

Utah Division of Air Quality

PM10 & PM2.5 Exceptional High Wind Event Lindon Monitoring Station

Event Date – May 20, 2008

*Millard County, Utah
Taken By Don Halterman June 2009*

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APPENDIX 1 HOURLY DATA FROM REAL TIME MONITORS DURING THE EVENT
APPENDIX 2 PM2.5 SPECIATION FILTER DATA

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 high wind 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 exceedance at the Lindon monitoring station;
- IV. The measured concentration was beyond normal historical levels; and
- V. The exceedance would not have occurred “but for” the high winds.

On May 20, 2008, winds increased in the late afternoon, spiking around 10 p.m., than rebounded with gusts as high as 50 mph shortly after midnight.

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 and is as much as 49 inches in the mountains. 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).

Affect Air Quality

The 24-hour standards for PM₁₀ and PM_{2.5} were exceeded at the Lindon monitoring station as follows;

- ❖ Lindon PM₁₀ – 177 µg/m³
- ❖ Lindon PM_{2.5} – 36.3 µg/m³

Figures 1 and 2 present the PM₁₀ and PM_{2.5} 24-hr values from May 18 to 22, 2008, for the entire Utah air monitoring network.

Utah Division of Air Quality – High Wind Exceptional Event
Event Day – May 20, 2008

Figure 1 – PM10 24-hr Values

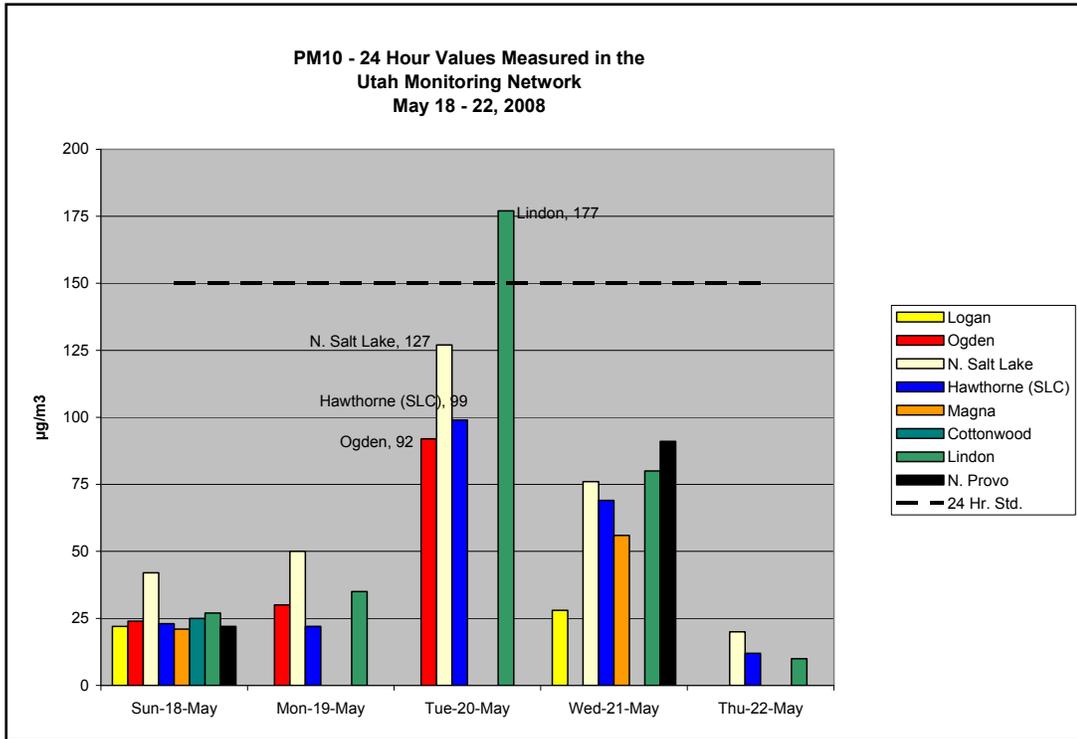
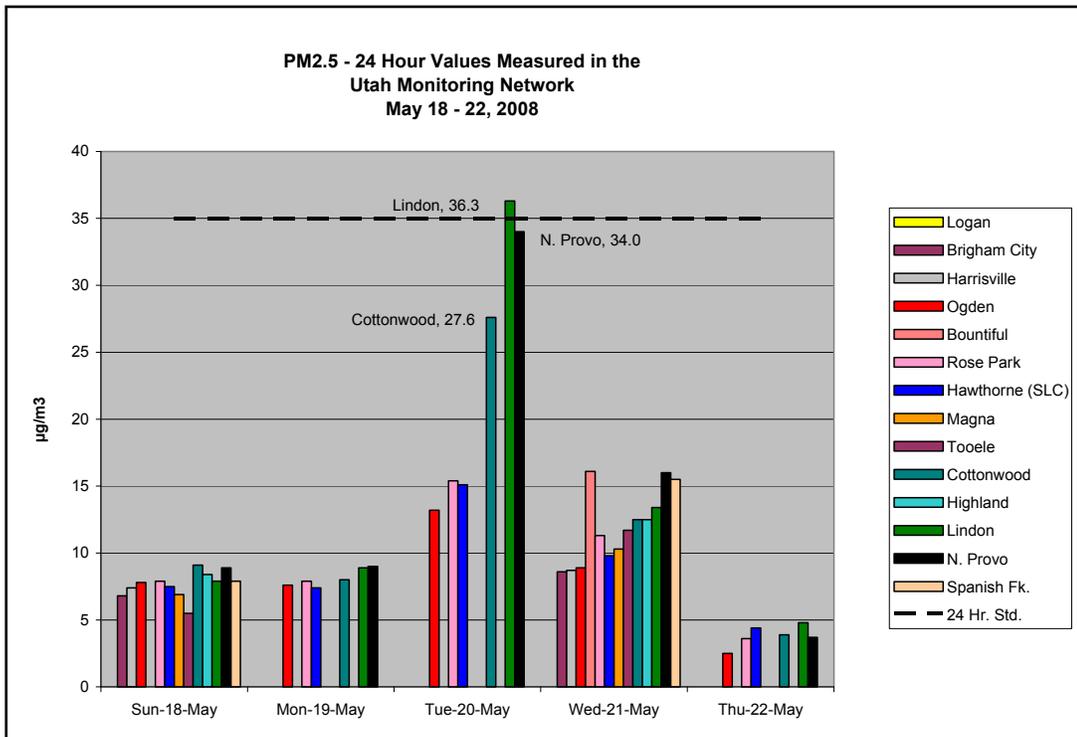


Figure 2 – PM2.5 24-hr Values



Figures 3 and 4 show the hourly measurements for PM10 and PM2.5, at available TEIOM monitors.

Utah Division of Air Quality – High Wind Exceptional Event
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Figure 3 – PM10 Hourly Values

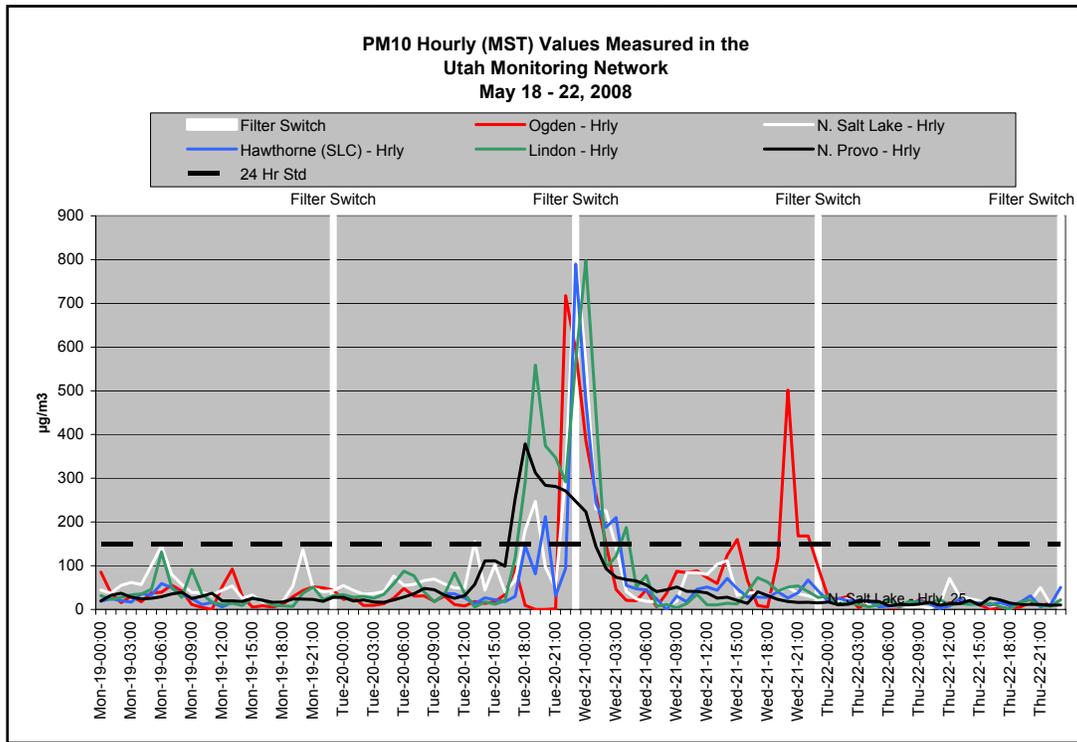
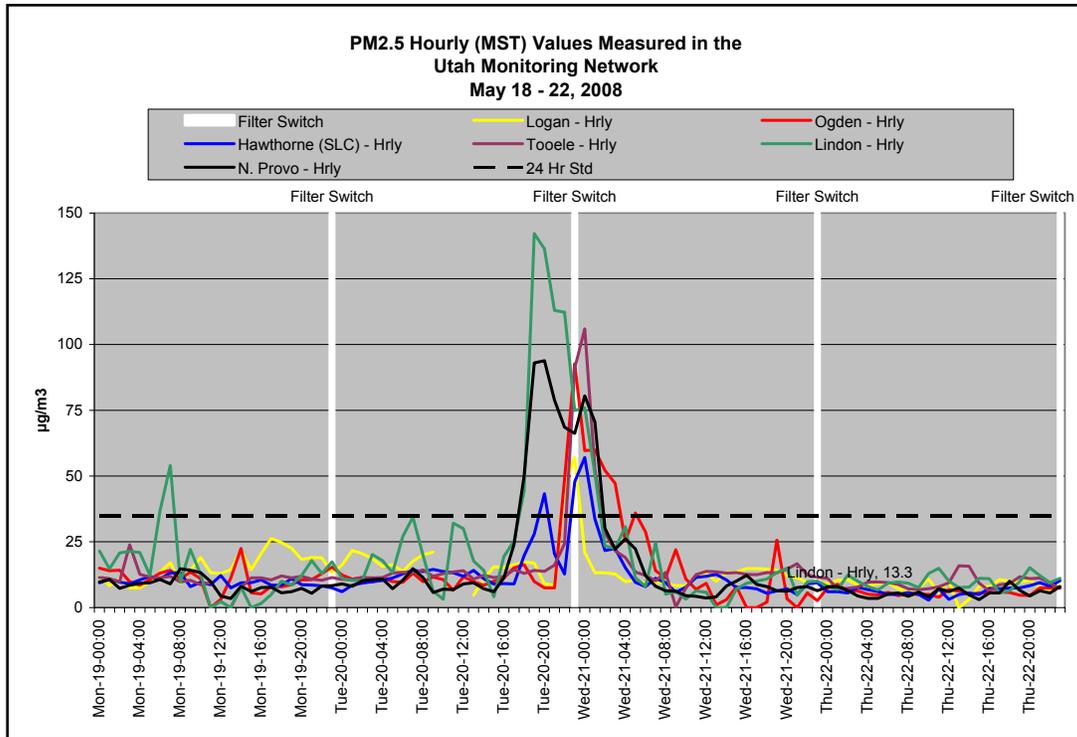


Figure 4 – PM2.5 Hourly Values

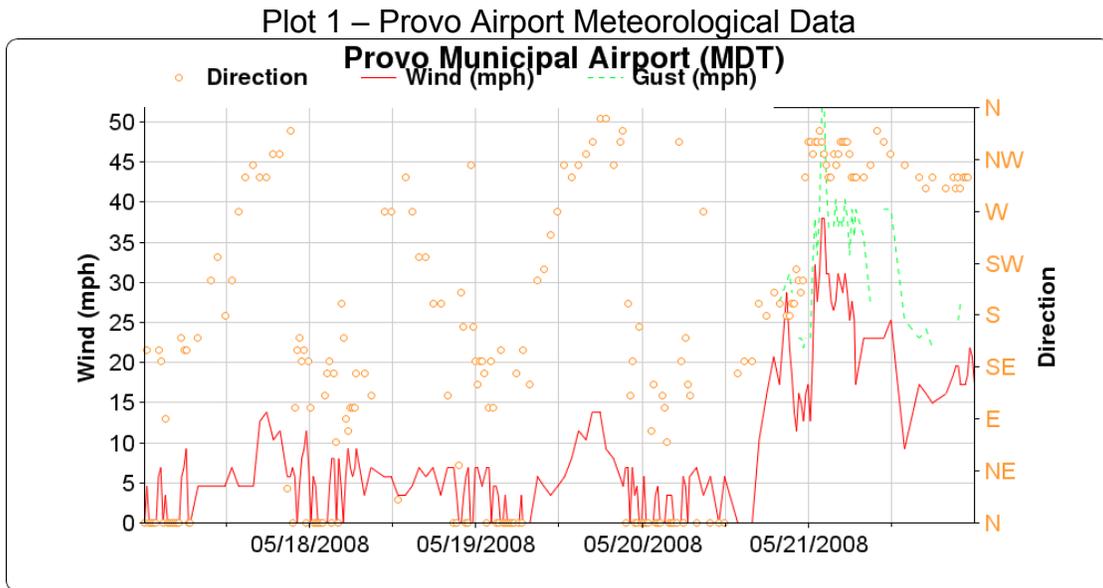


Appendix 1 contains the hourly data from the real time monitors.

Not Reasonably Controllable or Preventable & Natural Event

Utah experiences naturally occurring wind storms, predominantly in the spring. These natural events are included in the Exceptional Event rule even though they are recurring because they generate **unpreventable** and **uncontrollable** high winds.

The Provo airport meteorological data explains the double peaking in the hourly data that is particularly pronounced for the Lindon station. Notice the wind shift from the west to the south, followed by wind spiking. Winds averaged 16.9 mph from 7 p.m. to midnight, gusting to 38 mph around 11 p.m.



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 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.).

The data ranking described above for the Lindon monitoring station data collected from 1993 through 2008 verifies that the PM10 concentration on May 20, 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.

The following is the IQR for all Lindon data:

First Quartile (Q1):	17 $\mu\text{g}/\text{m}^3$
Median (Q2):	27 $\mu\text{g}/\text{m}^3$
Third Quartile (Q3):	40 $\mu\text{g}/\text{m}^3$
IQR:	23 $\mu\text{g}/\text{m}^3$

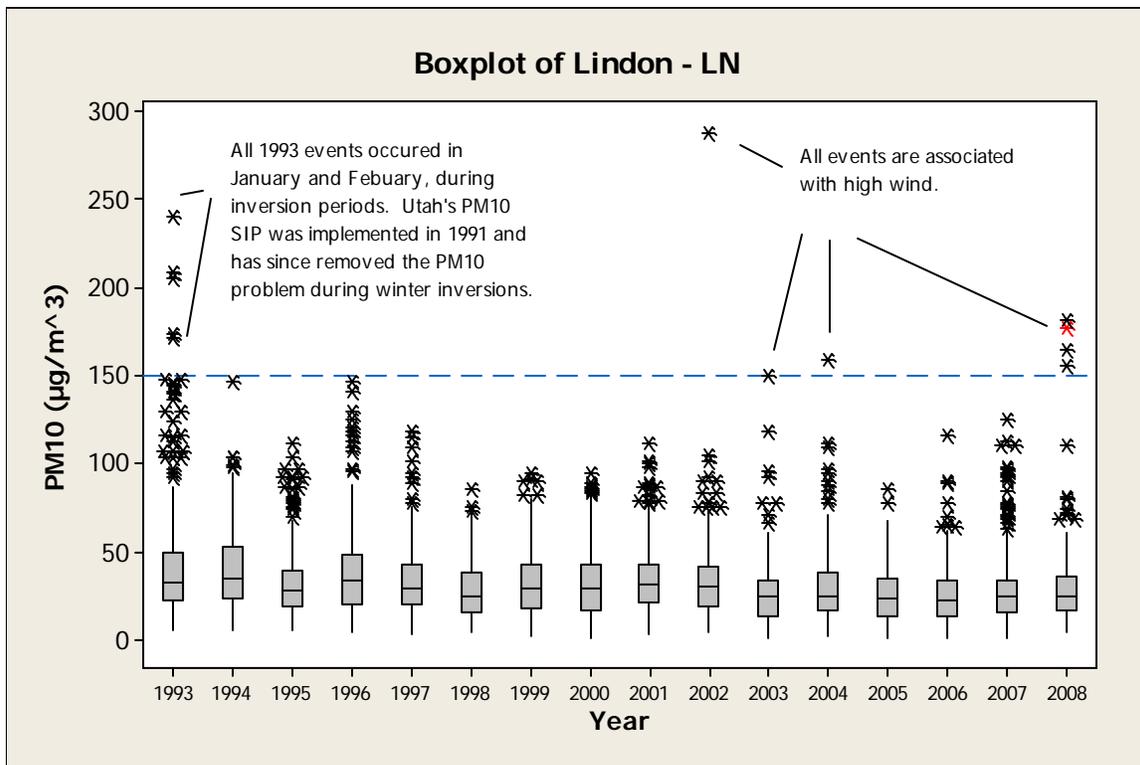
The IQR was calculated on a quarterly basis (shown in Table 1) along with the annual.

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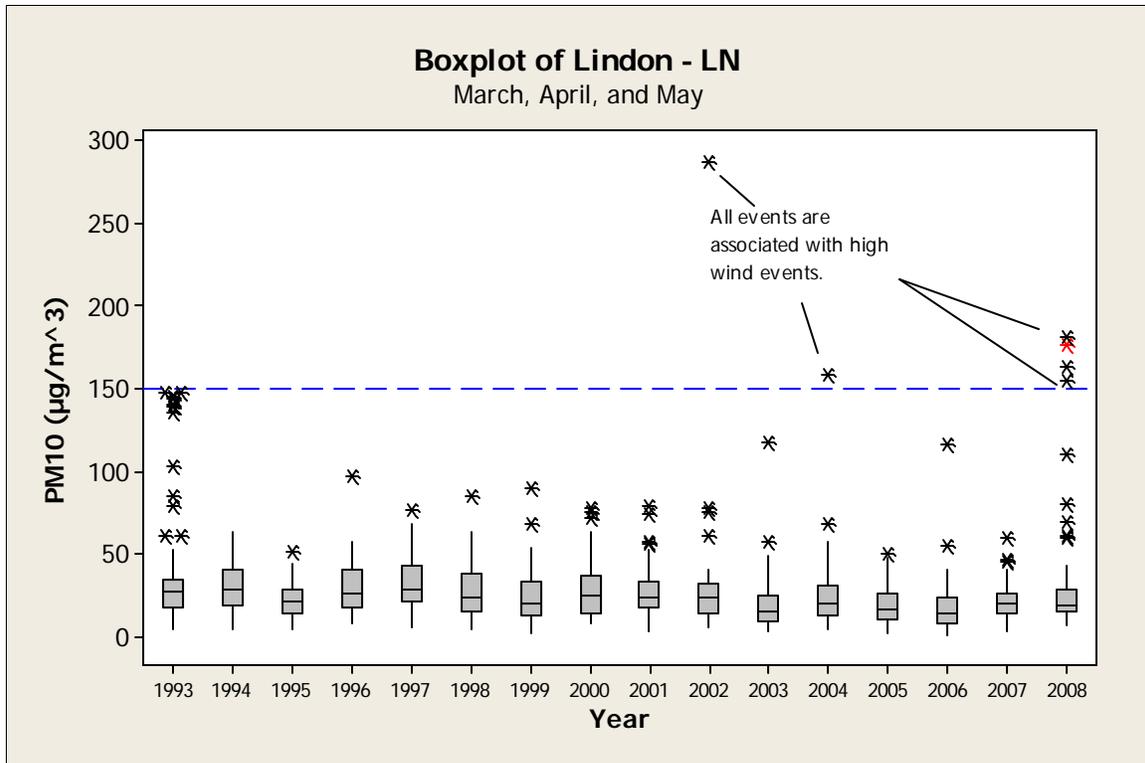
Table – 1 Lindon Interquartile ($\mu\text{g}/\text{m}^3$)

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.



Because this event occurred during the second quarter, it may be 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 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.

Lognormal Distribution

Lognormal distribution analysis was conducted to establish the normal historical fluctuations for the Lindon station (inclusive of exceptional event results). Lognormal distribution was selected because of its ability to accurately describe the distribution of measured concentrations of PM10. The geometric mean (μ_{geo}) was calculated on a quarterly basis (shown in Table 2) 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 value.

Table 2 – Geometric Mean of PM10

Location	Quarter	N Quarterly	μ_{geo} ($\mu\text{g}/\text{m}^3$)	Annual μ_{geo} ($\mu\text{g}/\text{m}^3$)
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	

The annual value is far below the May 20 event of 177 $\mu\text{g}/\text{m}^3$.

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

Geometric Mean (μ_{geo}): $\text{Exp}(\text{Loc})=25.38$

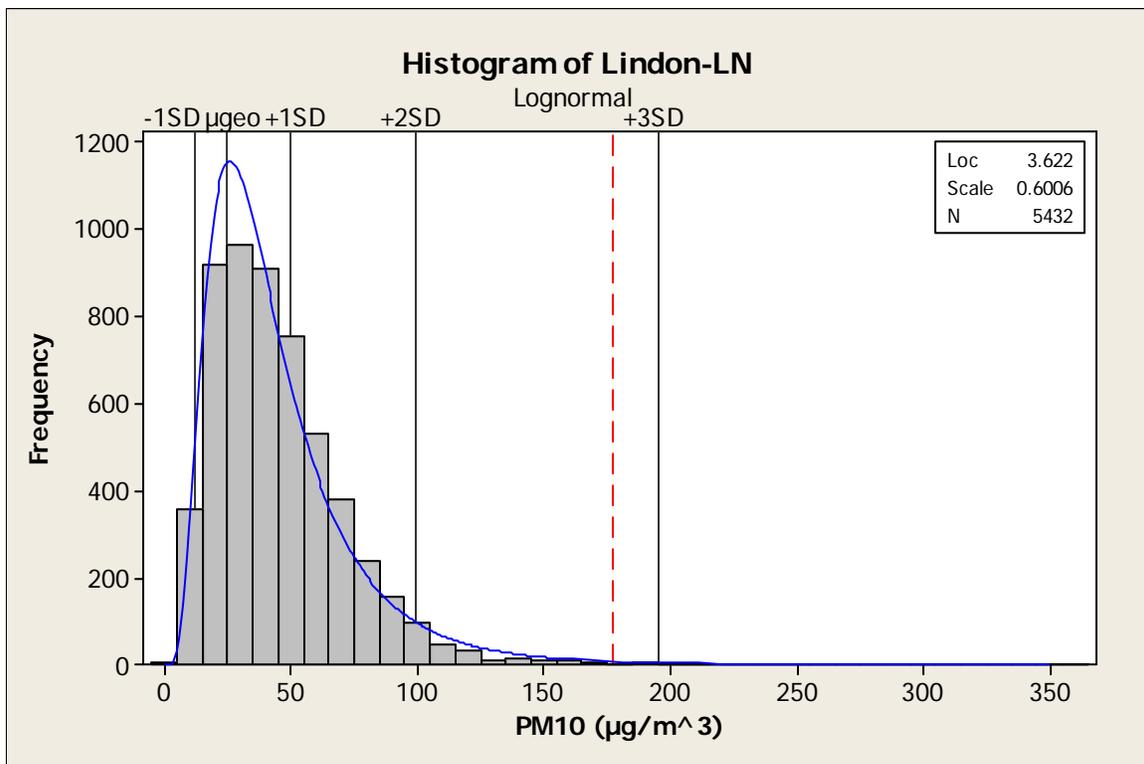
Geometric Standard Deviation (σ_{geo}): $\text{Exp}(\text{Scale})= 1.9758$

+1 Standard Deviation (+1SD): $\text{Exp}(\text{Loc} + \text{Scale})= \mu_{geo} * \sigma_{geo}= 50.14$

+2 Standard Deviation (+2SD): $\text{Exp}(\text{Loc} + 2 * \text{Scale})= \mu_{geo} * (\sigma_{geo})^2= 99.08$

+3 Standard Deviation (+3SD): $\text{Exp}(\text{Loc} + 3 * \text{Scale})= \mu_{geo} * (\sigma_{geo})^3= 195.78$

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 the geometric mean as the bounds of normal PM10 values. The event value **exceeds 2SD**. The event value is clearly outside the normal historical fluctuation.

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 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 performed on the historical data. The interquartile range (IQR) was calculated. This was then compared to the event value.

Third, a lognormal distribution analysis was performed 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. > 95thile) than for concentrations that were closer to “typical levels” (e.g. < 75thile.).

The data ranking described above for the Lindon monitoring station data collected from 1999 through 2008 verifies that the PM2.5 concentration on May 20, 2008, is above the 97thile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

Interquartile Range

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

The following is the IQR for all Lindon data:

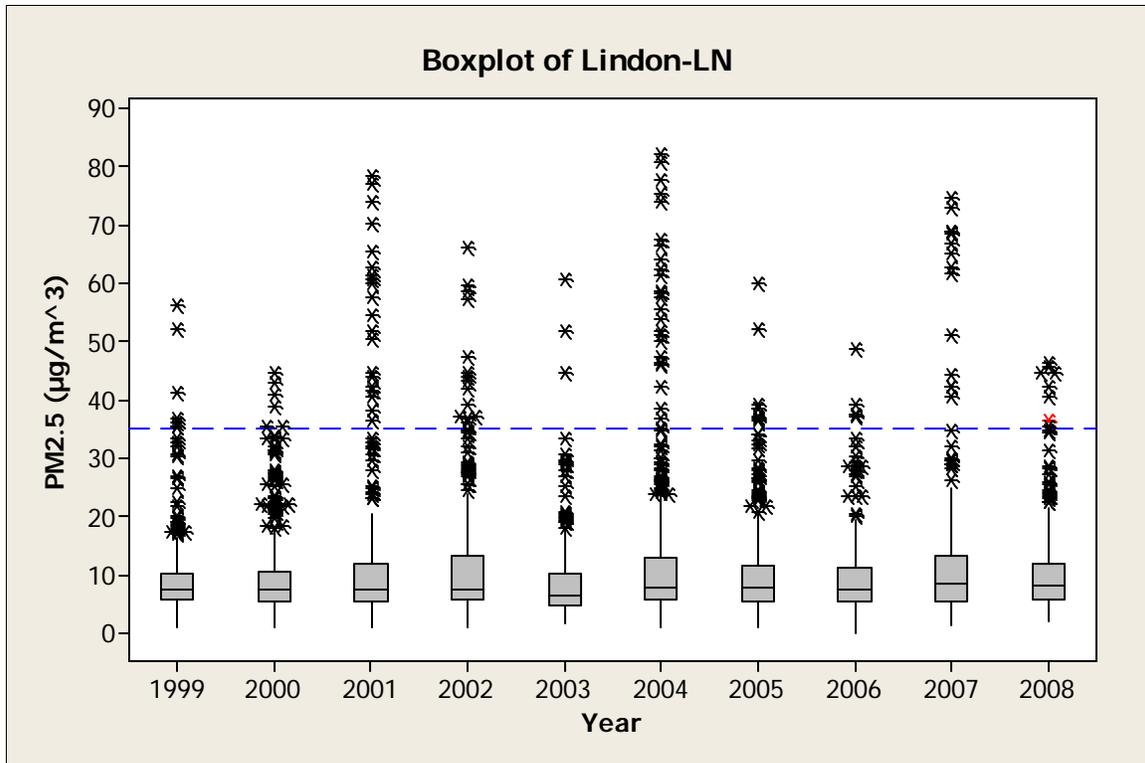
First Quartile (Q1): 5.3 $\mu\text{g}/\text{m}^3$
Median (Q2): 7.4 $\mu\text{g}/\text{m}^3$
Third Quartile (Q3): 11.5 $\mu\text{g}/\text{m}^3$
IQR: 6.2 $\mu\text{g}/\text{m}^3$

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

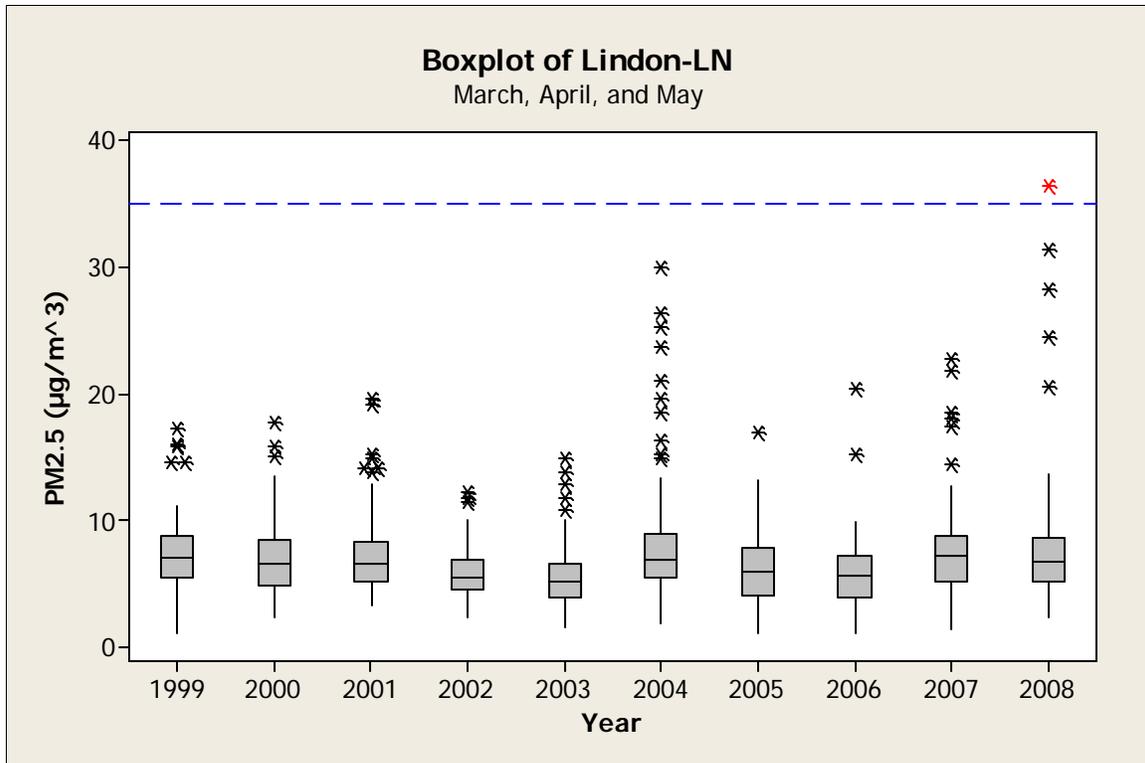
Table – 3 Lindon Interquartile ($\mu\text{g}/\text{m}^3$)

Quarter	Sample Size (N)	Q1	Q2	Q3	IQR
1	1366	7.2	12.9	22.8	15.6
2	1423	4.7	6.2	8.2	3.5
3	1357	5.7	7.3	9.8	4.1
4	1300	5.3	7	10.7	5.4
All	5446	5.3	7.4	11.5	6.2

The boxplot presents the historical PM10 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 may be 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 May 20, 2008, 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 Lindon station (inclusive of exceptional event results). Lognormal distribution was selected because of its ability to accurately describe the distribution of measured concentrations of PM2.5. The geometric mean (μ_{geo}) 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 value.

Table 4 – Geometric Mean of PM2.5

Location	Quarter	N Quarterly	μ_{geo} ($\mu\text{g}/\text{m}^3$)	Annual μ_{geo} ($\mu\text{g}/\text{m}^3$)
Lindon 01/01/1999 to 12/31/2008	1	837	12.49	8.09
	2	879	6.18	
	3	886	7.64	
	4	863	7.41	

The annual value is far below the May 20 event of 36.5 $\mu\text{g}/\text{m}^3$.

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

Geometric Mean (μ_{geo}): $\text{Exp}(\text{Loc})=8.09$

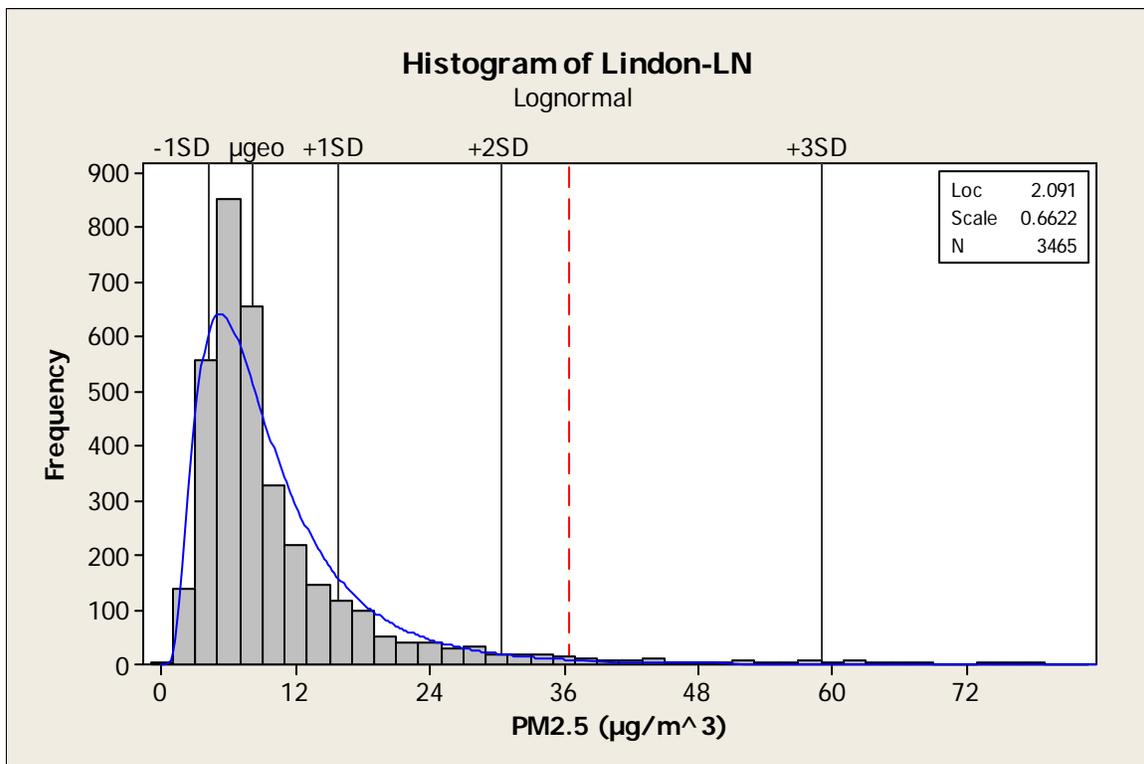
Geometric Standard Deviation (σ_{geo}): $\text{Exp}(\text{Scale})= 1.9391$

+1 Standard Deviation (+1SD): $\text{Exp}(\text{Loc} + \text{Scale})= \mu_{geo} * \sigma_{geo}= 15.69$

+2 Standard Deviation (+2SD): $\text{Exp}(\text{Loc} + 2 * \text{Scale})= \mu_{geo} * (\sigma_{geo})^2= 30.43$

+3 Standard Deviation (+3SD): $\text{Exp}(\text{Loc} + 3 * \text{Scale})= \mu_{geo} * (\sigma_{geo})^3= 59$

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 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.

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 5 - Average Wind Speed in mph for 1996-2006

Station	Jan	Feb	Mar	Apr	May	Annual	MesoWest Hourly Average on 5-20-08
Provo	4.9	6.0	7.2	7.9	7.4	6.3	7.3
Salt Lake City	6.9	7.6	8.9	9.8	9.2	8.6	6.1

Data Source: Western Regional Climate Center

Maximum Wind at Provo Airport on May 20, 2008 – 28 mph

Ranking

A Ranked method was used to determine if the wind speed measured on May 20, 2008, was outside what is normally observed. All historical wind speeds 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 PM10 and PM2.5, it can be extrapolated that “extremely high” measurements are above the 95th%ile and that “typical levels” are closer to the 75th%ile.

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 May 20, 2008 of 12.1 mph, is above the 84th%ile. Consequently, we can conclude that the event day concentration is outside the normal historical fluctuation.

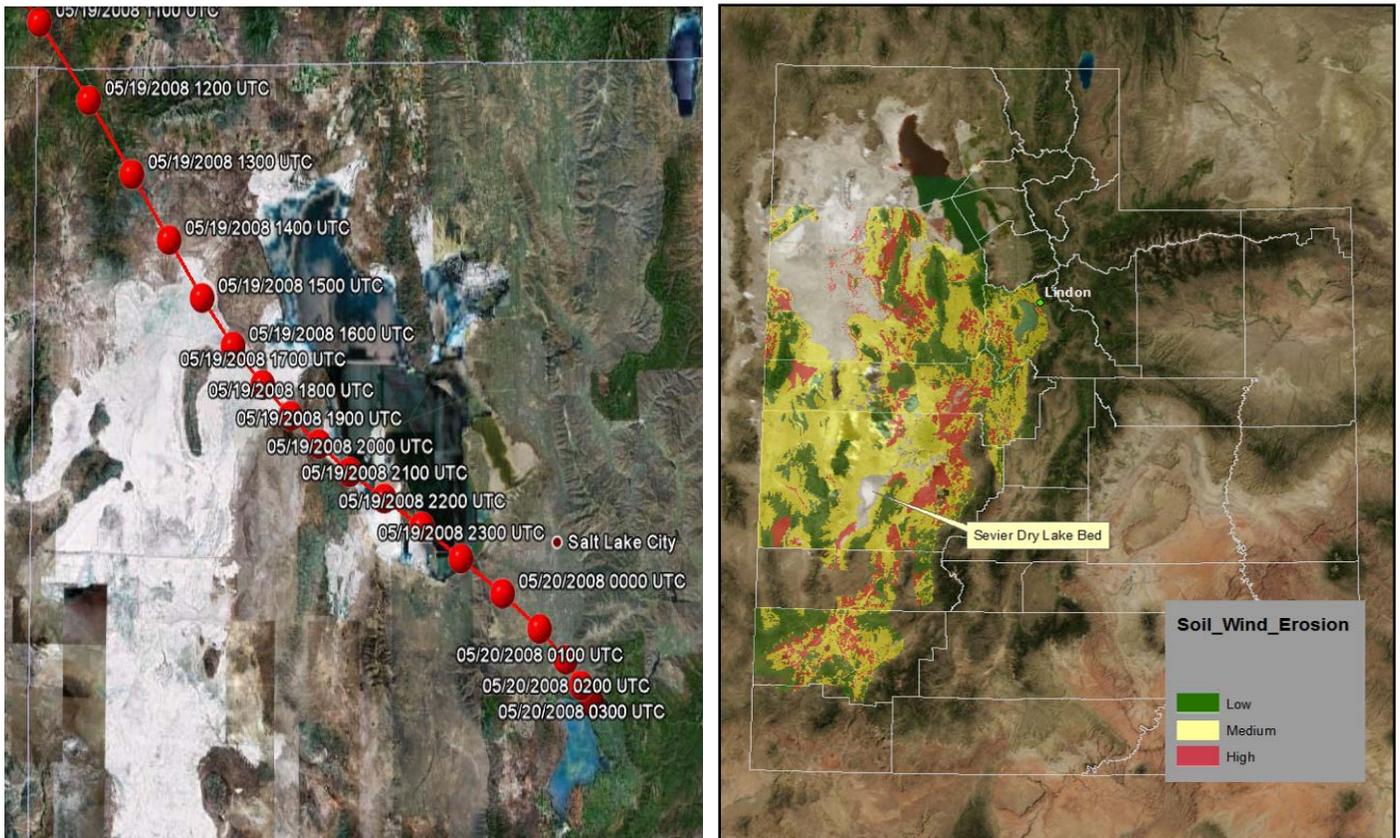
Clear Causal Relationship (40 CFR 50.14)

Trajectory and Impacted Area

Backward trajectory analysis using the NOAA HYSPLIT mode was used to project the winds over a 24-hr period ending at the start of the event. EDAS meteorological data at 1000 meters was plotted onto a Google Earth satellite image for visual enhancement. 1000 meters was selected to represent the steering height of the air mass over the complex terrain.

The U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS), developed a wind erosion GIS map (right side of Image 1) of MLRA 28A for the DEQ using the Wind Erodibility Index, that assigns an erosion rate to soil. The NRCS categorized soil wind erosion into three categories; low, medium and high erodibility. The desert areas, such as the Great Salt Lake are not defined because the NRCS does not have data for these regions, however these areas are known to have a high erosion potential (shown in white on left side of Image 1) and are often major contributors to Utah dust storms. The trajectory of this storm shows that the storm traveled over the erosion prone areas of the Great Salt Lake.

Image 1 – Back Trajectory and Utah Erodible Soils Profile



Speciation

Coarse Mass Analysis

Studies conducted in national parks on coarse mass (2.5-10 µm) indicate the composition of coarse 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 SiO₂, Al₂O₃, CaO, Fe₂O₃, K₂O, MgO, FeO, Na₂O, TiO₂, SO₂, P₂O₅, 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 6 – Coarse Mass Analysis of PM2.5

	Lindon 5/20/08 Event Day	Published Values	Lindon* 5/24/08 Post- event
Mineral	34.6%	34-74%	7.8%
Nitrate	1.1%	10-12%	7.1%
Sulfate	1.9%	≈ 5%	11.2%

*Lindon sample flagged for holding time.

Appendix 2 contains the speciation filter data.

The coarse mass analysis values are consistent with DEQ’s observations for high wind event days where the mineral content drastically increases from entrained dust while predominately anthropogenically associated nitrates and sulfates decrease. This observed pattern is a significant weight of evidence that the majority of the dust that caused the exceedance is naturally occurring.

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.

The California Regional PM₁₀ and PM_{2.5} 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, NO_x, 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 PM_{2.5} 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 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.

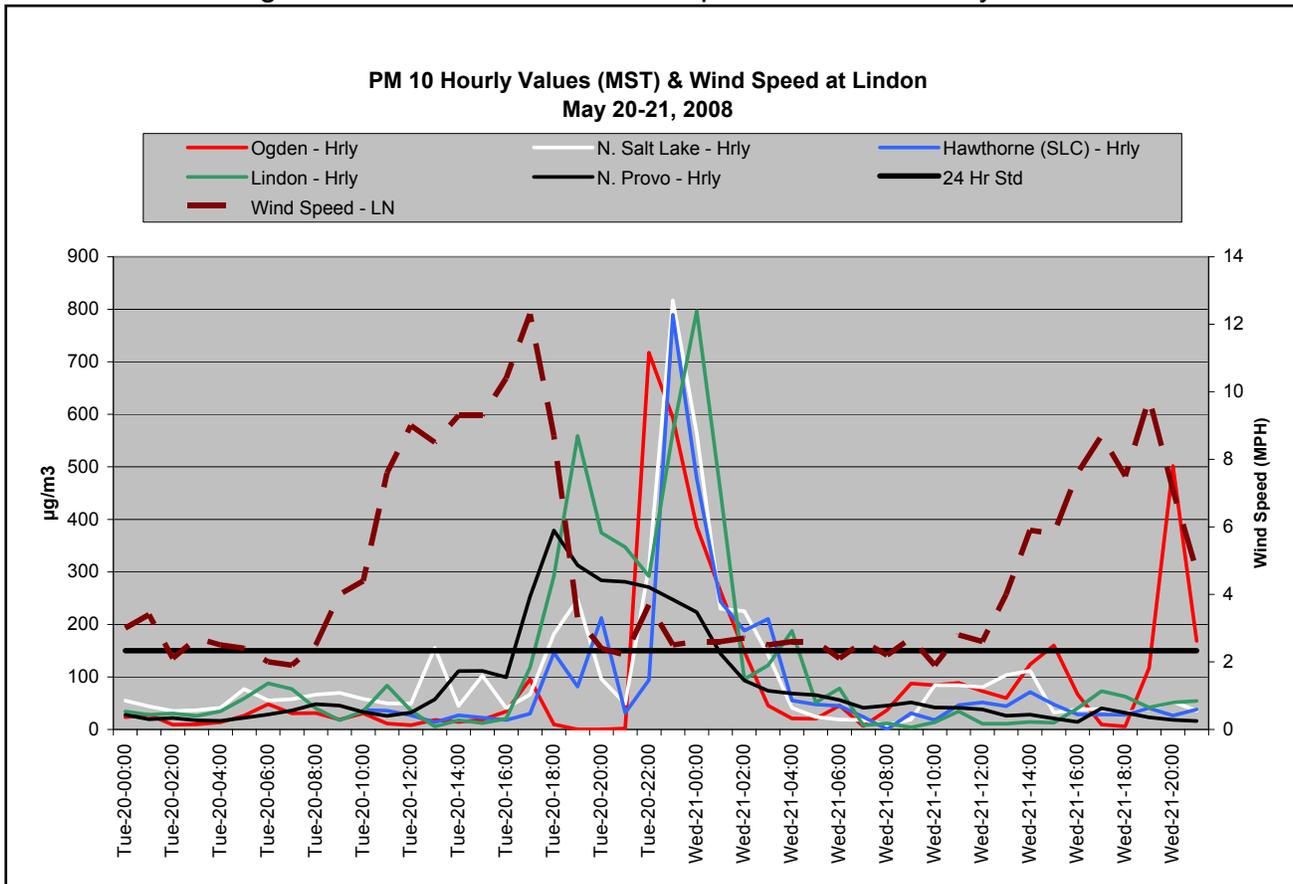
No Exceedance or Violation But For the Event

Wind Storm Event

There were no unusual local anthropogenic emissions reported before, during, and after the event.

Figure 5 is a plot of the wind speed measured at the Lindon monitoring station along with the PM10 hourly values.

Figure 5 – Lindon Station Wind Speed & PM10 Hourly Data



The hourly PM10 pattern across the network mirrored each other before, during and after the event, demonstrating that PM10 levels at all stations before and after the high wind event were substantially below the level that would generate a reading above the 24-hr standard.

We substantiate the “but not for” high wind 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, has 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 based on Figure 5 with excursions directly associated with gusting winds.

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:

- ❖ PM10 and PM2.5 concentration patterns correspond directly to high winds showing a direct relationship; and
- ❖ Speciation mass analysis showed a reduction in nitrate and sulfate mass, supporting evidence that the source(s) of the particulates 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 (BACM) 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.

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%
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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%. As of 2009, a total of 247 buses have been retrofitted. By the fall of 2010, 454 buses will be 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.

Utah Division of Air Quality – High Wind Exceptional Event Event Day – May 20, 2008



The screenshot shows the Utah Division of Air Quality website. The header includes the logo 'DEQ Utah gov' and 'Utah Department of Environmental Quality'. The main navigation menu on the left lists various categories such as 'Air Quality Items', 'Public Interest', 'Permitting', and 'Compliance'. The main content area is titled 'Dust Control and the Aggregate Industry' and includes sub-links for 'Fugitive Dust', 'Opacity', 'Control Options', 'Site Specific Repository', and 'Contacts'. A photograph of a gravel processing site is displayed. Below the photo, there is text explaining that sand and gravel, asphalt production, and concrete processing operations are monitored for compliance with fugitive dust rules. The text is organized into sections: 'FUGITIVE DUST' and 'OPACITY'. The 'FUGITIVE DUST' section defines it as stirred-up dust made of fine particles called particulate matter or PM, and notes that it irritates eyes and impacts the respiratory system. It also states that fugitive dust may come from gravel operations, construction, land clearing, and mining. The 'OPACITY' section explains that it is a measure of dust concentration, measured with instruments or by a trained eye, and that it is used to determine the effectiveness of dust control efforts. It also mentions that opacity limits are contained in a source's air quality permit and that enforcement actions can be taken against those with excessive opacity.

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).

 <h3>1 Preservation of Existing Vegetation</h3> <ul style="list-style-type: none"> 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. 	 <h3>2 Construction Phasing</h3> <ul style="list-style-type: none"> 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. 	 <h3>3 Construction Entrances</h3> <ul style="list-style-type: none"> 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.
 <h3>4 Silt Fencing</h3> <ul style="list-style-type: none"> 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. 	<h2 style="text-align: center;">TOP TEN BMPs</h2> <h3 style="text-align: center;">for Pollution Prevention at the Construction Site</h3> <p>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</p>	 <h3>5 Storm Drain Inlet Protection</h3> <ul style="list-style-type: none"> 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.
 <h3>6 Vegetative Buffers</h3> <ul style="list-style-type: none"> 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. 		 <h3>7 Site Stabilization</h3> <ul style="list-style-type: none"> Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.
 <h3>8 Equipment Fueling and Containment</h3> <ul style="list-style-type: none"> 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. 	 <h3>9 Waste Management</h3> <ul style="list-style-type: none"> 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. 	 <h3>10 Fugitive Dust Suppression</h3> <ul style="list-style-type: none"> 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)(I0) and R317-8-3.9(6)(e)(I), 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 pasturand, 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 (Cache 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

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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

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<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.

Utah Division of Air Quality – High Wind Exceptional Event Event Day – May 20, 2008



It Lake Valley Health Department
[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

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

References

Land Resource Regions and Major Land Resource Area of the United States, the Caribbean, and the Pacific Basin. *United States Department of Agriculture Handbook 296*, 2006.

Malm, W.C., M.L. Pitchford, C. McDade, and L.L. Ashbaugh. 2007. Coarse particle speciation at selected locations in the rural continental United States. *Atmospheric Environment*, 41 (10): 2225-2239.

Appendix 1

Hourly Data from Real Time Monitors During the Event

PM10	Ogden	N. Salt Lake	Hawthorne	Lindon	N. Provo	Wind Speed - LN	PM2.5	Logan	Ogden	Hawthorne	Tooele	Lindon	N. Provo
5/20/08 0:00	23	55		34	28	3		16.2	12.4	6	10.7	11	9
5/20/08 1:00	27	44		28	19	3.4		21.7	10.8	8.5	10.7	10.3	8.1
5/20/08 2:00	9	35		30	22	2.1		20.5	11.5	9.3	11.4	10.3	10.2
5/20/08 3:00	10	36		26	17	2.7		18.6	9.7	9.8	11.3	20.2	10.6
5/20/08 4:00	13	41		34	16	2.5		15.6	11.2	10.3	11.4	17.8	10.9
5/20/08 5:00	26	77		59	22	2.4		16.3	9.9	11.2	13.1	13.3	7.2
5/20/08 6:00	48	55		88	28	2		13.7	9.6	12.8	13.4	27	10.4
5/20/08 7:00	31	58		77	36	1.9		17.6	13.1	14.1	13.1	34.4	14.8
5/20/08 8:00	31	66		40	48	2.5		20.1	9.8	13.7	14.3	19.9	11.4
5/20/08 9:00	19	70		18	45	4		21.1	11.6	14.5	11.9	6.2	5.7
5/20/08 10:00	31	58	37	35	33	4.4			10.6	13.7	12.9	3.2	7
5/20/08 11:00	11	50	36	84	26	7.6			6.6	13.2	13.5	32.1	6.8
5/20/08 12:00	8	49	27	36	32	9			11.7	11.9	14	30	9
5/20/08 13:00	18	155	13	5	57	8.5		4.7	9.8	14.1	10.8	17.7	9.4
5/20/08 14:00	14	45	27	17	111	9.3		10.6	8.4	11	12.3	14.2	7.2
5/20/08 15:00	18	102	23	12	111	9.3		15.5	10	8.9	11.4	4.1	6
5/20/08 16:00	34	41	18	20	99	10.4		15.2	11.2	9.1	11.8	19.4	11.3
5/20/08 17:00	95	66	30	118	253	12.3		16.3	15.1	9	14.4	25.3	24
5/20/08 18:00	10	182	146	292	379	8.7		17.3	16.3	19.7	13	44.1	49.9
5/20/08 19:00	0	247	81	559	313	3.3		16.9	9.9	28	14.1	142.2	93
5/20/08 20:00	0	96	212	374	284	2.4		9	7.5	43.3	13.8	136.4	93.9
5/20/08 21:00	2	49	32	347	281	2.2		8.5	7.5	20.4	16.1	113	78.9
5/20/08 22:00	717	310	94	292	271	3.7		46	48.7	12.7	24.2	112.3	68.6
5/20/08 23:00	594	817	790	566	247	2.5		57.1	92.7	47.8	91	74.9	66.2
5/21/08 0:00	386	563	478	797	223	2.6		20.9	59.7	57	106	76	80.5
5/21/08 1:00	263	230	244	453	144	2.6		13.2	59.9	33.6	52.5	50.7	70.5
5/21/08 2:00	148	225	188	96	93	2.7		13.2	52.1	21.7	28.4	23.4	30.1
5/21/08 3:00	45	142	210	122	74	2.5		12.7	47.2	22.4	21.6	22.5	22.2
5/21/08 4:00	21	41	55	188	68	2.6		9.8	25.2	15.2	19	30.8	26.1
5/21/08 5:00	20	24	47	51	65	2.6		10.5	36	9.6	13.5	11.3	22.3
5/21/08 6:00	45	19	45	78	56	2.1		9.1	28.7	8	12.2	8.1	12.1
5/21/08 7:00	6	18	24	8	41	2.6		9.6	14	11.1	10.2	24.5	8.1
5/21/08 8:00	37	8	0	11	45	2.2		9.3	11.3	9.5	13.3	5.1	6.4
5/21/08 9:00	88	19	31	4	52	2.7		8.3	22	5.8	0.2	6.2	6.2
5/21/08 10:00	84	84	18	14	42	1.9		8.3	10.9	7.7	7.5	3.2	4.5
5/21/08 11:00	89	84	46	35	41	2.8		12.3	6.9	11.5	12.5	6.3	4.3
5/21/08 12:00	73	80	52	11	38	2.6		12.8	9.2	11.9	13.8	5.8	3.6
5/21/08 13:00	60	104	44	11	26	4		10	1	12.6	13.6	0	4.1
5/21/08 14:00	124	112	71	14	28	5.9		13.2	3	10.5	13.1	0	8.2
5/21/08 15:00	160	32	48	13	21	5.8		13.5	7.9	7.6	13.3	7.1	10.1
5/21/08 16:00	67	38	29	40	14	7.6		14.8	0	7.6	12.6	9.2	12.3
5/21/08 17:00	9	39	28	73	40	8.7		14.8	0	7.1	12.5	10	8.8
5/21/08 18:00	6	31	28	63	32	7.5		14.6	2.1	5.4	13.3	10.9	8
5/21/08 19:00	117	39	40	42	23	9.8		14.2	25.6	6.3	13.2	13.3	6.4
5/21/08 20:00	502	52	26	52	18	7.1		12	3.3	7.1	14.6	15	6.2
5/21/08 21:00	168	36	38	54	16	4.7		11.3	0	4.9	16.7	4.7	7.6

Appendix 2

Speciation filter data

Client: U005 - State of Utah DEQ
Report Number: 09-089

=====
Lab ID: 09-X783

Client ID: 8131629

Site: Lindon (LN)

Sample Date: 5/20/08

Mass: 877. +- 10. µg

Volume: 24.00 +- 2.400 m³

Deposit Area: 11.3 cm²

Size Fraction: PM2.5

Suspended

Particulates: 36.54 +- 3.68 µg/m³

Analyte µg/filter percent µg/m³

XRF

Na 0.0000 ± 0.6983 0.0000 ± 0.0796 0.0000 ± 0.0291

Mg 24.25 ± 1.936 2.765 ± 0.2230 1.010 ± 0.1293

Al 41.57 ± 2.704 4.740 ± 0.3130 1.732 ± 0.2066

Si 113.8 ± 6.203 12.98 ± 0.7226 4.741 ± 0.5400

P 0.6147 ± 0.0644 0.0701 ± 0.0074 0.0256 ± 0.0037

S 4.557 ± 0.2712 0.5196 ± 0.0315 0.1899 ± 0.0221

Cl 0.7661 ± 0.0836 0.0874 ± 0.0096 0.0319 ± 0.0047

K 16.23 ± 0.8339 1.850 ± 0.0974 0.6761 ± 0.0760

Ca 79.30 ± 4.021 9.043 ± 0.4699 3.304 ± 0.3705

Ti 1.991 ± 0.1040 0.2270 ± 0.0121 0.0830 ± 0.0094

V 0.0429 ± 0.0124 0.0049 ± 0.0014 0.0018 ± 0.0005

Cr 0.0181 ± 0.0113 0.0021 ± 0.0013 0.0008 ± 0.0005

Mn 0.5311 ± 0.0554 0.0606 ± 0.0064 0.0221 ± 0.0032

Fe 21.09 ± 1.058 2.404 ± 0.1237 0.8786 ± 0.0983

Co 0.0000 ± 0.0294 0.0000 ± 0.0034 0.0000 ± 0.0012

Ni 0.0418 ± 0.0170 0.0048 ± 0.0019 0.0017 ± 0.0007

Cu 0.0475 ± 0.0147 0.0054 ± 0.0017 0.0020 ± 0.0006

Zn 0.2565 ± 0.0192 0.0292 ± 0.0022 0.0107 ± 0.0013

Ga 0.0079 ± 0.0102 0.0009 ± 0.0012 0.0003 ± 0.0004

Ge 0.0124 ± 0.0090 0.0014 ± 0.0010 0.0005 ± 0.0004

As 0.0000 ± 0.0124 0.0000 ± 0.0014 0.0000 ± 0.0005

Se 0.0102 ± 0.0068 0.0012 ± 0.0008 0.0004 ± 0.0003

Br 0.1186 ± 0.0090 0.0135 ± 0.0010 0.0049 ± 0.0006

Rb 0.0791 ± 0.0090 0.0090 ± 0.0010 0.0033 ± 0.0005

Sr 0.3548 ± 0.0203 0.0405 ± 0.0024 0.0148 ± 0.0017

Y 0.0090 ± 0.0102 0.0010 ± 0.0012 0.0004 ± 0.0004

Zr 0.0633 ± 0.0124 0.0072 ± 0.0014 0.0026 ± 0.0006

Mo 0.0090 ± 0.0181 0.0010 ± 0.0021 0.0004 ± 0.0008

Pd 0.0000 ± 0.0508 0.0000 ± 0.0058 0.0000 ± 0.0021

Ag 0.1345 ± 0.0542 0.0153 ± 0.0062 0.0056 ± 0.0023

Cd 0.0407 ± 0.0588 0.0046 ± 0.0067 0.0017 ± 0.0025

In 0.0655 ± 0.0667 0.0075 ± 0.0076 0.0027 ± 0.0028

Sn 0.0554 ± 0.0757 0.0063 ± 0.0086 0.0023 ± 0.0032

Sb 0.0000 ± 0.1503 0.0000 ± 0.0171 0.0000 ± 0.0063

Ba 0.1695 ± 0.0746 0.0193 ± 0.0085 0.0071 ± 0.0032

La 0.0000 ± 0.0542 0.0000 ± 0.0062 0.0000 ± 0.0023

Hg 0.0000 ± 0.0192 0.0000 ± 0.0022 0.0000 ± 0.0008

Pb 0.0701 ± 0.0192 0.0080 ± 0.0022 0.0029 ± 0.0009

IC

Cl 1.920 ± 0.0960 0.2189 ± 0.0043 0.0800 ± 0.0089

Br 0.0000 ± 0.5000 0.0000 ± 0.0081 0.0000 ± 0.0208

NO3 9.990 ± 0.4995 1.139 ± 0.0153 0.4162 ± 0.0465

SO4 16.77 ± 0.8385 1.912 ± 0.0242 0.6988 ± 0.0781

Na 2.070 ± 0.1035 0.2360 ± 0.0045 0.0862 ± 0.0096

NH4 4.150 ± 0.2075 0.4732 ± 0.0075 0.1729 ± 0.0193

K 2.480 ± 0.1240 0.2828 ± 0.0051 0.1033 ± 0.0116