphasis on HEL soils;
- NRCS encourages the use of perennial crops and existing weeds on corners and non-utilized areas of agricultural land to resist soil erosion;
- NRCS "costs shares" on conservation practices with local farmers to prevent soil erosion; and
- NRCS works with Utah State University to identify agricultural techniques and practices to minimize soil erosion.

A primary aim of this process is to reduce soil erosion on agricultural land, which in turn reduces wind blown dust during high-wind events. This program is open to attainment and nonattainment areas in Utah. **There are 1,133,687 acres in this program in Utah.**

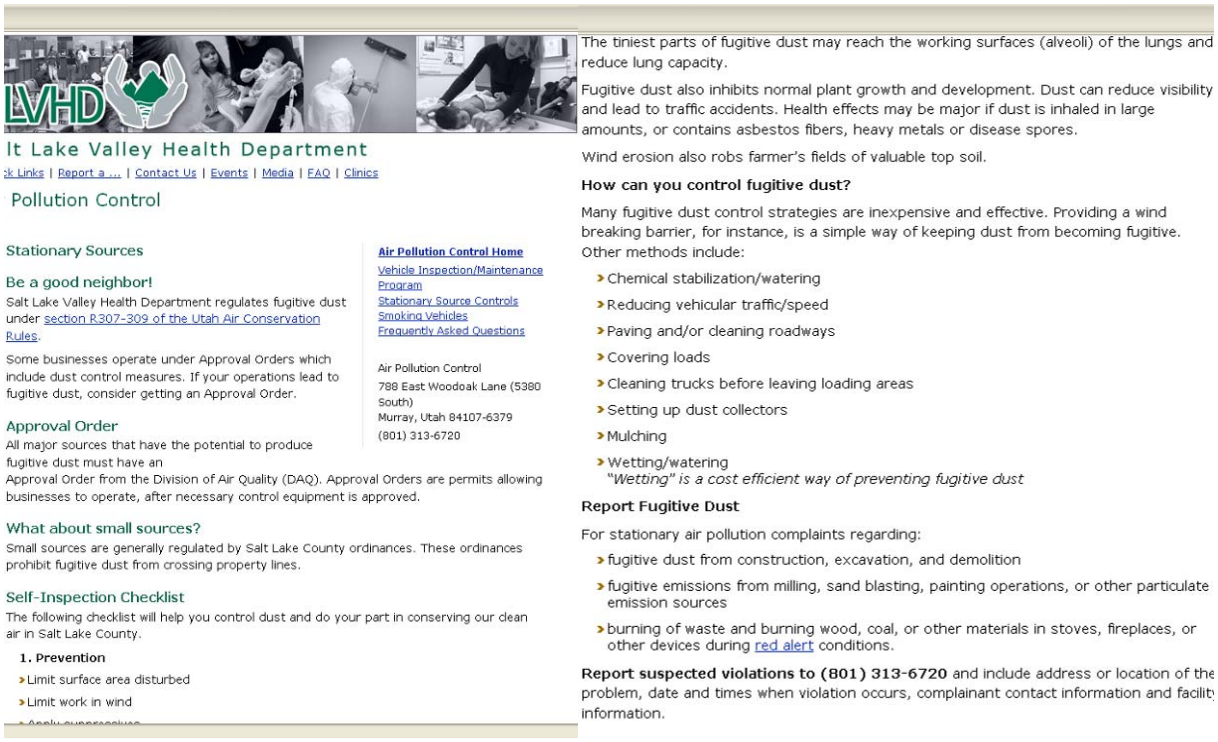
Sustainable Agriculture Research and Education (SARE)

SARE is a program of the U.S. Department of Agriculture that functions through competitive grants conducted cooperatively by farmers, ranchers, researchers and agricultural professionals to advance farm and ranch systems that are profitable, environmentally sound and good for communities. Since its launch in 1988, Western SARE has provided Utah with $1,949,049 to support 41 projects, including 18 research and/or education projects, five extension projects and 18 producer-led projects towards sustainable agricultural practices which directly or indirectly impact soil preservation.

Representative County Dust Control Programs

Salt Lake County

Salt Lake Valley Health Department regulates fugitive dust under section R307-309 of the Utah Air Conservation Rules. The County enforces fugitive dust from construction, aggregate industries, sand blasting, painting and burning. The web site includes information on reporting violations. County inspectors actively inspect dust prone activities.



It Lake Valley Health Department

:k Links | Report a ... | Contact Us | Events | Media | FAQ | Clinics

Pollution Control

Stationary Sources

Be a good neighbor!

Salt Lake Valley Health Department regulates fugitive dust under section R307-309 of the Utah Air Conservation Rules.

Some businesses operate under Approval Orders which include dust control measures. If your operations lead to fugitive dust, consider getting an Approval Order.

Approval Order

All major sources that have the potential to produce fugitive dust must have an
Approval Order from the Division of Air Quality (DAQ). Approval Orders are permits allowing businesses to operate, after necessary control equipment is approved.

What about small sources?

Small sources are generally regulated by Salt Lake County ordinances. These ordinances prohibit fugitive dust from crossing property lines.

Self-Inspection Checklist

The following checklist will help you control dust and do your part in conserving our clean air in Salt Lake County.

1. Prevention
- Limit surface area disturbed
- Limit work in wind

Air Pollution Control Home
Vehicle Inspection/Maintenance Program
Stationary Source Controls
Smoking Vehicles
Frequently Asked Questions

Air Pollution Control
788 East Woodoak Lane (5380 South)
Murray, Utah 84107-6379
(801) 313-6720

The tiniest parts of fugitive dust may reach the working surfaces (alveoli) of the lungs and reduce lung capacity.

Fugitive dust also inhibits normal plant growth and development. Dust can reduce visibility and lead to traffic accidents. Health effects may be major if dust is inhaled in large amounts, or contains asbestos fibers, heavy metals or disease spores.

Wind erosion also robs farmer's fields of valuable top soil.

How can you control fugitive dust?

Many fugitive dust control strategies are inexpensive and effective. Providing a wind breaking barrier, for instance, is a simple way of keeping dust from becoming fugitive. Other methods include:

- Chemical stabilization/watering
- Reducing vehicular traffic/speed
- Paving and/or cleaning roadways
- Covering loads
- Cleaning trucks before leaving loading areas
- Setting up dust collectors
- Mulching
- Wetting/watering
  "Wetting" is a cost efficient way of preventing fugitive dust

Report Fugitive Dust

For stationary air pollution complaints regarding:

- fugitive dust from construction, excavation, and demolition
- fugitive emissions from milling, sand blasting, painting operations, or other particulate emission sources
- burning of waste and burning wood, coal, or other materials in stoves, fireplaces, or other devices during red alert conditions.

Report suspected violations to (801) 313-6720 and include address or location of the problem, date and times when violation occurs, complainant contact information and facility information.

Davis County

Davis, like Salt Lake County, enforces fugitive dust through Utah R307-309 and also maintains a fugitive dust web page and violation reporting. Inspectors have been known to park themselves all day long on Beck Street to enforce compliance. Beck Street contains refineries and very large aggregate industries that are a source of fugitive dust.

Taken from County 2009 Annual Report:

"The Staff of the Air Quality Bureau is composed of both Environmental Health Scientists and employees of the Inspection/Maintenance program. Some of the activities in this bureau are to investigate any air related discharge from fuel and other volatile organic compounds (VOC) such as spills and fuel transfer operations. To investigate smoke of any kind, including open burning, point or stack emissions and mobile source violations."

Selected Statistics Taken From Annual Report

Air Quality	2009	2008	2007
Environmental Investigations in Air Quality	70	441	64
Open Burning Activities	28	18	21
Air Quality Complaints	31	10	70
Air Quality Consultations with the Public	297	156	422

Weber County

Weber County has its own Excavation Ordinance for construction that includes dust control. Application must be made and approved before construction. An application fee includes the cost for reviewing engineering plans and site inspection.

Cache County

Cache County maintains zoning ordnances that include dust controls.

Utah Air Quality Public Notifications

In order to improve the presentation of air quality information to the public, DAQ has improved our air quality forecasting webpage. The web page now shows the air quality forecast for today and the next two days. The Air Monitoring Center (AMC) provides air pollution information based on daily air quality status. The AMC data is used to determine the relationship of existing pollutant concentrations to the National Ambient Air Quality Standards. There is a three tiered air quality alert system: Green, Yellow (alert days), and Red (actions days) that is used to implement winter and summer **controls on the use of wood and coal burning stoves, fire places**, and motor vehicles. There are five health advisory categories: good, moderate, unhealthy advisories A and B, and very unhealthy. The AMC advisory is calculated for five major pollutants including ground-level ozone, particulate pollution (particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. The new index now also incorporates recommendations for actions to take on days when concentrations are in the red zone, to mitigate the effects of pollution for affected groups and recommendations for industry and citizens that help reduce pollution levels. The outreach program information consolidated in the three day forecast includes the Summer and Winter Control Programs and Choose Clean Air information.

The web site includes additional information on wind blown dust.

News Release to Media

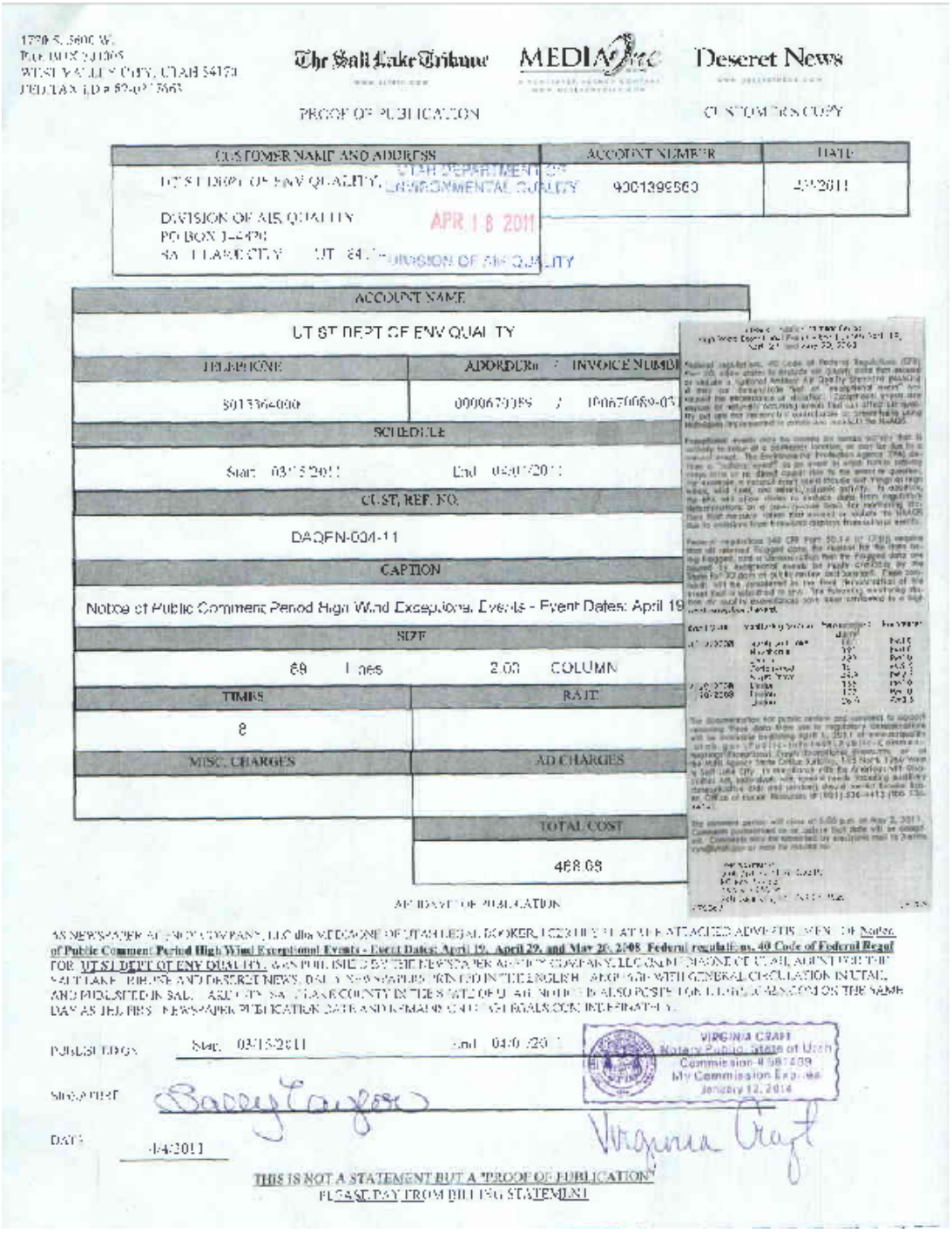
In additional to web site alerts, DEQ also notifies the media in order to maximize public distribution.

Red air quality alert issued
Published: April 19, 2008
The Utah Department of Environmental Quality upgraded today's air quality condition from "yellow" to "red" this afternoon as air the quality worsened in Salt Lake, Davis and Weber Counties. Air quality conditions deteriorated significantly from this morning as persistent, strong south/southwest winds have increased the amount of blowing dust in the area. Utah County's air quality remains at a "yellow" level. As a result of poor air conditions, a health advisory has been issued for Salt Lake, Davis and Weber Counties that could be in effect for the next 12-18 hours. People are advised to stay indoors to avoid the dust swirling in the air. The Bear River Health Department has listed Cache County's air levels as "moderate." Air conditions are expected to improve early Sunday morning. More information on air quality can be found at www.airmonitoring.utah.gov.

Public Comment (Preamble V.G.)

The DEQ established a 30-day comment period from April 1, 2011 through May 2, 2011. Comments were submitted by one party. Those comments are included as an attachment to the cover letter.

Affidavit of Publication



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CUSTOMER NAME AND ADDRESS	ACCOUNT NUMBER	DATE
UT ST DEPT OF ENV QUALITY DIVISION OF AIR QUALITY PO BOX 144820 SALT LAKE CITY UT 84114-4820	9001399560	4/4/2011

UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY
APR 18 2011
DIVISION OF AIR QUALITY

ACCOUNT NAME	
UT ST DEPT OF ENV QUALITY	
TELEPHONE	ADORDER# / INVOICE NUMBER
8013366000	0000670089 / 0000670089-03
SCHEDULE	
Start 03/15/2011	End 04/01/2011
CUST. REF. NO.	
DAQFN-004-11	
CAPTION	
Notice of Public Comment Period High Wind Exceptional Events - Event Dates: April 19	
SIZE	
69 Lines	2.00 COLUMN
TIMES	RATE
8	
MISC. CHARGES	AD CHARGES
	TOTAL COST
	468.08

AFFIDAVIT OF PUBLICATION

AS NEWSPAPER AGENCY COMPANY, LLC dba MEDIAONE OF UTAH LEGAL BOOKER, I CERTIFY THAT THE ATTACHED ADVERTISEMENT OF Notice of Public Comment Period High Wind Exceptional Events - Event Dates: April 19, April 29, and May 20, 2008 Federal regulations, 40 Code of Federal Regul FOR UT ST DEPT OF ENV QUALITY, WAS PUBLISHED BY THE NEWSPAPER AGENCY COMPANY, LLC AND EMPLOYED BY THE AGENT OF UTAH, AGENT OF 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 INDEFINITELY.

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DATE: 4/4/2011

VIRGINIA CRAFT
Notary Public, State of Utah
Commission # 581409
My Commission Expires
January 12, 2014

Virginia Craft

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

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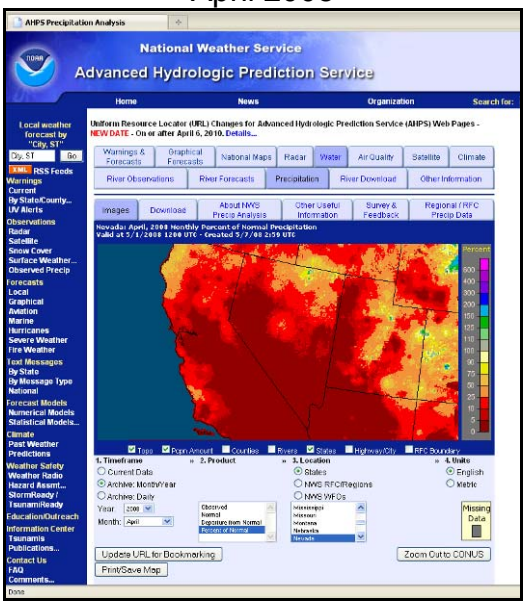
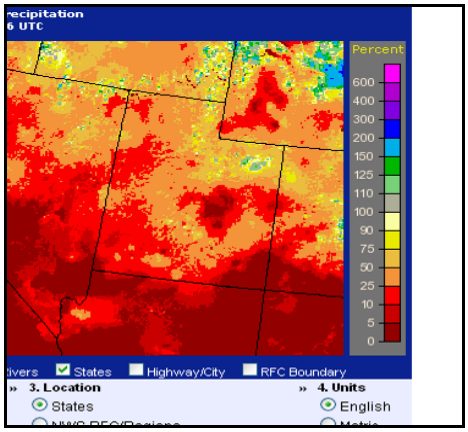
Appendix 1

NOAA Advanced Hydrologic Prediction Service – Precipitation Percent of Normal

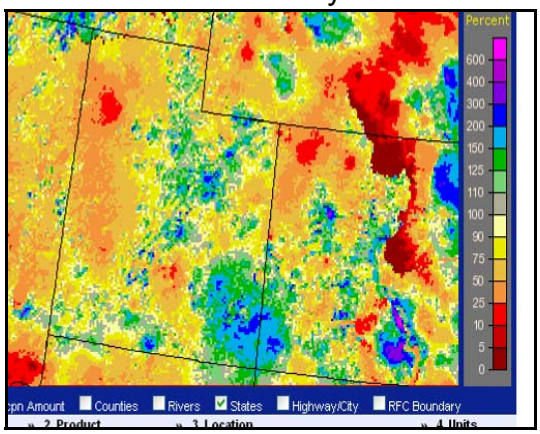
April 2008



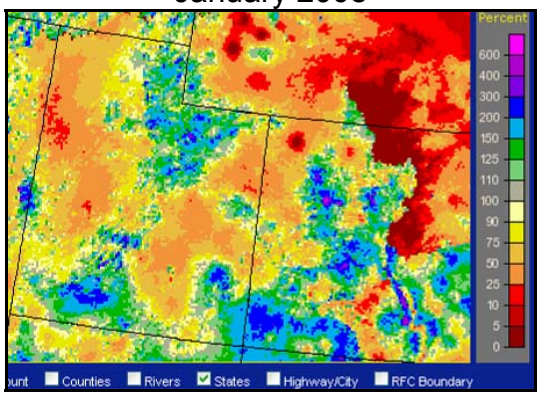
March 2008



February 2008



January 2008



Appendix 2

Hourly PM10 and PM2.5 Concentrations and Wind Speed

	PM10 Hourly						PM2.5 Hourly					
	Ogden	N. Salt Lake	Hawthorne	Lindon	N. Provo	Wind Speed - Lindon	Logan	Ogden	Hawthorne	Tooele	Lindon	N. Provo
/17/08 0:00	18	31	20	3	16	3.6	7.2	10.5	4.0	7.2	8.3	5.2
4/17/08 1:00	17	35	14	4	13	2.9	6.7	10.7	5.1	5.4	9.6	5.7
4/17/08 2:00	18	38	6	5	13	1.4	6.6	10.2	4.3	7.0	7.5	5.8
4/17/08 3:00	14	25	10	5	10	1.8	8.0	9.8	4.4	7.1	7.8	4.6
4/17/08 4:00	18	25	51	6	10	3.5	8.8	7.9	6.0	7.4	5.8	5.4
4/17/08 5:00	24	38	53	8	5	2.7	9.9	9.1	8.9	8.2	6.1	6.8
4/17/08 6:00	44	17	35	16	9	1.6	13.3	11.8	9.4	9.5	7.5	6.5
4/17/08 7:00	41	24	27	18	11	1.6	12.4	15.7	8.1	7.7	9.3	7.2
4/17/08 8:00	17	29	26		24	3.1	13.7	12.4	8.0	10.7	12.0	9.5
4/17/08 9:00	20	105	21	16	19	4.3	10.2	10.3	8.2	12.4	16.2	11.0
4/17/08 10:00	20	32	19	6	17	4.1	10.2	14.8	9.2	56.1	9.3	7.6
4/17/08 11:00	19	22	20	13	14	5.3	6.4	17.6	13.5	30.8	7.8	6.3
4/17/08 12:00	16	19	15	16	12	4.3	5.6	18.1	14.1	13.2	13.7	4.8
4/17/08 13:00	11	26	16	13	14	5.8	8.2	16.7	16.7	14.1	11.6	5.7
4/17/08 14:00	14	14	10	17	19	6.9	10.8	16.0	17.5	12.2	17.5	9.7
4/17/08 15:00	6	15	7	24	16	4.9	10.7	18.1	13.2	9.4	17.0	11.8
4/17/08 16:00	11	31	9	18	24	4	9.5	13.7	7.9	8.8	19.8	15.0
4/17/08 17:00	8	9	10	13	27	4.4	11.8	12.3	6.7	8.9	19.3	15.4
4/17/08 18:00	11	8	10	14	32	4.1	17.1	14.2	9.5	10.8	13.3	18.2
4/17/08 19:00	11	49	18	26	28	1.5	22.7	12.7	9.7	10.2	11.8	16.8
4/17/08 20:00	14	64	18	30	25	3.1	22.7	11.9	9.9	12.6	16.6	15.0
4/17/08 21:00	26	79	51	20	34	4.1	19.3	14.0	11.7	11.6	17.9	19.0
4/17/08 22:00	28	13	34	17	42	3.3	16.0	17.5	12.8	10.6	17.7	23.6
4/17/08 23:00	44	19	36	22	26	1.8	19.7	15.3	8.7	8.8	12.8	11.6
4/18/08 0:00	54	30	49	21	20	1.7	19.1	12.4	12.1	9.2	14.7	9.5
4/18/08 1:00	27	25	32	14	25	3.6	17.9	11.2	10.3	7.9	15.8	14.8
4/18/08 2:00	19	32	23	14	23	1.5	16.2	10.8	8.0	8.2	10.6	11.0
4/18/08 3:00	16	27	42	18	31	3.4	14.2	8.7	9.3	9.8	10.7	15.0
4/18/08 4:00	23	21	41	16	28	3.8	13.6	9.4	9.9	10.0	12.6	15.1
4/18/08 5:00	30	31	36	18	22	1.9	15.8	8.9	10.8	10.2	13.6	11.7
4/18/08 6:00	58	48	70	36	32	1.5	16.4	11.4	12.1	12.1	14.7	13.3
4/18/08 7:00	57	42	51	20	45	1.7	19.7	17.3	14.8	14.6	17.8	15.0
4/18/08 8:00	30	49	37	44	32	2.4	20.5	15.1	12.8	11.7	15.8	13.6
4/18/08 9:00	17	44	35	9	24	2.7	15.2	12.4	10.3	13.2	15.1	12.1
4/18/08 10:00	21	39	30	9	22	5.9	10.7	13.5	10.5	11.4	17.6	12.7
4/18/08 11:00	26	41	30	15	21	5.9	9.4	13.2	10.0	11.4	3.4	12.3
4/18/08 12:00	20	27	20	13	25	3.5	13.1	12.0	10.5	9.8	2.6	10.3
4/18/08 13:00	18	24	17	9	21	5.7	13.2	11.0	7.4	9.2	11.1	5.6
4/18/08 14:00	20	19	16	8	14	7.9	12.2	9.7	8.8	9.3	4.6	5.3
4/18/08 15:00	13	13	16	44	41	6.9	7.7	9.8	8.5	5.5	9.9	12.4
4/18/08 16:00	8	30	17	16	61	5.9	5.1	11.2	8.5	6.4	17.6	15.4
4/18/08 17:00	6	8	11	12	30	4.7	6.1	10.0	8.7	8.0	11.8	7.6
4/18/08 18:00	9	47	16	37	51	6	8.3	8.9	8.8	7.6	10.4	13.5
4/18/08 19:00	21	65	25	106	103	6.1	11.0	9.8	10.1	11.4	20.9	22.8
4/18/08 20:00	25	65	65	114	129	5.7	12.5	12.6	12.8	10.9	37.1	26.2
4/18/08 21:00	44	314	193	77	122	6.8	14.6	13.0	44.9	25.3	35.0	27.1

	PM10 Hourly						PM2.5 Hourly					
	Ogden	N. Salt Lake	Hawthorne	Lindon	N. Provo	Wind Speed - Lindon	Logan	Ogden	Hawthorne	Tooele	Lindon	N. Provo
4/18/08 23:00	125	101	36	12	30	3.5	15.9	42.8	19.6	13.5	14.0	8.2
4/19/08 0:00	39	46	16	7	15	3.3	12.4	30.0	10.2	7.8	12.5	3.3
4/19/08 1:00	19	40	19	8	14	2.7	14.6	13.4	7.0	8.6	9.2	5.1
4/19/08 2:00	30	42	15	8	7	3.5	13.7	8.0	7.1	9.3	4.2	1.8
4/19/08 3:00	30	22	13	7	13	3.1	13.4	12.4	7.1	8.8	8.3	3.8
4/19/08 4:00	16	23	14	7	13	4.1	18.0	9.6	6.6	9.0	7.2	6.0
4/19/08 5:00	19	21	12	7	20	2.8	17.7	8.2	4.8	7.4	8.6	6.9
4/19/08 6:00	13	21	16	11	21	4	10.7	7.8	7.0	7.7	8.6	6.8
4/19/08 7:00	14	29	20	13	23	7	12.2	7.5	7.3	7.1	5.8	12.3
4/19/08 8:00	28	107	20	12	24	7.5	8.9	8.7	6.0	7.3	7.1	10.9
4/19/08 9:00	53	127	24	7	23	9.8	10.4	11.2	7.2	10.7	8.5	8.4
4/19/08 10:00	74	180	36	8	15	11	10.7	14.1	9.3	8.4	5.4	5.8
4/19/08 11:00	51	113	65	25	24	11.2	15.8	20.4	13.7	14.8	12.0	0.1
4/19/08 12:00	32	193	169	198	90	14.7	15.0	11.7	32.1	42.1	24.7	14.7
4/19/08 13:00	74	467	285	369	364	17	11.5	18.4	59.7	54.4	79.2	66.8
4/19/08 14:00	82	548	346	330	559	16.9	15.9	29.9	83.7	33.5	98.1	103.4
4/19/08 15:00	61	464	254	329	556	15.5	26.0	21.5	70.8	62.6	87.3	104.2
4/19/08 16:00	151	409	183	264	668	15.2	37.7	38.1	49.4	76.0	75.2	113.2
4/19/08 17:00	173	350	175	211	473	12.7	35.2	50.3	54.8	64.6	66.6	77.9
4/19/08 18:00	170	182	147	148	293	9.5	34.5	60.6	53.8	33.8	60.4	52.9
4/19/08 19:00	72	142	86	113	293	6.8	35.3	36.1	39.8	19.3	40.1	57.8
4/19/08 20:00	124	168	104	81	303	3.6	31.8	25.1	35.6	35.6	32.1	61.6
4/19/08 21:00	58	238	168	157	325	2.5	13.9	21.2	40.2	88.3	38.7	71.4
4/19/08 22:00	125	270	236	156	188	4.9	12.7	26.2	67.0	58.3	59.6	45.7
4/19/08 23:00	106	120	128	174	165	4.3	15.2	40.2	49.0	27.3	50.5	37.2
4/20/08 0:00	80	153	141	154	170	2.7	19.2	25.3	39.8	23.2	40.1	38.0
4/20/08 1:00	105	86	104	148	174	7.1	19.0	27.9	35.3	26.4	40.1	40.3
4/20/08 2:00	104	100	121	81	152	4.8	20.1	36.2	24.6	42.0	37.7	38.2
4/20/08 3:00	110	212	168	75	105	6.8	25.3	31.6	30.2	40.0	25.5	25.6
4/20/08 4:00	140	240	242	44	58	9.2	21.3	32.0	50.5	37.5	15.7	13.1
4/20/08 5:00	107	206	227	18	55	8.1	22.5	30.2	46.5	31.7	18.3	12.6
4/20/08 6:00	159	148	192	29	63	5.4	15.9	31.2	45.6	24.7	15.0	18.5
4/20/08 7:00	121	181	176	33	80	8.5	12.9	34.9	33.0	29.9	11.6	22.0
4/20/08 8:00	90	193	164	153	106	14.1	12.3	25.3	33.0	39.5	21.9	28.6
4/20/08 9:00	200	389	298	249	152	17.1	18.5	22.5	38.1	41.1	36.6	31.7
4/20/08 10:00	114	411	278	224	249	14.8	16.3	13.8	28.3	41.8	53.6	39.3
4/20/08 11:00	107	267	249	157	313	8.9	8.9	16.8	57.9	36.5	35.0	43.2
4/20/08 12:00	163	161	128	140	336	15	7.7	16.9	35.9	12.8	34.5	47.3
4/20/08 13:00	52	89	79	56	132	13	5.4	19.7	21.5	12.6	28.1	25.0
4/20/08 14:00	31	12	28	108	84	12.8	6.9	10.1	10.7	15.7	22.2	14.9
4/20/08 15:00	41	10	13	79	100	12.3	8.1	9.6	6.8	12.4	22.6	13.4
4/20/08 16:00	14	52	26	40	70	9.2	6.4	6.1	5.1	7.0	11.2	16.7
4/20/08 17:00	21	12	42	26	45	9.4	3.8	5.5	4.2	4.3	10.5	12.2
4/20/08 18:00	85	24	21	23	30	11.4	3.4	7.5	6.9	5.7	6.9	9.4
4/20/08 19:00	65	71	30	20	20	10.3	4.3	15.0	4.1	9.7	7.5	4.6
4/20/08 20:00	12	83	93	24	17	11.7	4.3	6.5	11.0	23.8	9.4	3.3
4/20/08 21:00	21	33	63	79	31	13.3	6.1	3.2	12.7	18.8	12.5	5.5

	PM10 Hourly						PM2.5 Hourly					
	Ogden	N. Salt Lake	Hawthorne	Lindon	N. Provo	Wind Speed - Lindon	Logan	Ogden	Hawthorne	Tooele	Lindon	N. Provo
4/20/08 22:00	8	13	47	34	64	6.1	4.4	5.0	10.1	21.5	14.5	12.4
4/20/08 23:00	5	23	26	26	39	6.2	5.4	3.9	9.5	16.8	7.8	9.5
4/21/08 0:00	16	24	25	27	43	6	6.2	4.4	6.6	16.4	11.5	11.5
4/21/08 1:00	24	13	29	56	62	3.3	8.5	5.3	5.6	17.8	12.6	14.4
4/21/08 2:00	16	31	25	54	49	2.5	8.0	9.8	7.3	13.5	14.9	11.8
4/21/08 3:00	24	5	21	53	44	2.7	4.7	10.2	7.2	9.4	12.0	12.4
4/21/08 4:00	14	26	23	38	38	1.7	1.7	7.7	6.7	8.1	12.6	7.6
4/21/08 5:00	30	104	16	44	32	2.7	5.5	7.0	6.6	4.3	8.0	7.2
4/21/08 6:00	31	58	23	36	39	1.8	7.3	10.2	5.8	5.1	14.1	10.2
4/21/08 7:00	21	80	37	52	42	2.1	8.7	11.5	9.6	6.7	9.0	9.9
4/21/08 8:00	20	17	19	45	38	3.4	5.2	11.9	11.9	6.9	12.2	9.0
4/21/08 9:00	10	57	10	38	32	3.6	8.4	8.4	8.2	7.1	10.7	7.6
4/21/08 10:00	17	21	13	35	30	5.6	8.4	8.7	4.8	7.1	17.1	6.5
4/21/08 11:00	18	21	20	14	24	5.3	8.0	9.1	7.7	6.9	14.1	8.7
4/21/08 12:00	9	33	20	12	18	6.3	8.9	6.3	7.5	3.8	6.7	4.3
4/21/08 13:00	13	36	20	19	11	5.9	7.1	7.3	11.4	7.8	12.3	5.4
4/21/08 14:00	13	42	25	16	17	6.3	6.4	8.0	11.6	3.9	13.8	5.8
4/21/08 15:00	13	7	16	12	24	6.2	10.4	7.1	10.9	5.8	10.7	7.0
4/21/08 16:00	8	6	12	9	21	5.5	6.5	6.3	10.7	5.2	10.9	9.2
4/21/08 17:00	7	8	10	7	20	3.9	3.7	7.9	10.9	6.3	10.2	7.9
4/21/08 18:00	6	13	13	11	23	2.8	3.8	8.7	12.8	6.0	11.1	7.2
4/21/08 19:00	10	30	19	23	22	4.7	7.4	7.3	10.3	8.4	13.5	6.7
4/21/08 20:00	23	52	24	10	20	5.2	7.9	7.9	8.0	8.4	16.3	8.8
4/21/08 21:00	26	25	25	11	23	5	9.3	10.3	13.6	8.0	12.4	9.4
4/21/08 22:00	30	36	21	22	24	3.1	13.9	14.8	11.3	11.0	12.8	9.9
4/21/08 23:00	34	50	17	57	23	2	11.8	13.1	11.1	11.6	14.7	12.6
4/22/08 0:00	34	43	21	48	30	3.2	10.3	15.4	12.0	8.3	18.0	11.9

Appendix 3
Speciation Data

Client: U005 - State of Utah DEQ
Report Number: 09-089
==========
Lab ID: 09-X780
Client ID: 8131368
Site: Lindon (LN)
Sample Date: 4/19/08
Mass: 754. +- 10. ug
Volume: 24.00 +- 2.400 m³
Deposit Area: 11.3 cm²
Size Fraction: PM2.5
Suspended
Particulates: 31.42 +- 3.17 Ug/m³
Comments: NUD-Mn

Analyte,	Ug/filter,	percent	Ug/m³
XRF			
Na	0.5435 ± 0.7017	0.0721 ± 0.0931	0.0226 ± 0.0293
Mg	30.80 ± 2.368	4.085 ± 0.3188	1.283 ± 0.1619
Al	40.19 ± 2.598	5.331 ± 0.3517	1.675 ± 0.1994
Si	111.2 ± 6.035	14.75 ± 0.8240	4.635 ± 0.5273
P	0.0000 ± 0.0565	0.0000 ± 0.0075	0.0000 ± 0.0024
S	8.003 ± 0.4441	1.061 ± 0.0606	0.3334 ± 0.0381
Cl	4.013 ± 0.2305	0.5322 ± 0.0314	0.1672 ± 0.0193
K	14.78 ± 0.7605	1.960 ± 0.1042	0.6158 ± 0.0693
Ca	67.02 ± 3.397	8.889 ± 0.4657	2.793 ± 0.3131
Ti	1.850 ± 0.0960	0.2453 ± 0.0131	0.0771 ± 0.0087
V	0.0328 ± 0.0124	0.0043 ± 0.0016	0.0014 ± 0.0005
Cr	0.0350 ± 0.0113	0.0046 ± 0.0015	0.0015 ± 0.0005
Mn	0.4870 ± 0.0712	0.0646 ± 0.0095	0.0203 ± 0.0036
Fe	19.61 ± 0.9831	2.600 ± 0.1349	0.8169 ± 0.0914
Co	0.0000 ± 0.0294	0.0000 ± 0.0039	0.0000 ± 0.0012
Ni	0.0362 ± 0.0181	0.0048 ± 0.0024	0.0015 ± 0.0008
Cu	0.0667 ± 0.0158	0.0088 ± 0.0021	0.0028 ± 0.0007
Zn	0.1209 ± 0.0147	0.0160 ± 0.0020	0.0050 ± 0.0008
Ga	0.0237 ± 0.0113	0.0031 ± 0.0015	0.0010 ± 0.0005
Ge	0.0090 ± 0.0102	0.0012 ± 0.0013	0.0004 ± 0.0004
As	0.0000 ± 0.0147	0.0000 ± 0.0019	0.0000 ± 0.0006
Se	0.0000 ± 0.0079	0.0000 ± 0.0010	0.0000 ± 0.0003
Br	0.0836 ± 0.0090	0.0111 ± 0.0012	0.0035 ± 0.0005
Rb	0.0836 ± 0.0090	0.0111 ± 0.0012	0.0035 ± 0.0005
Sr	0.4791 ± 0.0271	0.0635 ± 0.0037	0.0200 ± 0.0023
Y	0.0124 ± 0.0113	0.0016 ± 0.0015	0.0005 ± 0.0005
Zr	0.0362 ± 0.0136	0.0048 ± 0.0018	0.0015 ± 0.0006
Mo	0.0124 ± 0.0192	0.0016 ± 0.0025	0.0005 ± 0.0008
Pd	0.0000 ± 0.0520	0.0000 ± 0.0069	0.0000 ± 0.0022
Ag	0.0045 ± 0.0542	0.0006 ± 0.0072	0.0002 ± 0.0023
Cd	0.0655 ± 0.0599	0.0087 ± 0.0079	0.0027 ± 0.0025
In	0.1085 ± 0.0678	0.0144 ± 0.0090	0.0045 ± 0.0029
Sn	0.0520 ± 0.0791	0.0069 ± 0.0105	0.0022 ± 0.0033
Sb	0.2215 ± 0.1582	0.0294 ± 0.0210	0.0092 ± 0.0067
Ba	0.0881 ± 0.0712	0.0117 ± 0.0094	0.0037 ± 0.0030
La	0.0000 ± 0.0531	0.0000 ± 0.0070	0.0000 ± 0.0022
Hg	0.0000 ± 0.0203	0.0000 ± 0.0027	0.0000 ± 0.0008
Pb	0.0102 ± 0.0203	0.0013 ± 0.0027	0.0004 ± 0.0008
IC			
Cl	5.080 ± 0.2540	0.6737 ± 0.0112	0.2117 ± 0.0237
Br	0.0000 ± 0.5000	0.0000 ± 0.0094	0.0000 ± 0.0208
NO3	10.67 ± 0.5335	1.415 ± 0.0211	0.4446 ± 0.0497
SO4	29.00 ± 1.450	3.846 ± 0.0535	1.208 ± 0.1351
Na	7.250 ± 0.3625	0.9615 ± 0.0150	0.3021 ± 0.0338
NH4	5.120 ± 0.2560	0.6790 ± 0.0112	0.2133 ± 0.0239
K	2.150 ± 0.1075	0.2851 ± 0.0058	0.0896 ± 0.0100

Client: U005 - State of Utah DEQ
Report Number: 09-089
==========
Lab ID: 09-X781
Client ID: 8131360
Site: Hawthorn (HW)
Sample Date: 4/19/08
Mass: 752. +- 10. Ug
Volume: 24.00 +- 2.400 m³
Deposit Area: 11.3 cm²
Size Fraction: PM2.5
Suspended
Particulates: 31.33 +- 3.16 Ug/m³
Analyte, Ug/filter, percent Ug/m³
XRF
Na 15.91 ± 2.319 2.116 ± 0.3096 0.6629 ± 0.1172
Mg 40.30 ± 3.037 5.358 ± 0.4102 1.679 ± 0.2103
Al 25.02 ± 1.638 3.327 ± 0.2223 1.042 ± 0.1246
Si 76.98 ± 4.173 10.24 ± 0.5714 3.207 ± 0.3648
P 0.0000 ± 0.0554 0.0000 ± 0.0074 0.0000 ± 0.0023
S 16.40 ± 0.8690 2.180 ± 0.1191 0.6832 ± 0.0773
Cl 10.22 ± 0.5413 1.359 ± 0.0742 0.4257 ± 0.0482
K 10.23 ± 0.5300 1.360 ± 0.0728 0.4262 ± 0.0480
Ca 64.66 ± 3.275 8.598 ± 0.4502 2.694 ± 0.3020
Ti 1.248 ± 0.0667 0.1659 ± 0.0091 0.0520 ± 0.0059
V 0.0508 ± 0.0113 0.0068 ± 0.0015 0.0021 ± 0.0005
Cr 0.0192 ± 0.0102 0.0026 ± 0.0014 0.0008 ± 0.0004
Mn 0.2090 ± 0.0158 0.0278 ± 0.0021 0.0087 ± 0.0011
Fe 13.01 ± 0.6531 1.730 ± 0.0898 0.5419 ± 0.0606
Co 0.0000 ± 0.0260 0.0000 ± 0.0035 0.0000 ± 0.0011
Ni 0.0237 ± 0.0158 0.0032 ± 0.0021 0.0010 ± 0.0007
Cu 0.0497 ± 0.0147 0.0066 ± 0.0020 0.0021 ± 0.0006
Zn 0.0994 ± 0.0136 0.0132 ± 0.0018 0.0041 ± 0.0007
Ga 0.0000 ± 0.0102 0.0000 ± 0.0014 0.0000 ± 0.0004
Ge 0.0000 ± 0.0090 0.0000 ± 0.0012 0.0000 ± 0.0004
As 0.0000 ± 0.0136 0.0000 ± 0.0018 0.0000 ± 0.0006
Se 0.0045 ± 0.0068 0.0006 ± 0.0009 0.0002 ± 0.0003
Br 0.0870 ± 0.0079 0.0116 ± 0.0011 0.0036 ± 0.0005
Rb 0.0441 ± 0.0079 0.0059 ± 0.0011 0.0018 ± 0.0004
Sr 3.083 ± 0.1559 0.4099 ± 0.0214 0.1284 ± 0.0144
Y 0.0102 ± 0.0102 0.0014 ± 0.0014 0.0004 ± 0.0004
Zr 0.0441 ± 0.0136 0.0059 ± 0.0018 0.0018 ± 0.0006
Mo 0.0000 ± 0.0170 0.0000 ± 0.0023 0.0000 ± 0.0007
Pd 0.0034 ± 0.0497 0.0005 ± 0.0066 0.0001 ± 0.0021
Ag 0.1209 ± 0.0542 0.0161 ± 0.0072 0.0050 ± 0.0023
Cd 0.1774 ± 0.0588 0.0236 ± 0.0078 0.0074 ± 0.0026
In 0.0102 ± 0.0633 0.0014 ± 0.0084 0.0004 ± 0.0026
Sn 0.0226 ± 0.0746 0.0030 ± 0.0099 0.0009 ± 0.0031
Sb 0.1831 ± 0.1514 0.0243 ± 0.0201 0.0076 ± 0.0064
Ba 0.0520 ± 0.0576 0.0069 ± 0.0077 0.0022 ± 0.0024
La 0.0000 ± 0.0508 0.0000 ± 0.0068 0.0000 ± 0.0021
Hg 0.0000 ± 0.0158 0.0000 ± 0.0021 0.0000 ± 0.0007
Pb 0.0576 ± 0.0192 0.0077 ± 0.0026 0.0024 ± 0.0008
IC
Cl 0.0000 ± 0.5000 0.0000 ± 0.0094 0.0000 ± 0.0208
Br 0.0000 ± 0.5000 0.0000 ± 0.0094 0.0000 ± 0.0208
NO3 0.0000 ± 0.5000 0.0000 ± 0.0094 0.0000 ± 0.0208
SO4 0.0000 ± 0.5000 0.0000 ± 0.0094 0.0000 ± 0.0208
Na 23.60 ± 1.180 3.138 ± 0.0442 0.9833 ± 0.1099
NH4 4.460 ± 0.2230 0.5931 ± 0.0101 0.1858 ± 0.0208
K 2.480 ± 0.1240 0.3298 ± 0.0064 0.1033 ± 0.0116

Client: U005 - State of Utah DEQ
Report Number: 09-089
==========
Lab ID: 09-X782
Client ID: 8131377
Site: North Provo (NP)
Sample Date: 4/19/08
Mass: 1199. +- 10. Ug
Volume: 24.00 +- 2.400 m^3
Deposit Area: 11.3 cm^2
Size Fraction: PM2.5
Suspended
Particulates: 49.96 +- 5.01 Ug/m^3
Analyte, Ug/filter, percent Ug/m^3
XRF
Na 0.0000 ± 0.8837 0.0000 ± 0.0737 0.0000 ± 0.0368
Mg 39.08 ± 3.138 3.259 ± 0.2631 1.628 ± 0.2088
Al 64.76 ± 4.325 5.401 ± 0.3635 2.698 ± 0.3245
Si 173.1 ± 9.682 14.44 ± 0.8164 7.213 ± 0.8265
P 0.5673 ± 0.0757 0.0473 ± 0.0063 0.0236 ± 0.0039
S 8.115 ± 0.4599 0.6768 ± 0.0388 0.3381 ± 0.0389
Cl 2.730 ± 0.1729 0.2277 ± 0.0145 0.1138 ± 0.0135
K 23.46 ± 1.209 1.957 ± 0.1022 0.9774 ± 0.1100
Ca 102.6 ± 5.226 8.558 ± 0.4417 4.276 ± 0.4798
Ti 3.051 ± 0.1559 0.2545 ± 0.0132 0.1271 ± 0.0143
V 0.0689 ± 0.0158 0.0057 ± 0.0013 0.0029 ± 0.0007
Cr 0.0644 ± 0.0124 0.0054 ± 0.0010 0.0027 ± 0.0006
Mn 0.8113 ± 0.0723 0.0677 ± 0.0061 0.0338 ± 0.0045
Fe 32.71 ± 1.638 2.728 ± 0.1385 1.363 ± 0.1524
Co 0.0565 ± 0.0328 0.0047 ± 0.0027 0.0024 ± 0.0014
Ni 0.0701 ± 0.0170 0.0058 ± 0.0014 0.0029 ± 0.0008
Cu 0.1062 ± 0.0170 0.0089 ± 0.0014 0.0044 ± 0.0008
Zn 0.2170 ± 0.0181 0.0181 ± 0.0015 0.0090 ± 0.0012
Ga 0.0090 ± 0.0102 0.0008 ± 0.0008 0.0004 ± 0.0004
Ge 0.0000 ± 0.0102 0.0000 ± 0.0008 0.0000 ± 0.0004
As 0.0000 ± 0.0136 0.0000 ± 0.0011 0.0000 ± 0.0006
Se 0.0068 ± 0.0068 0.0006 ± 0.0006 0.0003 ± 0.0003
Br 0.0927 ± 0.0079 0.0077 ± 0.0007 0.0039 ± 0.0005
Rb 0.1243 ± 0.0102 0.0104 ± 0.0009 0.0052 ± 0.0007
Sr 0.5921 ± 0.0316 0.0494 ± 0.0027 0.0247 ± 0.0028
Y 0.0000 ± 0.0102 0.0000 ± 0.0008 0.0000 ± 0.0004
Zr 0.1424 ± 0.0147 0.0119 ± 0.0012 0.0059 ± 0.0009
Mo 0.0328 ± 0.0181 0.0027 ± 0.0015 0.0014 ± 0.0008
Pd 0.0757 ± 0.0542 0.0063 ± 0.0045 0.0032 ± 0.0023
Ag 0.0000 ± 0.0565 0.0000 ± 0.0047 0.0000 ± 0.0024
Cd 0.1322 ± 0.0622 0.0110 ± 0.0052 0.0055 ± 0.0026
In 0.0090 ± 0.0678 0.0008 ± 0.0057 0.0004 ± 0.0028
Sn 0.1277 ± 0.0791 0.0106 ± 0.0066 0.0053 ± 0.0033
Sb 0.2893 ± 0.1593 0.0241 ± 0.0133 0.0121 ± 0.0067
Ba 0.2384 ± 0.1028 0.0199 ± 0.0086 0.0099 ± 0.0044
La 0.0147 ± 0.0734 0.0012 ± 0.0061 0.0006 ± 0.0031
Hg 0.0181 ± 0.0170 0.0015 ± 0.0014 0.0008 ± 0.0007
Pb 0.0904 ± 0.0203 0.0075 ± 0.0017 0.0038 ± 0.0009
IC
Cl 13.60 ± 0.6800 1.134 ± 0.0117 0.5667 ± 0.0634
Br 0.0000 ± 0.5000 0.0000 ± 0.0059 0.0000 ± 0.0208
NO3 12.46 ± 0.6230 1.039 ± 0.0109 0.5192 ± 0.0580
SO4 58.75 ± 2.938 4.900 ± 0.0433 2.448 ± 0.2737
Na 6.720 ± 0.3360 0.5605 ± 0.0067 0.2800 ± 0.0313
NH4 5.000 ± 0.2500 0.4170 ± 0.0054 0.2083 ± 0.0233
K 2.980 ± 0.1490 0.2485 ± 0.0038 0.1242 ± 0.0139

LOCATION **Bountiful** **4/12/2008** AIRS_CODE 490110004 POC 5
SAMPLER TYPE URG 3000N
FIELD CUSTODY NO Q159209C ROUTINE
CHANNEL 1 SAMPLE 31.72
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: Flow Flags:

Field Sampling Data .....

		Value	AIRS Value Code
1	Average Flow	22.0	
2	End Date	4/13/2008	
3	End Time	12:00 AM	
4	Retrieval Date	4/14/2008	
5	Retrieval Time	01:50 PM	
6	Run Time	24.0	
7	Start Date	4/12/2008	
8	Start Time	12:00 AM	
9	Total Volume	31.7	

Laboratory Analysis Data .....

Quartz Filter (25 mm) I8549A
Shipping Flags:
Module Disassembly Flags:

Organic and elemental carbon IMPROVE_A

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Value Code
10	E1 IMPROVE	15.7	0.494				
11	E2 IMPROVE	2.28	0.07180				
12	E3 IMPROVE	0.00000	0.00000				
13	EC IMPROVE TOR	10.5	0.331				
14	EC IMPROVE TOT	8.29	0.261				
15	O1 IMPROVE	1.83	0.05770				
16	O2 IMPROVE	9.78	0.308				
17	O3 IMPROVE	10.1	0.317				
18	O4 IMPROVE	6.64	0.209				
19	OC IMPROVE TOR	35.8	1.13				
20	OC IMPROVE TOT	38.0	1.20				
21	OP IMPROVE TOR	7.45	0.235				
22	OP IMPROVE TOT	9.66	0.305				
23	TC IMPROVE	46.3	1.46				

LOCATION Bountiful **4/12/2008** AIRS_CODE 490110004 POC 5
SAMPLER TYPE SASS with URG 3000N
FIELD CUSTODY NO Q1592105 ROUTINE
CHANNEL 1 SAMPLE 9.692
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: Flow Flags:

Field Sampling Data .....

		Value	AIRS Value Code
24	Average flow	6.73	
25	Avg ambient temp	7.6	
26	Avg BP	658	
27	Delta T Flag		
28	End date	4/13/2008	
29	End time	12:00 AM	
30	Max ambient temp	14.5	
31	Max BP	662	
32	Min ambient temp	-0.8	
33	Min BP	651	
34	Retrieval date	4/14/2008	
35	Retrieval time	01:35 PM	
36	Run Time	24.0	
37	Run Time Flag		
38	Sample volume	9.69	
39	Start date	4/12/2008	
40	Start time	12:00 AM	

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Laboratory Analysis Data .....

Teflon Filter I58340
Shipping Flags:
Module Disassembly Flags:

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Value Code
Mass - PM2.5							
41	Particulate matter 2.5u	55.0±4.0	5.67±0.41	7.2	0.74		
Trace elements							
42	Aluminum	0.666±0.12	0.06870±0.012	0.12	0.013		
43	Antimony	0.00000±0.13	0.00000±0.014	0.40	0.042		
44	Arsenic	0.00000±0.006	0.00000±0.000	0.016	0.00170		
45	Barium	0.00000±0.039	0.00000±0.004	0.099	0.010		
46	Bromine	0.01470±0.012	0.00152±0.001	0.017	0.00180		
47	Cadmium	0.00000±0.060	0.00000±0.006	0.18	0.019		
48	Calcium	0.586±0.046	0.06050±0.004	0.046	0.00470		
49	Cerium	0.00000±0.032	0.00000±0.003	0.066	0.00680		
50	Cesium	0.00000±0.11	0.00000±0.011	0.33	0.034		
51	Chlorine	0.05650±0.022	0.00583±0.002	0.048	0.00500		
52	Chromium	0.00000±0.007	0.00000±0.000	0.021	0.00220		
53	Cobalt	0.00000±0.004	0.00000±0.000	0.011	0.00110		
54	Copper	0.00757±0.007	0.00078±0.000	0.013	0.00130		
55	Europium	0.00000±0.018	0.00000±0.001	0.046	0.00470		

56	Gallium	0.00000±0.009	0.00000±0.000	0.024	0.00250
57	Gold	0.00000±0.018	0.00000±0.001	0.053	0.00550
58	Hafnium	0.00000±0.016	0.00000±0.001	0.038	0.00390
59	Indium	0.00000±0.071	0.00000±0.007	0.21	0.022
60	Iridium	0.00000±0.024	0.00000±0.002	0.069	0.00710
61	Iron	0.633±0.047	0.06530±0.004	0.014	0.00140
62	Lanthanum	0.00000±0.032	0.00000±0.003	0.076	0.00780
63	Lead	0.00000±0.016	0.00000±0.001	0.047	0.00480
64	Magnesium	0.04520±0.041	0.00466±0.004	0.11	0.011
65	Manganese	0.00000±0.006	0.00000±0.000	0.017	0.00180
66	Mercury	0.00000±0.044	0.00000±0.004	0.091	0.00940
67	Molybdenum	0.00000±0.029	0.00000±0.003	0.087	0.00900
68	Nickel	0.00000±0.003	0.00000±0.000	0.011	0.00110
69	Niobium	0.00000±0.015	0.00000±0.001	0.046	0.00470
70	Phosphorus	0.00000±0.048	0.00000±0.004	0.098	0.010
71	Potassium	0.437±0.035	0.04510±0.003	0.038	0.00390
72	Rubidium	0.00000±0.005	0.00000±0.000	0.017	0.00180
73	Samarium	0.00904±0.021	0.00093±0.002	0.045	0.00460
74	Scandium	0.00000±0.12	0.00000±0.012	0.36	0.037
75	Selenium	0.00000±0.006	0.00000±0.000	0.019	0.00200
76	Silicon	1.79±0.16	0.185±0.017	0.11	0.011
77	Silver	0.00000±0.047	0.00000±0.004	0.14	0.015
78	Sodium	0.00000±0.13	0.00000±0.014	0.39	0.040
79	Strontium	0.01920±0.015	0.00198±0.001	0.022	0.00230
80	Sulfur	3.53±0.25	0.364±0.026	0.071	0.00730
81	Tantalum	0.01360±0.047	0.00140±0.004	0.095	0.00980
82	Terbium	0.01240±0.019	0.00128±0.002	0.035	0.00360
83	Tin	0.04520±0.36	0.00466±0.037	0.31	0.032
84	Titanium	0.00000±0.016	0.00000±0.001	0.042	0.00430
85	Vanadium	0.00000±0.013	0.00000±0.001	0.029	0.00300
86	Wolfram	0.00339±0.046	0.00035±0.004	0.071	0.00730
87	Yttrium	0.00000±0.009	0.00000±0.000	0.027	0.00280
88	Zinc	0.171±0.015	0.01770±0.001	0.034	0.00350
89	Zirconium	0.00000±0.081	0.00000±0.008	0.044	0.00450

LOCATION Bountiful **4/12/2008** AIRS_CODE 490110004 POC 5
SAMPLER TYPE SASS with URG 3000N
FIELD CUSTODY NO Q1592105 ROUTINE
CHANNEL 2 SAMPLE 9.696
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: Flow Flags:

Field Sampling Data .....

		Value	AIRS Null Value Code
90	Average flow	6.73	
91	Avg ambient temp	7.6	
92	Avg BP	658	
93	Delta T Flag		
94	End date	4/13/2008	
95	End time	12:00 AM	
96	Max ambient temp	14.5	
97	Max BP	662	
98	Min ambient temp	-0.8	
99	Min BP	651	
100	Retrieval date	4/14/2008	
101	Retrieval time	01:35 PM	
102	Run Time	24.0	
103	Run Time Flag		
104	Sample volume	9.70	
105	Start date	4/12/2008	
106	Start time	12:00 AM	

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Laboratory Analysis Data .....

Nylon Filter I58351
Shipping Flags:
Module Disassembly Flags:

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Null Value Code
Cations - PM2.5 (NH4, Na, K)							
107	Ammonium	9.54±0.67	0.984±0.070	0.16	0.017		
108	Potassium	0.00000±0.000	0.00000±0.000	0.13	0.014		
109	Sodium	0.446±0.27	0.04600±0.028	0.29	0.030		
Nitrate - PM2.5							
110	Nitrate	21.1±1.5	2.18±0.16	0.066	0.00680		
Sulfate - PM2.5							
111	Sulfate	10.4±0.76	1.08±0.078	0.074	0.00760		

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LOCATION **Lindon** **4/12/2008** AIRS_CODE 490494001 POC 5
SAMPLER TYPE URG 3000N
FIELD CUSTODY NO **Q159242D** ROUTINE
CHANNEL 1 SAMPLE 31.70
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: **DST** Flow Flags: **FHT**

Field Sampling Data .....

		Value	AIRS Value Code
1865	Average Flow	22.0	
1866	End Date	4/13/2008	
1867	End Time	12:00 AM	
1868	Retrieval Date	4/15/2008	
1869	Retrieval Time	08:48 AM	
1870	Run Time	24.1	
1871	Start Date	4/12/2008	
1872	Start Time	12:00 AM	
1873	Total Volume	31.7	

Laboratory Analysis Data .....

Quartz Filter (25 mm) I8687J
Shipping Flags:
Module Disassembly Flags:

Organic and elemental carbon IMPROVE_A

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Value Code
1874	E1 IMPROVE	30.3	0.955				
1875	E2 IMPROVE	1.76	0.05550				
1876	E3 IMPROVE	0.00000	0.00000				
1877	EC IMPROVE TOR	18.4	0.580				
1878	EC IMPROVE TOT	11.2	0.352				
1879	O1 IMPROVE	7.18	0.226				
1880	O2 IMPROVE	15.2	0.479				
1881	O3 IMPROVE	19.8	0.625				
1882	O4 IMPROVE	14.8	0.467				
1883	OC IMPROVE TOR	70.6	2.23				
1884	OC IMPROVE TOT	77.9	2.46				
1885	OP IMPROVE TOR	13.6	0.430				
1886	OP IMPROVE TOT	20.9	0.659				
1887	TC IMPROVE	89.0	2.81				

LOCATION Lindon **4/12/2008** AIRS_CODE 490494001 POC 5
SAMPLER TYPE SASS with URG 3000N
FIELD CUSTODY NO Q159243E ROUTINE
CHANNEL 1 SAMPLE 9.695
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: **DST** Flow Flags: **FHT**

Field Sampling Data .....

		Value	AIRS Null Value Code
1888	Average flow	6.73	
1889	Avg ambient temp	7.6	
1890	Avg BP	645	
1891	Delta T Flag		
1892	End date	4/13/2008	
1893	End time	12:00 AM	
1894	Max ambient temp	15.8	
1895	Max BP	653	
1896	Min ambient temp	-1.9	
1897	Min BP	642	
1898	Retrieval date	4/15/2008	
1899	Retrieval time	08:42 AM	
1900	Run Time	24.0	
1901	Run Time Flag		
1902	Sample volume	9.70	
1903	Start date	4/12/2008	
1904	Start time	12:00 AM	

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Laboratory Analysis Data .....

Teflon Filter I5084M
Shipping Flags:
Module Disassembly Flags:

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Null Value Code
Mass - PM2.5							
1905	Particulate matter 2.5u	89.0±5.1	9.18±0.52	7.2	0.74		
Trace elements							
1906	Aluminum	0.589±0.12	0.06070±0.012	0.12	0.013		
1907	Antimony	0.00000±0.13	0.00000±0.014	0.40	0.042		
1908	Arsenic	0.00000±0.006	0.00000±0.000	0.016	0.00170		
1909	Barium	0.00000±0.039	0.00000±0.004	0.099	0.010		
1910	Bromine	0.03620±0.013	0.00373±0.001	0.017	0.00180		
1911	Cadmium	0.00000±0.060	0.00000±0.006	0.18	0.019		
1912	Calcium	0.792±0.059	0.08170±0.006	0.046	0.00470		
1913	Cerium	0.00000±0.032	0.00000±0.003	0.066	0.00680		
1914	Cesium	0.00000±0.11	0.00000±0.011	0.33	0.034		
1915	Chlorine	0.103±0.023	0.01060±0.002	0.048	0.00500		
1916	Chromium	0.00000±0.009	0.00000±0.000	0.021	0.00220		
1917	Cobalt	0.00000±0.004	0.00000±0.000	0.011	0.00110		
1918	Copper	0.01800±0.007	0.00185±0.000	0.013	0.00130		
1919	Europium	0.00000±0.018	0.00000±0.001	0.046	0.00470		

1920	Gallium	0.00000±0.009	0.00000±0.000	0.024	0.00250
1921	Gold	0.00000±0.018	0.00000±0.001	0.053	0.00550
1922	Hafnium	0.00000±0.016	0.00000±0.001	0.038	0.00390
1923	Indium	0.00000±0.071	0.00000±0.007	0.21	0.022
1924	Iridium	0.00000±0.024	0.00000±0.002	0.069	0.00710
1925	Iron	0.788±0.058	0.08120±0.005	0.014	0.00140
1926	Lanthanum	0.00000±0.032	0.00000±0.003	0.076	0.00780
1927	Lead	0.05200±0.031	0.00536±0.003	0.047	0.00480
1928	Magnesium	0.02150±0.041	0.00221±0.004	0.11	0.011
1929	Manganese	0.00994±0.007	0.00103±0.000	0.017	0.00180
1930	Mercury	0.00000±0.044	0.00000±0.004	0.091	0.00940
1931	Molybdenum	0.00000±0.029	0.00000±0.003	0.087	0.00900
1932	Nickel	0.00000±0.003	0.00000±0.000	0.011	0.00110
1933	Niobium	0.00000±0.015	0.00000±0.001	0.046	0.00470
1934	Phosphorus	0.00000±0.048	0.00000±0.004	0.098	0.010
1935	Potassium	0.590±0.045	0.06080±0.004	0.038	0.00390
1936	Rubidium	0.00000±0.005	0.00000±0.000	0.017	0.00180
1937	Samarium	0.00000±0.019	0.00000±0.002	0.045	0.00460
1938	Scandium	0.00000±0.12	0.00000±0.012	0.36	0.037
1939	Selenium	0.00000±0.006	0.00000±0.000	0.019	0.00200
1940	Silicon	1.81±0.16	0.187±0.017	0.11	0.011
1941	Silver	0.102±0.15	0.01050±0.015	0.14	0.015
1942	Sodium	0.00000±0.13	0.00000±0.014	0.39	0.040
1943	Strontium	0.00113±0.016	0.00012±0.001	0.022	0.00230
1944	Sulfur	3.23±0.23	0.333±0.024	0.071	0.00730
1945	Tantalum	0.00000±0.034	0.00000±0.003	0.095	0.00980
1946	Terbium	0.00000±0.027	0.00000±0.002	0.035	0.00360
1947	Tin	0.00000±0.10	0.00000±0.011	0.31	0.032
1948	Titanium	0.00000±0.016	0.00000±0.001	0.042	0.00430
1949	Vanadium	0.01240±0.015	0.00128±0.001	0.029	0.00300
1950	Wolfram	0.00000±0.026	0.00000±0.002	0.071	0.00730
1951	Yttrium	0.00226±0.018	0.00023±0.001	0.027	0.00280
1952	Zinc	0.130±0.013	0.01350±0.001	0.034	0.00350
1953	Zirconium	0.00000±0.081	0.00000±0.008	0.044	0.00450

LOCATION Lindon **4/12/2008** AIRS_CODE 490494001 POC 5
SAMPLER TYPE SASS with URG 3000N
FIELD CUSTODY NO Q159243E ROUTINE
CHANNEL 2 SAMPLE 9.690
Sample Handling Validation Checks Performed Level 0: T Level 1: T
Event Flags: **DST** Flow Flags: **FHT**

Field Sampling Data .....

		Value	AIRS Value Code
1954	Average flow	6.73	
1955	Avg ambient temp	7.6	
1956	Avg BP	645	
1957	Delta T Flag		
1958	End date	4/13/2008	
1959	End time	12:00 AM	
1960	Max ambient temp	15.8	
1961	Max BP	653	
1962	Min ambient temp	-1.9	
1963	Min BP	642	
1964	Retrieval date	4/15/2008	
1965	Retrieval time	08:42 AM	
1966	Run Time	24.0	
1967	Run Time Flag		
1968	Sample volume	9.69	
1969	Start date	4/12/2008	
1970	Start time	12:00 AM	

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Laboratory Analysis Data .....

Nylon Filter I51005
Shipping Flags:
Module Disassembly Flags:

		Analyte Mass (ug)	Conc (ug/m^3)	Det Limit (ug)	Det Limit (ug/m^3)	Analysis Flags	AIRS Value Code
Cations - PM2.5 (NH4, Na, K)							
1971	Ammonium	12.4±0.88	1.28±0.090	0.16	0.017		
1972	Potassium	0.512±0.044	0.05280±0.004	0.13	0.014		
1973	Sodium	0.433±0.62	0.04470±0.064	0.29	0.030		
Nitrate - PM2.5							
1974	Nitrate	33.3±2.4	3.43±0.24	0.070	0.00720		
Sulfate - PM2.5							
1975	Sulfate	9.33±0.68	0.963±0.071	0.10	0.010		

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