APPENDIX B
Volume 2

Emissions Inventory

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Pinal County PM10 Nonattainment Area 2008 Base Year Emissions for Selected Design Days and Modeling Domains

Appendices

prepared for:

Arizona Dept. of Environmental Quality

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Pinal County PM10 Nonattainment Area 2008 Base Year Emissions for Selected Design Days and Modeling Domains

Appendices

Appendix 1

Analysis of Unpaved Roads in the Pinal County
PM10 Nonattainment Area

Revised by Kate Edwards 3/07/2013

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Introduction

Preparation of a Pinal County PM10 State Implementation Plan (SIP) requires a detailed inventory of all PM10 emission sources. Unpaved roads in Pinal County need to be evaluated as part of the emissions inventory. PM10 emissions from unpaved roads reflect roadway lengths, traffic volumes, traffic speed, surface moisture and surface silt loading.

Since management responsibility largely follows surface ownership and maintenance, this analysis attempts to define a roadway classification system. The analysis also posits suggested corresponding values for traffic volume ("average daily travel" or "ADT"), traffic speed and surface silt content. Where traffic volumes vary markedly as a result of recurring seasonal activity, the analysis also posits suggested seasonal ADT levels.

GIS aerials photographs were reviewed and in-field "ground truthing" employed to assess roadway use and ownership. Based on that effort, roads were broken down into four categories: Agricultural apron roads (Ag roads), Publicly maintained roads (county/city maintained roads), Private roads, and Trails. Two sets of field tests were conducted to collect silt data for various roadway categories. The samples were sent to JBR Environmental Consultants (JBR, 2012) for laboratory analysis of moisture content and silt content. Figure 1 is a summary chart from the report. Map locations are shown in Figure 2.

Silt can be categorized in two ways: Silt Content or Silt Loading. Silt content is expressed as a weight fraction, namely as a percent of the weight of silt (soil passing a 200 mesh sieve) in a soil sample. Silt loading is expressed as mass per area, such as $200 g/m^2$. In a sense, silt content is a shovel sample and silt loading is broomed samples. Silt that is available to become airborne is a function of the mechanical wear and tear and maintenance of a road base. Identical road bases can show markedly different soil loadings due to the amount and type of traffic (mechanical wear). Additional road data for Pinal County is available in a 2006 report prepared for Arizona Department of Transportation (ADOT) and Pinal County by DKS Associates (DKS, 2006). Figure 3, which is Page 3-8 of the report, is a summary of the Silt and Moisture Contents of the roads under study. The accompanying General Soil Map from the USDA Soil Conservation Service (Figure 4) shows the road locations in relation to the major soil basins. Five unpaved roads were characterized for silt content, moisture content, ADT and average vehicle speed in the study. It should be noted that silt content and silt loading is variable based on traffic loading and meteorological conditions (i.e. wind, precipitation) and is simply an estimate of conditions on the day that sampling occurred.

For the most part, surface moisture content is low (<8%).

A contractor was hired to conduct traffic counts at selected representative locations on publicly maintained roadways. That data was compared to historic records of unpaved roadway traffic count data. The most recent traffic volume data was grouped according to volume and a series of five traffic loading categories defined.

This first analysis was compiled for modeling purposes. Suggested values contained herein are intended for use in short term (24 hr) use in modeling and daily average calculations. On an annual basis these short term ADT values for ag roads, may overstate actual activity. Further revisions/adjustments will be made pending additional review.

Agricultural Roads

In terms of miles of unpaved roads, ag roads are the most common in the county. Since ag roads are on private property for the most part, public access is restricted, thus limiting the amount of data that can be collected. Specific access was granted for a joint Pinal County Air Quality Control District (PCAQCD) / Arizona Department of Environmental Quality (ADEQ) study of soils on state land, which included some agricultural property. Two of the samples were from ag roads. One showed a silt content of 16.2%, the other a silt content of 35.1%, for an average silt content of 25.6%. In the 2008 Maricopa Co. PM10 Emissions Inventory, a value of 11.9% was used for unpaved agricultural roads.

Empirical observation suggests that vehicle traffic on ag roads falls into three categories: operations, inspections and harvest. Operations include generally low-speed roadway transport of planting and tilling equipment and travel by operators setting and removing irrigation equipment. Inspection involves supervisory visits to growing operations, and often occurs at higher speeds. Harvest operations entail both slow moving equipment and personal vehicles, as well as haul trucks traveling back and forth to the nearest paved arterial. Haul traffic typically involves higher speeds.

As for daily traffic counts, the Maricopa County 2008 PM10 Emissions Inventory report uses 49.5 VMT / 1000 acres based on a study done in 2001. (Agricultural operations typically occur on fractions of 640 acre mile-square sections of land; that VMT value equates to about 32 VMT per section). The report, Technical Support Document for Quantification of Agricultural Best Management Practices, was prepared by URS and the Eastern Research Group for ADEQ. If a 1000 acre parcel is layed out with 20 acre panels, two trips around each panel per day results in approximately 45 VMT. Thus the 49.5 VMT / 1000 acres factor equates to about 2 ADT and appears to be very plausible for normal, everyday business. Again, based on empirical observation, that traffic can be further divided into 1.5 ADT for planting, tilling, and irrigation traffic, and 0.5 ADT for inspection operations. However, unpaved ag road traffic increases significantly during the harvest operations. VMT for harvest seasons needs to reflect the significant traffic increase during those harvest operations. For example, such an adjustment would logically be required for the design day of October 29, 2008.

Suggested inventory values:

- Silt content – 25.6% (Average from JBR and 2012 testing)
- Moisture content – 1.5% (Average from JBR and 2012 testing)
- Traffic volume (non-harvest operations) – 1.5 ADT @ 10 mph
- Traffic volume (inspection operations) – 0.5 ADT @ 25 mph
- Traffic volume (harvest operations) – 50 ADT @ 15 mph

Public Maintained Roads

Due the rural nature of the county, many roads remained unpaved until the housing boom began in 2003. As subdivisions blossomed across the county in areas formerly used as farm fields, more roads were paved to provide access. However, a good many roads remain unpaved in the county and within municipal boundaries. The 1922 Declaration of Road for Pinal County gave the county right of way on section lines for most sections, townships and ranges that are in the PM10 NAA. Over time some of these roads were annexed into cities and towns. Though a road may be in a county right-of-way, in some cases, the Right of Way (ROW) still does not fall within the county maintenance system. PCAQCD has done simple, daily average road counts throughout the county, usually based on a complaint. In January, 2013, as part of the preparation for the emission inventory, an outside company was consulted (Traffic Research, 2013) to do more sophisticated counts that include 15 minute incremental traffic counts on 20 unpaved roads chosen by PCAQCD. A summary is shown below in Table 1. Locations are shown in Figure 5.

Table 1 – Proposed Classifications for Public Unpaved Roads

Road Name	ADT	Classification	Classification Criteria
Eleven Mile Corner Rd S of Phillips Rd	17	A	Dead end within 0.5 miles in any direction
Papago Rd E of Hidden Valley Rd	18	A	Dead end within 0.5 miles in any direction
Hidden Valley Rd N of Dune Shadow Rd	25	A	Dead end within 0.5 miles in any direction
Clemans Rd S of Martin Rd	54	A	Dead end within 0.5 miles in any direction
Hartman Rd N of Maricopa-CG Hwy	72	B	Rural access road
White & Parker S of Hwy 84	81	B	Rural access road
Green Reservoir Rd E of Tweedy Rd	94	B	Rural access road
Alsdorf Rd W of Toltec Hwy	96	B	Rural access road
Curry Rd S of Hwy 287	97	B	Rural access road
Cornman Rd E of Eleven Mile Corner Rd	97	B	Rural access road
Montgomery Rd N of Clayton Rd	106	C	Rural arterial road
Bartlett Rd W of Skousen Rd	118	C	Rural arterial road
Hash Knife Rd W of Schnepf Rd	134	C	Rural arterial road
Peters Rd E of Stanfield Rd	148	C	Rural arterial road
Storey Rd W of Sunshine Rd	170	D	Rural major arterial
Amarillo Valley Rd S of Barnes Rd	177	D	Rural major arterial
Peters Rd W of Bianco Rd	188	D	Rural major arterial
Thornton Rd S Hanna Rd	208	D	Rural major arterial
Cooper Rd N of Arizona Farms Rd	358	E	Urban arterial - to be paved in near future
Earley Rd E of Peart Rd	519	E	Urban arterial - to be paved in near future

The Classification and Classification Criteria listed above is a suggested way to label roads for emission inventory purposes only. For lack of definitive characterization, all section line roads are assumed to be county maintained roads if not located within another municipal boundary. This may overstate the public road lengths and understate the private road lengths but the data will be revised or adjusted if more detailed information is forthcoming

Suggested inventory values:

- Silt content – 7.5 % (Average silt content from DKS, 2006 and JBR, 2012)
- Moisture content – < 1% (Average silt content from DKS, 2006 and JBR, 2012)
- Traffic volume (Class A roadways) – 28.5 ADT @ 20 mph
- Traffic volume (Class B roadways) – 89.5 ADT @ 25 mph
- Traffic volume (Class C roadways) – 126.5 ADT @ 30 mph
- Traffic volume (Class D roadways) – 185.5 ADT @ 35 mph
- Traffic volume (Class E roadways) – 438.5 ADT @ 40 mph

The ADT values represent the numerical average of the class. The proposed speeds represent an estimated average speed for the class of road. The speed for the Class E roadways was taken from the ADOT/Pinal County report (DKS, 2006). See Figure 6. Roads with high traffic volumes typically have better maintenance, hence higher average speeds.

<u>Private Dirt Roads</u>

Private dirt roads can generally be attributed to two categories: canal roads and other non-public, regularly traveled unpaved roads. Non-canal roads may provide access to residences or places of business but are wholly owned by the property owners. An easement may have been given to the public and/or utilities for ingress/egress purposes. These roads may run from a hundred feet to several miles. Since they are not publicly owned roads, there is not much available data regarding ADT/VMT or silt content. They are simply established, and sometimes graded, out of the natural soil in place. Canal roads are constructed by the canal companies on both sides of their canals in order to do their business. Private dirt roads are often composed of native soil or material dredged from canals. Often times signs prohibit trespass but some trespass undoubtedly occurs. The Institute of Transportation Engineers (ITE) has developed a Trip Generation Report that contains ADT rates and ranges for residential, commercial, industrial and other categories. The residential standard of 10 ADT per dwelling unit is utilized in many SIPs and Emissions Inventories. Since there is no data for the private roads in the county, using the ITE residential trip value is the best option. As for canal roads, Doug Mason of the San Carlos Irrigation District suggested in 2011 that a reasonable number for ADT would be four, but acknowledged some areas get much more traffic from trespassers. Since canal roads run on each side of the canal, this is reflected in the ADT below. So for a principle canal road, there would be a total of 30 ADT in any given stretch.

Suggested inventory values:

- Silt content – *Based on NRCS major soil basin map characteristics*
- Moisture content - < 1%
- Traffic volume (non-irrigation roads) – 10 ADT/residence @ 25 mph (further investigation pending)
- Traffic volume (principal canal roads) – 15 ADT @ 25 mph
- Traffic volume (secondary canal roads) – 3 ADT @ 15 mph

Trails

In Pinal County there are many trails that crisscross the landscape. Most are shortcuts from place to place, developed by OHVs, animals and vehicles. Other roads that have been classified as trails are pipeline ROWs that are not maintained but traversed periodically. When digitizing the Roads layer, not all shortcut trails were counted. If there were several trails within a quarter of a mile of each other, only one was digitized. In addition, long, unpaved driveways were also digitized as trails, since they have regular traffic (probably in excess of 2 ADT) over typically unstabilized ground. ADTs for trails will only be an approximation as most are on private ground, with localized traffic that is sporadic in nature. However, to account for the emissions, some numbers must be assigned.

Suggested inventory values:

- Silt content - *Based on NRCS major soil basin map characteristics*
- Moisture content - < 1%
- Traffic volume – 2 ADT @ 15 mph

Conclusion

These values reflect PCAQCD's best estimates, based on the data and analysis discussed above.

References

JBR, 2012. A report prepared by JBR Environmental Consultants, Inc. for Sierra Research dated December 5, 2012 Re: Moisture and Silt Analysis of Soil Samples Results.

DKS, 2006. Final Report, Identification of Emissions Sources for Pinal County. Prepared by DKS Associates for Pinal County.

Traffic Research, 2013. A tabulation or road counts prepared by Traffic Research & Analysis, Inc. for Sierra Research dated January 22, 2013.

Figure 1 – Laboratory Results from JBR Environmental Consultants, Inc.

JBR

creating solutions for today's environment

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: Sierra Research Corporation

Sample ID	Sample Source	Moisture Content (%)	Silt Content (%)	Silt Content (grams)
ST-01	Desert Soil	3.07	17.9	239.5
ST-02	Maintained Dirt Road	0.41	7.9	85.9
ST-03	AG Road	0.84	16.2	162.0
ST-04	AG Field	1.93	10.6	108.6
EL-01	Vacant Land	2.05	22.7	305.7
EL-02	AG Field	2.45	23.9	405.3
EL-03	AG Road	2.26	35.1	494.0
EL-04	Maintained Dirt Road	0.68	15.7	194.0
PI-01	Desert Soil	1.70	18.9	262.2
Sample Site #1 (1)	Unpaved Road Fluff	N/A	16.1	65.2
Sample Site #1 (2)	Unpaved Road Fluff	N/A	18.0	57.3
Sample Site #2 (1)	AG Field	N/A	17.9	65.6
Sample Site #2 (2)	Fallow AG Field	N/A	17.9	62.9
Sample Site #3 (1)	Cloded Fallow AG Field	N/A	11.5	24.2
Sample Site #3 (2)	Cloded Fallow AG Field	N/A	15.1	30.4
Sample Site #4 (1)	Very Silty Road (Story)	N/A	28.5	91.5
Sample Site #4 (2)	Very Silty Road (Story)	N/A	24.4	86.2
PCH	Unknown	N/A	34.1	154.9
Florence	Unknown	N/A	23.0	100.5
Cowtown	Unknown	N/A	29.2	115.4
Average		**1.71**	**20.2**	

Figure 2 – Soil Sampling Locations in Pinal County

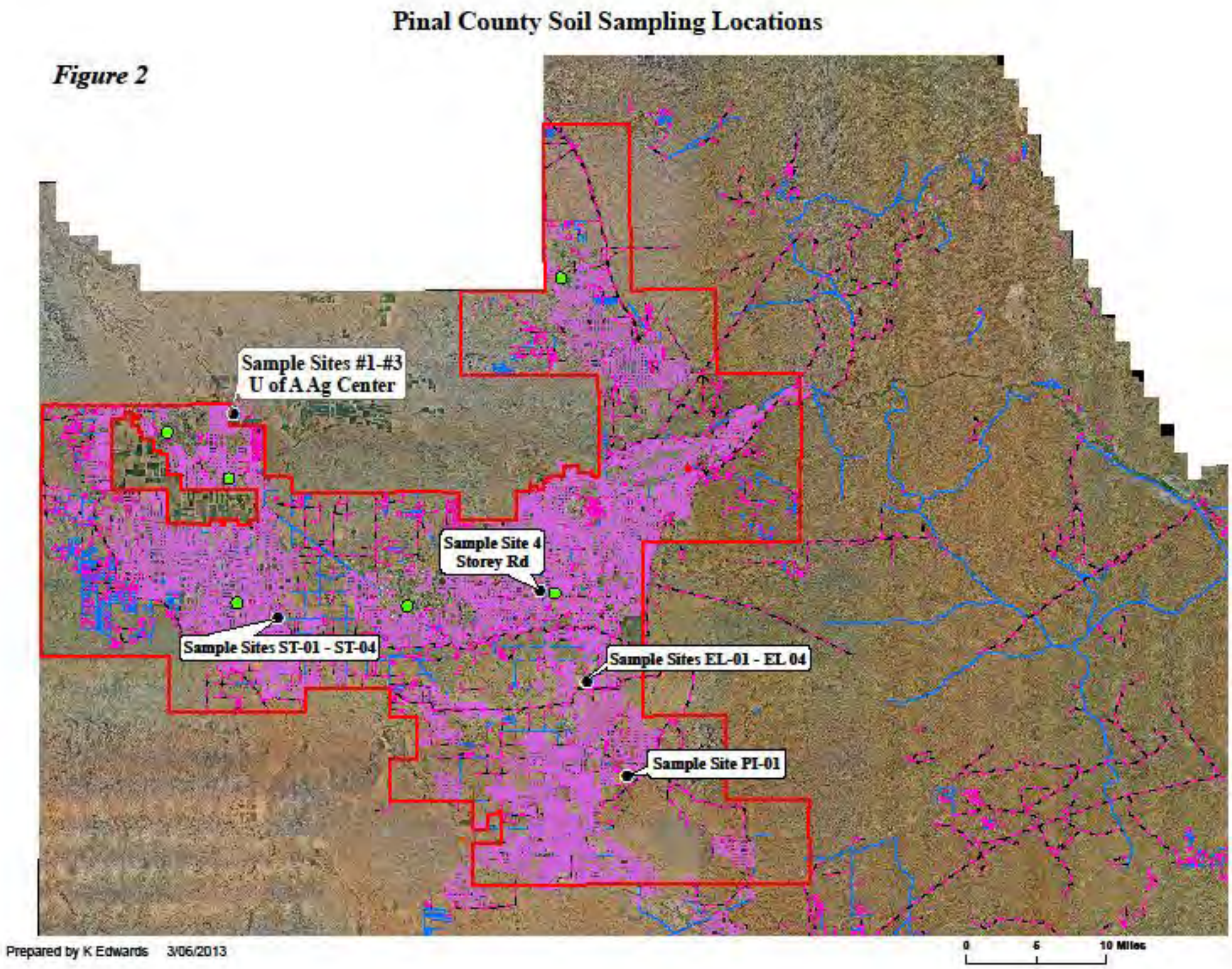
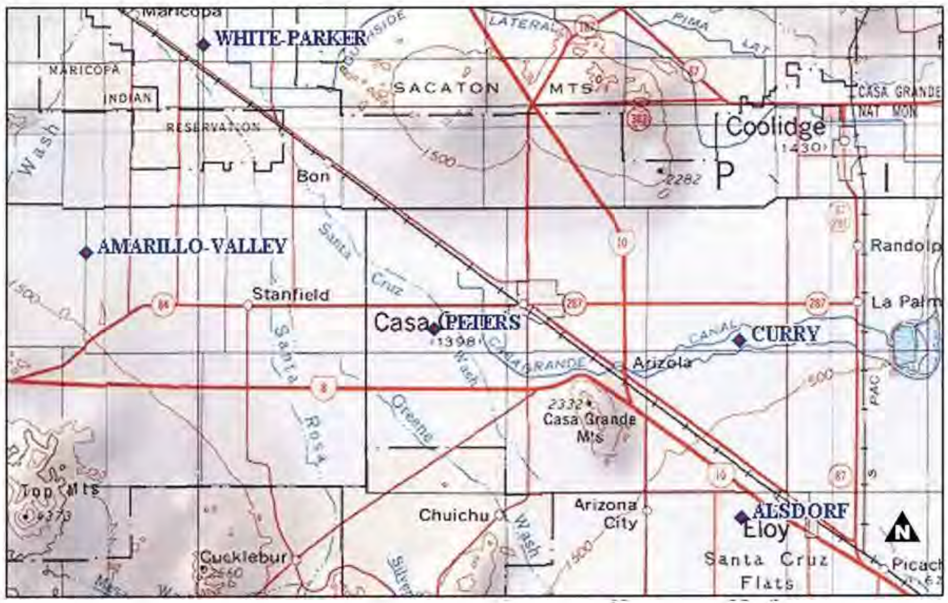


Figure 3 – Unpaved Road Surface Soil Silt and Moisture Content

Figure 2: Locations of Unpaved Road Traffic Count and Soil Sampling Sites



PSI performed sieve and moisture content analyses on the shipped samples. For the first two samples collected (Alsdorf Road and Curry Road), these analyses were conducted within about one week of receipt by the laboratory. Because of personnel changes at the laboratory, however, the second set of samples collected (Amarillo Valley Road, Peters Road, and White & Parker Road) was not analyzed until about three weeks after receipt by PSI. Although the delay in analysis of the second set of samples could have allowed moisture in the soil to evaporate, the moisture contents of soil samples at the time of collection were undoubtedly very low, and the reported measurements indicate that moisture contents of the second set of samples were equivalent to or greater than those of the first set. For these reasons, we conclude that the delay in performing moisture content analyses of the second set of soil samples did not significantly affect the analytical results. The silt and moisture contents reported for each sample are listed in Table 3.

Table 3: Unpaved Road Surface Soil Silt and Moisture Content

Unpaved Road	Silt Content	Moisture Content
Alsdorf Road	2.60%	0.097%
Amarillo Valley Road	7.40%	0.106%
Curry Road	4.20%	0.154%
Peters Road	7.10%	0.306%
White & Parker Road	5.90%	0.477%

Figure 4 – West Pinal County General Soil Map

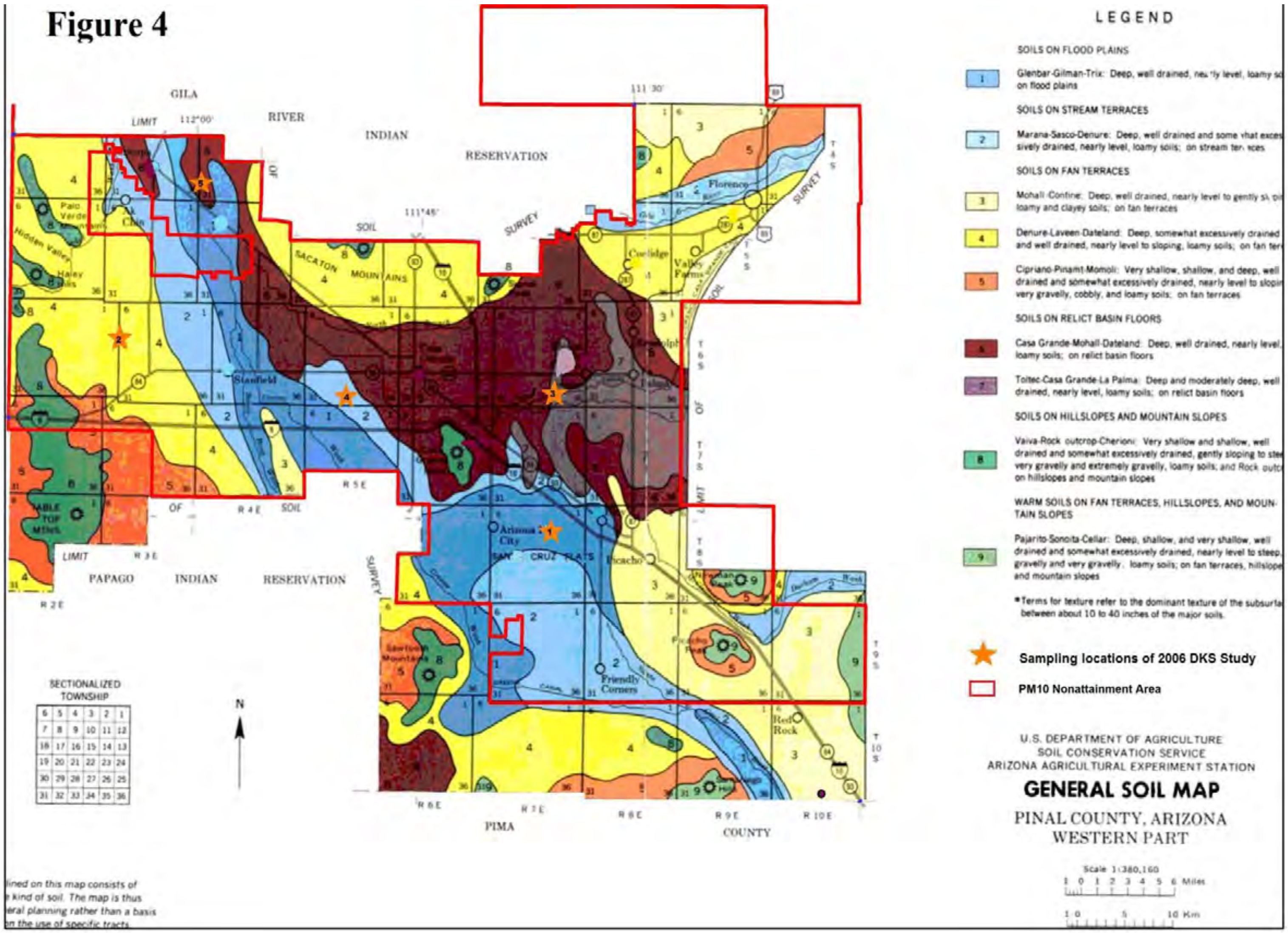
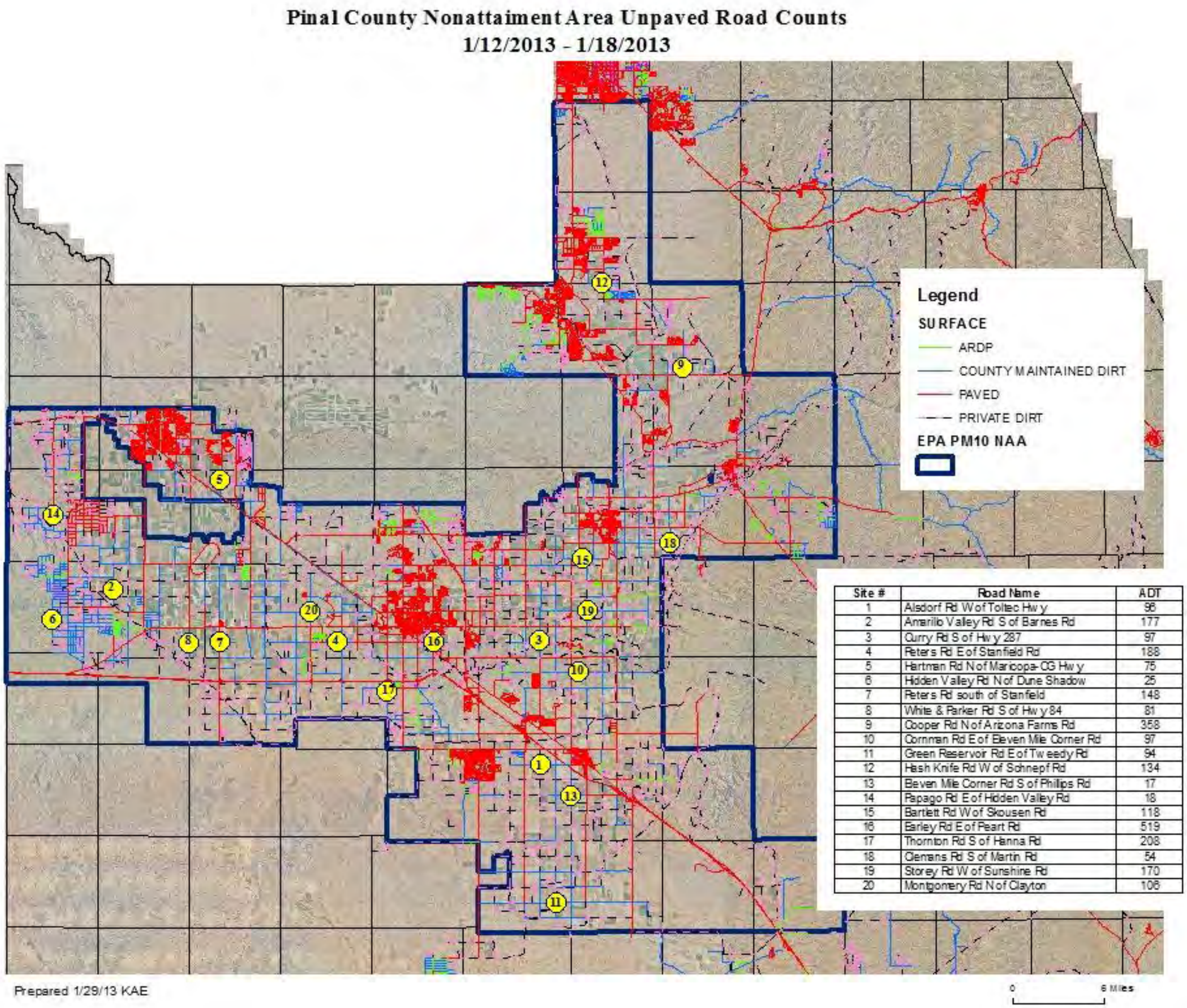


Figure 5 – Summary of Road Count Locations and ADTs



Site #	Road Name	ADT
1	Alsdorf Rd W of Toltec Hwy	96
2	Amarillo Valley Rd S of Barnes Rd	177
3	Curry Rd S of Hwy 287	97
4	Peters Rd E of Stanfield Rd	188
5	Hartman Rd N of Maricopa-CG Hwy	75
6	Hidden Valley Rd N of Dune Shadow	25
7	Peters Rd south of Stanfield	148
8	White & Parker Rd S of Hwy 84	81
9	Cooper Rd N of Arizona Farms Rd	358
10	Cornman Rd E of Eleven Mile Corner Rd	97
11	Green Reservoir Rd E of Tweedy Rd	94
12	Hash Knife Rd W of Schnepf Rd	134
13	Eleven Mile Corner Rd S of Phillips Rd	17
14	Papago Rd E of Hidden Valley Rd	18
15	Bartlett Rd W of Skousen Rd	118
16	Earley Rd E of Peart Rd	519
17	Thornton Rd S of Hanna Rd	208
18	Clemans Rd S of Martin Rd	54
19	Storey Rd W of Sunshine Rd	170
20	Montgomery Rd N of Clayton	106

Figure 6 – Average Vehicle Speeds and Average Daily Traffic Counts

As the EPA emission factor equation for unpaved road travel also includes average vehicle speed as a variable, data on vehicle speeds were collected through the use of traffic counters. Traffic Research and Analysis, Inc. (TRA) of Phoenix, Arizona installed dual tube counters on each of the five unpaved road segments in late May 2005. Each of the counters was left in place for seven days except for the counter on Amarillo Valley Road. Due to a communication gap, the Pinal County Public Works Department graded the portion of this road where the counter was located, causing the counter to cease operation after four days. After being repaired, the counter completed a seven-day traffic count in the following week. The average vehicle speeds and average daily traffic counts for each unpaved road segment are presented in Table 4.

Table 4: Average Vehicle Speeds and Average Daily Traffic Counts

Unpaved Road	Average Vehicle Speed (mph)	Average Daily Traffic Count
Alsdorf Road	42.8	153
Amarillo Valley Road	40.7	174
Curry Road	40.5	646
Peters Road	34.1	252
White & Parker Road	40.5	118

Two other factors that are constants in the EPA equation, for the purpose of this spreadsheet tool, were derived from EPA estimates and local meteorological data. The factor "C" in the EPA equation represents PM_{10} emissions from vehicle travel that are not generated by travel over unpaved roads. These emissions include particulate matter emissions from the vehicle exhaust pipe, brake wear particles, and tire wear particles. Data reported in the EPA MOBILE6.2 mobile source emission factor model lists the total of these emissions for the average light duty vehicle to be 0.00016 pounds of PM_{10} per vehicle mile traveled. This factor is subtracted from the total emissions reported by roadside testing to isolate the contribution made by travel over unpaved soil surfaces. The factor "P" in the EPA equation represents the number of days per year when rainfall reduces unpaved road travel emissions to zero. Other research referenced in AP-42 indicates that this situation occurs on any day in which 0.01 inches or more of precipitation occurs. From long-term rainfall data collected at Stanfield and Casa Grande, as tabulated on a website maintained for the National Oceanographic and Atmospheric Administration by the Desert Research Institute,6 the annual average number of precipitation days in the agricultural district is 30 days per year. The precipitation day adjustment factor is used to adjust annual average emission factors only. The maximum 24-hour PM_{10} impacts are assumed to occur on a day with no measurable rainfall.

[6] Average Number of Days With Measurable Precipitation, Arizona, Western Regional Climate Center, NOAA and DRI, http://www.wrcc.dri.edu/htmlfiles/az/az.01.html, accessed on August 22, 2005

Appendix 2

PM10 Dust Silt Contents and Moisture Contents Measurement
in Pinal Nonattainment Area

Pinal County Field Sampling and Analysis for the Silt Characterization of Unpaved Road Dust and Agricultural Soil

June 18th, 2013

FINAL REPORT

Arizona Department of Environmental Quality

Purpose:

The primary purpose of this field investigation was to determine the silt content of soil samples taken from unpaved roads and secondarily, determine silt content from soil samples taken from agricultural fields. Silt content is an important variable in many emission factor equations. This investigation was a joint effort between Pinal County Air Quality Control District (PCAQCD), the Arizona Department of Environmental Quality Air Quality Division (ADEQ AQD), and local farmers from Pinal County. This study took place on Wednesday May 8, 2013, at four different general locations within the Pinal County PM_{10} Nonattainment Area. JBR Environmental Consultants analyzed samples for moisture and silt content at their laboratory in Tempe Arizona[1].

Methods and Equipment:

Materials:

- Sealed Plastic Bags
- Shovels
- Dust Pan
- Dust Brushes
- Duct Tape (Sealing)
- Chain of Custody Forms
- Measuring Tape

The road samples were taken following the basic procedure developed by the Environmental Protection Agency (EPA) and published as appendix C1 in the AP-42 Emission Factor Reference Guide[2]. JBR Environmental Consultants performed laboratory analysis of the samples following the:

- ASTM C-136 Laboratory Sieve Analysis for Silt Content
- ASTM D-2216 Laboratory Determination of Moisture Content of Soil and Rock by Mass

In all, 60 total samples were taken of four different sample types and from four geographically distinct locations within Pinal County.

Results:

The sample domain table was compiled from the chain of custody forms used during sample collection. A sample number, description, date, time, and latitudinal and longitudinal coordinates

[1] JBR Environmental Consultants, 2013. Sierra Research – ADEQ Dust Study: Summary of Silt and Moisture Analyses of Soil Samples from Pinal County, Arizona, Collected on May 8th, 2013.
[2] Environmental Protection Agency (EPA), 1993. http://www.epa.gov/ttn/chief/ap42/appendix/app-c1.pdf

based on the WGS 84 Datum were used to identify each sample. Additionally, the square footage and sampling site specific notes were used to further qualify samples. The sample type refers to:

- $A = Agricultural\ Apron\ Road$
- $C = County\ Maintained\ Road$
- $F = Agricultural\ Field$
- $P = Privately\ Maintained\ Road$

Table 1 summarizes the sampling in a chronological fashion with the only sorting being the separation of the Agricultural Field Samples from the Road Samples.

Table 1: Sample Descriptions:

Sample #	Description	Type	Date	Time	Coordinates	ft^2	Comments
R1.1	Ag Apron Rd	A	5/8/2013	9:45am	32°55'22.1N 111°29'05.2W	11.5	Appearance of Heavily traffic
R1.2	Ag Apron Rd	A	5/8/2013	10:05am	32°55'18.6N 111°29'05.3W	21.0	Appearance of Heavily traffic
R1.3	Ag Apron Rd	A	5/8/2013	10:15am	32°55'16.0N 111°29'05.5W	10.0	Appearance of Heavily traffic
R2.1	Ag Apron Rd	A	5/8/2013	10:25am	32°55'13.3N 111°29'03.4W	13.0	less loose soil, parallel to canal
R2.2	Ag Apron Rd	A	5/8/2013	10:25am	32°55'13.2N 111°28'57.6W	15.6	less loose soil, parallel to canal
R2.3	Ag Apron Rd	A	5/8/2013	10:35am	32°55'13.4N 111°28'53.8W	15.0	less loose soil, parallel to canal
R3.1	Fasttrack S.	P	5/8/2013	10:45am	32°55'20.9N 111°28'49.8W	13.6	
R3.2	Fasttrack S.	P	5/8/2013	10:50am	32°55'14.6N 111°28'49.8W	15.1	
R3.3	Fasttrack S.	P	5/8/2013	10:55am	32°55'06.1N 111°28'50.0W	15.1	
R4.1	Randolph Rd	C	5/8/2013	10:50am	32°55'22.99N 111°28'52.84W	9.3	large amount of loose soil
R4.2	Randolph Rd	C	5/8/2013	10:57am	32°55'23.13N 111°29'13.24W	10.5	large amount of loose soil
R4.3	Randolph Rd	C	5/8/2013	11:05am	32°55'22.81N 111°29'39.34W	8.5	large amount of loose soil
R5.1	Storey W.	C	5/8/2013	11:44am	32°53'39.5N 111°35'36.6W	13.8	
R5.2	Storey W.	C	5/8/2013	11:57am	32°53'39.5N 111°35'49.2W	13.1	
R5.3	Storey W.	C	5/8/2013	12:11pm	32°53'39.5N 111°35'23.7W	14.1	
R6.1	Curry Apron W.	A	5/8/2013	12:23pm	32°54'18.5N 111°35'35.9W	11.1	

Sample #	Description	Type	Date	Time	Coordinates	ft^2	Comments
R6.2	Curry Apron W.	A	5/8/2013	12:36pm	32°54'18.5N 111°35'50.6W	11.1	
R6.3	Curry Apron W.	A	5/8/2013	12:44pm	32°54'18.6N 111°36'01.9W	10.1	
R7.1	Russell Apron E.	A	5/8/2013	2:31pm	32°50'06.8N 111°54'50.2W	10.9	
R7.2	Russell Apron E.	A	5/8/2013	2:37pm	32°50'06.8N 111°54'31.4W	12.2	
R7.3	Russell Apron E.	A	5/8/2013	2:42pm	32°50'06.8N 111°54'24.7W	13.0	
R8.1	Louis Johnson W.	C	5/8/2013	3:34pm	32°56'23.2N 112°03'02.6W	11.7	
R8.2	Louis Johnson W.	C	5/8/2013	3:45pm	32°56'23.2N 112°03'10.2W	10.1	
R8.3	Louis Johnson W.	C	5/8/2013	3:52pm	32°56'23.0N 112°03'50.7W	8.1	
R9.1	Barnes	P	5/8/2013	3:58pm	32°55'48.5N 112°03'54.8W	10.4	parallel to R14, same road as R9 (not Barnes)
R9.2	Barnes	P	5/8/2013	4:03pm	32°55'48.8N 112°03'41.3W	10.8	parallel to R14, same road as R9 (not Barnes)
R9.3	Barnes	P	5/8/2013	4:11pm	32°55'48.5N 112°03'26.1W	10.0	parallel to R14, same road as R9 (not Barnes)
R10.1	Ag Apron (N of Storey)	A	5/8/2013	12:00pm	32°53'43.98N 111°35'34.83W	15.0	
R10.2	Ag Apron (N of Storey)	A	5/8/2013	12:20pm	32°54'07.50N 111°35'34.07W	14.5	
R10.3	Ag Apron (N of Storey)	A	5/8/2013	12:30pm	32°53'29.05N 111°35'33.89W	9.0	
R11.1	Kleck	C	5/8/2013	12:50pm	32°54'31.87N 111°35'17.24W	11.0	
R11.2	Kleck	C	5/8/2013	12:52pm	32°54'32.0N 111°35'34.8W	17.6	
R11.3	Kleck	C	5/8/2013	12:55pm	32°54'32.17N 111°36'09.51W	25.5	
R12.1	Russell Rd	C	5/8/2013	2:36pm	32°49'58.76N 111°54'42.95W	12.0	
R12.2	Russell Rd	C	5/8/2013	2:43pm	32°50'29.24N 111°54'42.96W	11.0	
R12.3	Russell Rd	C	5/8/2013	2:50pm	32°51'06.88N 111°54'43.25W	11.5	
R13.1	Private Rd (E of Russell)	P	5/8/2013	3:00pm	32°50'59.41N 111°54'39.80W	17.0	elevated road, little loose soil
R14.1	Ag Apron (S of Louis Johnson)	A	5/8/2013	3:45pm	32°56'20.62N 112°03'26.80W	10.0	evidence of recent grading

Sample #	Description	Type	Date	Time	Coordinates	ft^2	Comments
R14.2	Ag Apron (S of Louis Johnson)	A	5/8/2013	3:50pm	32°56'02.58N 112°03'26.68W	13.0	evidence of recent grading
R14.3	Ag Apron (S of Louis Johnson)	A	5/8/2013	3:58pm	32°55'52.10N 112°03'26.63W	12.5	evidence of recent grading
R15.1	Ag Apron (S of Louis Johnson)	A	5/8/2013	4:10pm	32°55'48.33N 112°03'07.35W	9.5	located between R9/R16 and crop field
R15.2	Ag Apron (S of Louis Johnson)	A	5/8/2013	4:25pm	32°55'48.49N 112°03'29.08W	11.0	located between R9/R16 and crop field
R15.3	Ag Apron (S of Louis Johnson)	A	5/8/2013	4:30pm	32°55'48.40N 112°03'41.08W	10.5	located between R9/R16 and crop field
R16.1	Ag Apron (S of Louis Johnson)	A	5/8/2013	4:15pm	32°55'48.80N 112°03'07.48W	13.0	parallel to R14, same road as R9
R20.1	Barnes 2	P	5/8/2013	4:30pm	32°55'22.5N 112°03'56.9W	8.6	
R20.2	Barnes 2	P	5/8/2013	4:37pm	32°55'22.5N 112°03'46.2W	9.0	
R20.3	Barnes 2	P	5/8/2013	4:42pm	32°55'22.6N 112°03'28.3W	9.0	
F1.1	Field Ag Apron	F	5/8/2013	9:55am	32°55'21.1N 111°29'05.0W	NA	inactive, previously cotton
F1.2	Field Ag Apron	F	5/8/2013	10:10am	32°55'18.6N 111°29'05.2W	NA	inactive, previously cotton
F1.3	Field Ag Apron	F	5/8/2013	10:15am	32°55'13.3N 111°29'05.4W	NA	inactive, previously cotton
F2.1	Field N of Storey	F	5/8/2013	12:10pm	32°53'45.58N 111°35'35.15W	NA	Active field
F2.2	Field N of Storey	F	5/8/2013	12:25pm	32°54'20.30N 111°35'34.26W	NA	Active field
F2.3	Field N of Storey	F	5/8/2013	12:35pm	32°54'29.02N 111°35'33.93W	NA	Active field
F3.1	Cotton Field	F	5/8/2013	4:40pm	32°55'22.25N 112°03'56.90W	NA	Active field
F3.2	Cotton Field	F	5/8/2013	4:45pm	32°55'22.02N 112°03'45.10W	NA	Active field
F3.3	Cotton Field	F	5/8/2013	4:50pm	32°55'22.10N 112°03'17.60W	NA	Active field

Tables 2-5 report soil/dust moisture and silt content values as determined from the laboratory analysis completed by JBR Environmental Consultants Inc. The tables are separated based on sampling type. This is the same sorting that was used in the analysis of the results.

Due to the time constraints, soil moisture analysis was conducted on a few random samples to assess the variability in soil moisture within sample types. The moisture content was then evaluated from these samples and it was determined that the variation in moisture content was minimal and did not necessitate additional analyses. The silt content values were determined for each sample and those results are presented in these tables as well. ADEQ AQD, PCAQCD, and JBR Environmental Consultants collected, processed and analyzed all of the samples in the same fashion following the methods described in the previous section.

Table 2: Agriculture Apron Road Moisture and Silt Content Percentages:

Ag Apron Road Sample	Soil Moisture Content	Silt Content
R1.1		13.3
R1.2		3.9
R1.3	1	19
R2.1		14.5
R2.2		12.9
R2.3		15.8
R6.1		17.2
R6.2		17
R6.3		9.3
R7.1		6.9
R7.2	0.5	14.9
R7.3		12.9
R10.1		9.4
R10.2	0.6	4.3
R10.3	0.8	9.8
R14.1		22.6
R14.2		3
R14.3		9.4
R15.1		11.7
R15.2	1	32.9
R15.3	1	38.4
R16.1		7.3

Table 3: Private Unpaved Road Moisture and Silt Content Percentages:

Private Road Sample	Moisture Content	Silt Content
R3.1		2.7
R3.2	0.2	12
R3.3		8.5

R9.1	0.2	11.7
R9.2	0.3	16.1
R9.3	0.4	19.9
R13.1		16.5
R20.1		17
R20.2	0.3	18.2
R20.3	0.4	21.2

Table 4: County Maintained Road Moisture and Silt Content Percentages:

County Road Sample	Moisture Content	Silt Content
R4.1		6.6
R4.2		2.7
R4.3		4.7
R5.1	0.3	10.8
R5.2	0.3	3.1
R5.3	0.2	9.9
R8.1	0.2	9.5
R8.2	0.2	9.5
R8.3		6.7
R11.1		12
R11.2	0.3	10.5
R11.3		7.4
R12.1		1.2
R12.2		3.4
R12.3	0.4	8.1

Table 5: Agricultural Field Moisture and Silt Content Percentages:

Field Sample	Moisture Content	Silt Content
F1.1		10.2
F1.2	1.9	12.7
F1.3		5.8
F2.1		13.5
F2.2	5.9	15.5
F2.3		1.1
F3.1		1
F3.2	1.4	32.1

F3.3	17.3

Analysis and Discussion:

ADEQ AQD completed a brief statistical analysis of the silt and soil moisture contents to determine the general tendencies and variability of the study results. The following boxplots and table illustrate and describe the results in a fashion that allows some conclusions to be made about the silt content of different unpaved road types and agricultural fields in Pinal County.

Table 6: Statistical Analysis of the Four Sample Types

Type	Description	Mean Soil Moisture Content (%)	Soil Moisture Content SD	Mean Silt Content (%)	Silt Content SD
A	Agricultural Apron Road	0.8	0.2	13.9	8.7
C	County Maintained Road	0.3	0.1	7.1	3.4
P	Private Road	0.3	0.1	14.4	5.7
F	Agricultural Field	3.1	2.5	12.1	9.5

The moisture contents of the different sample types were generally comparable in the case of the agricultural fields. JBR only analyzed three agricultural field samples for moisture content (one from each field), resulting in a right-skewed distribution. The other sample types had a greater number of samples analyzed for moisture content, and in general exhibited more consistent moisture content percentages than the limited number of field samples.

Private and county maintained roadways had lower average moisture contents than the Agriculture apron roads, which border irrigated agricultural fields. Additionally, the agricultural field samples exhibited greater average moisture content than all sample types. Additionally, the standard deviation indicates that the sample population variance of moisture content is greater for agricultural fields than it is for unpaved road surfaces. This can be expected as different crop types will require different soil moisture contents.

JBR's laboratory performed a complete silt content analysis of all samples across sample types. The statistical tests and plots indicate that county maintained roads had the lowest average silt content, with privately maintained road, agricultural apron road and agricultural field samples having average silt content percentages between 12 and 15 percent. The county maintained roads also had the lowest variance in silt content, followed by privately maintained roads, agricultural apron roads, and agricultural fields respectively.

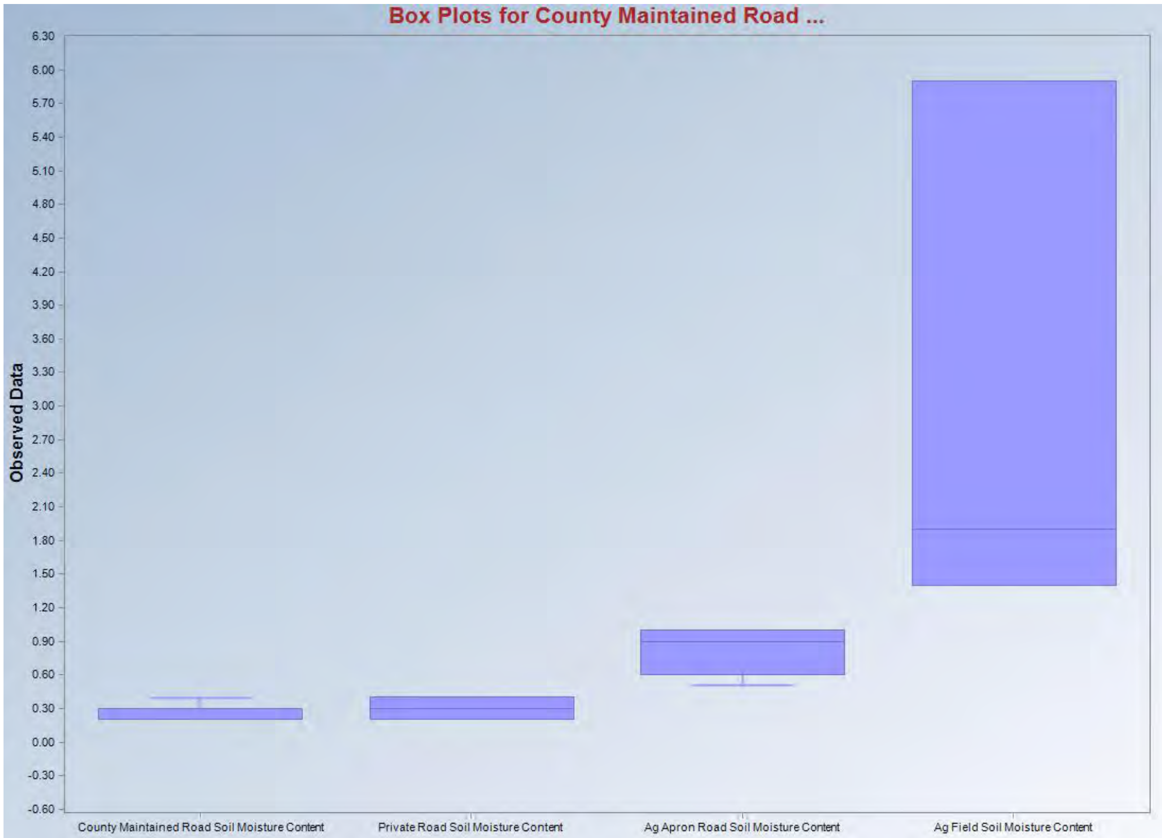


Figure 1: Soil Moisture Box Plot

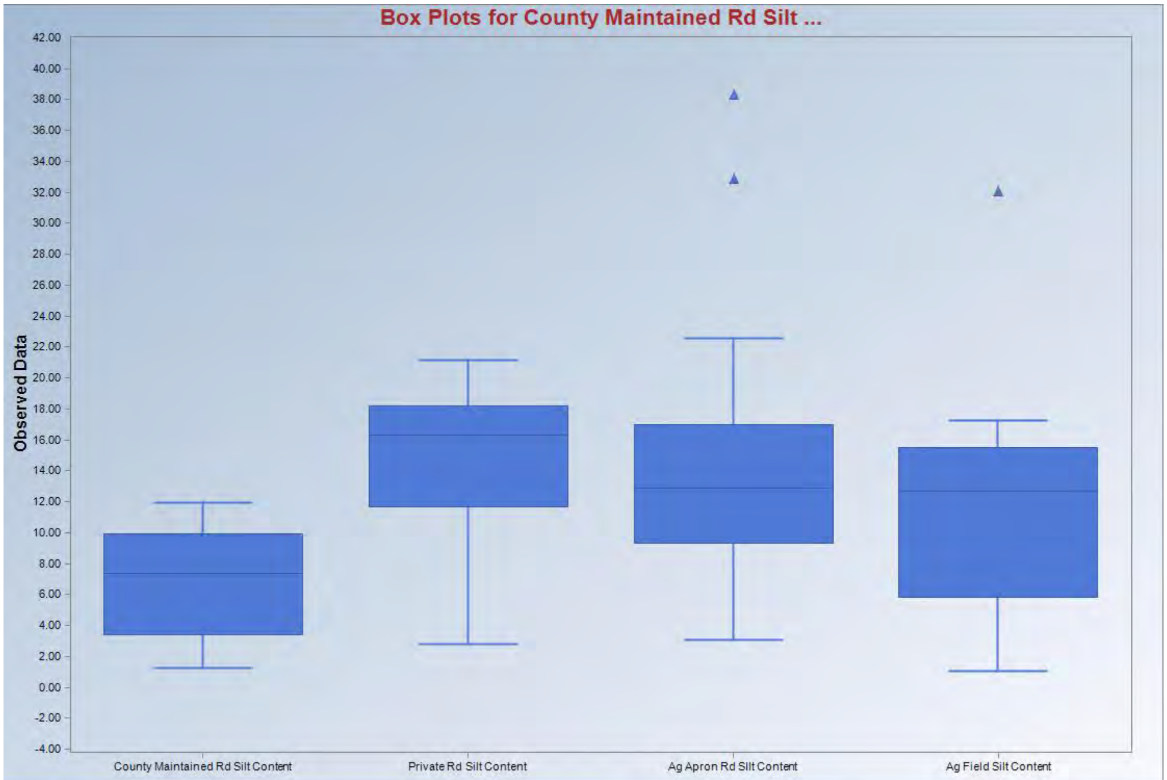


Figure 2: Silt Content

Pinal County Analysis:

PCAQCD expanded upon the analysis of Soil Samples taken on May 8, 2013 by computing the mean silt content per road sampled. Additionally, PCAQCD expanded the sample size by including soil sampling done on two previous dates[3]. ADEQ and PCAQCD analyzed silt content samples for unpaved agricultural apron roads, unpaved county maintained roads, and agricultural fields. Two samples were taken at each of these sites. ADOT also compiled silt content values for unpaved county maintained roads during sampling completed in June of 2005. The work done by PCAQCD summarizes the soil sampling data available from Pinal County since 2005.

In PCAQCD's analysis, sample averages from a given road or field were calculated to determine the mean silt content on both a total sample site basis and road/field basis. The **"site"** mean was the mean as calculated from all samples of the three data sets. The **"road"** was calculated by averaging samples on a given roadway/field to calculated a mean value of that individual roadway/field and then averaging the individual roadway/field means for a given road type/land use type to determine a road/land use type mean silt content. The following table gives the mean of each different road/land use type sampled over the three sampling periods.

[3] PCAQCD, 2013. Analysis of Unpaved Roads in the Pinal County PM10 Nonattainment Area.

Table 7: Three Study Mean Silt Content Values

	Ag Apron Rd		County Rd		Private Rd		Ag Fields	
	Site	Road	Site	Road	Site	Road	Site	Road
Mean (%)	14.9	15.8	7.1	7.2	14.4	14.7	13.1	14.2

Sierra Research – ADEQ Dust Study

Summary of Silt and Moisture Analyses of Soil Samples from Pinal County, Arizona Collected on May 8th, 2013

Prepared for:
Sierra Research, Inc.
1801 J Street
Sacramento, California 95811

Prepared by:
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1553 W. Elna Rae Street, Suite 101
Tempe, Arizona 85281
480.829.0457

June 26, 2013

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1.0 INTRODUCTION

JBR Environmental Consultants (JBR) was contracted by Sierra Research, Inc. to conduct analyses of 56 soil samples collected by Arizona Department of Environmental Quality (ADEQ) personnel on May 8, 2013 at various locations in Pinal County, Arizona. A description and the location of each sample is included in the Chain of Custody presented in Appendix A. The results of the silt and moisture analysis are to be used as part of a larger study being conducted by Sierra Research, Inc. for ADEQ.

The ensuing sections of this report summarize the analysis methods and results. A description of the method of analysis is presented in Section 2 and a summary of the results is in Section 3.

2.0 SAMPLE ANALYSIS

The laboratory analysis was conducted in accordance with the methodologies presented in Appendix C.2 of *Compilation of Air Pollutant Emission Factors, (AP-42).* Individual laboratory analysis results are presented in Appendix B.

2.1 Sample Splitting

Sample analysis commenced with the weighing of each sample. Samples over 5 pounds were split so that a sample between 1-5 pounds could be obtained. The split sample was then analyzed according to the methods below. The remainder of the sample was archived separately. If the sample was less than 5 pounds, the entire sample was analyzed.

Samples were split according to the "coning and quartering" method described in Section C.2.1 of Appendix C.2 of AP-42.

2.2 Moisture Analysis

Moisture analysis was initially performed on 22 of the 56 samples, according to the method in Section C.2.2 of Appendix C.2 of AP-42. The samples were dried overnight in an oven at 230°F.

Per Sierra Research's request, moisture analysis for the remaining samples was not conducted on the basis that the differences in moisture content among the samples that were analyzed were small. For all samples that were analyzed, the minimum moisture content was 0.2% by mass, and the maximum moisture content was 5.9%. The average was 0.8%.

2.3 Silt Analysis

Samples to be analyzed were placed into a pre-weighed pan and then weighed using a calibrated scale. After weighing, the entire sample was placed into the top sieve of a Gilson Sieve Tester, Model SS-15. The Gilson Sieve Tester consists of a series of sieves as shown in Figure 2.3-1. The bottom sieve has a No. 200 mesh screen. All material passing through the No. 200 sieve into the pre-weighed catchment pan represents the silt portion of the sample.

Each sample was shaken in the Sieve Tester for 10 minutes. The pre-weighed catchment pan was then weighed to determine the mass of the silt material. The sieving and weighing process was continued for each sample until the difference in successive pan weighings was less than 3.0% or 40 minutes of sieving had elapsed.

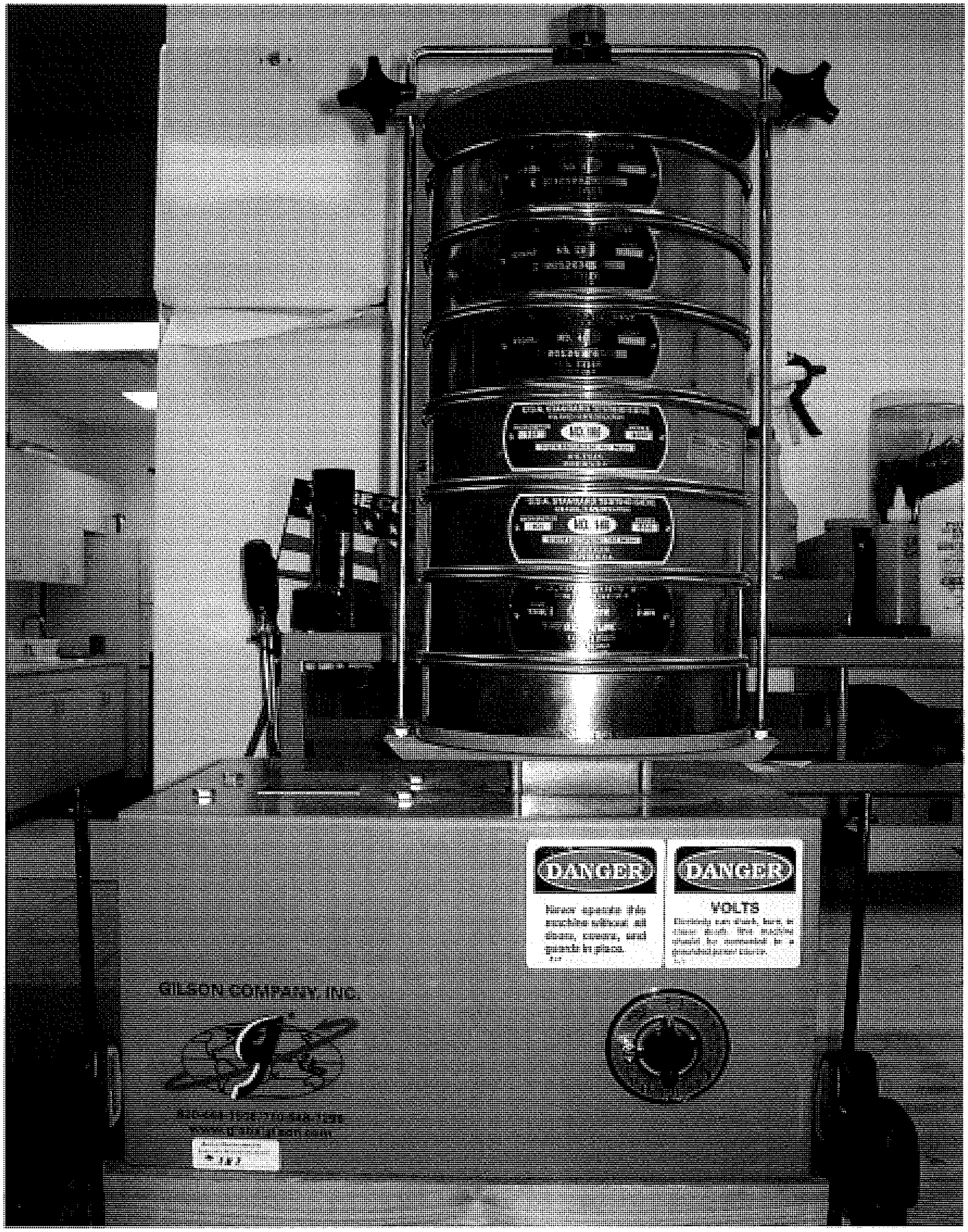

Figure 2.3-1 Photograph of the Gilson Sieve Tester, Model SS-15.

3.0 SAMPLING RESULTS

The moisture and silt content for all samples are summarized in Table 3.0-1. For the 22 samples analyzed for moisture, the minimum content is 0.2% by mass, and the maximum is 5.9%. Silt content ranged from 1.0% (Sample F3.1) to 38.4% (Sample R15.3). Complete results appear in Appendix B.

Table 3.0-1 Moisture and Silt Analysis Results

Sample No.	Description	Moisture Content (%)	Silt Content (%)
R1.1	Ag Apron Rd	-	13.3
R1.2	Ag Apron Rd	-	3.9
R1.3	Ag Apron Rd	1.0	19.0
R2.1	Ag Apron Rd	-	14.5
R2.2	Ag Apron Rd	-	12.9
R2.3	Ag Apron Rd	-	15.8
R3.1	Fasttrack S.	-	2.7
R3.2	Fasttrack S.	0.2	12.0
R3.3	Fasttrack S.	-	8.5
R4.1	Randolph Rd (Co. Maintained)	-	6.6
R4.2	Randolph Rd (Co. Maintained)	-	2.7
R4.3	Randolph Rd (Co. Maintained)	-	4.7
R5.1	Storey W.	0.3	10.8
R5.2	Storey W.	0.3	3.1
R5.3	Storey W.	0.2	9.9
R6.1	Curry Apron W.	-	17.2
R6.2	Curry Apron W.	-	17.0
R6.3	Curry Apron W.	-	9.3
R7.1	Russell Apron E.	-	6.9
R7.2	Russell Apron E.	0.5	14.9
R7.3	Russell Apron E.	-	12.9
R8.1	Louis Johnson W.	0.2	9.5
R8.2	Louis Johnson W.	0.2	9.5
R8.3	Louis Johnson W.	-	6.7
R9.1	Barnes	0.2	11.7
R9.2	Barnes	0.3	16.1

Table 3.0-1 Moisture and Silt Analysis Results

Sample No.	Description	Moisture Content (%)	Silt Content (%)
R9.3	Barnes	0.4	19.9
R10.1	Ag Apron (N of Storey)	-	9.4
R10.2	Ag Apron (N of Storey)	0.6	4.3
R10.3	Ag Apron (N of Storey)	0.8	9.8
R11.1	Kleck (Co. Maintained)	-	12.0
R11.2	Kleck (Co. Maintained)	0.3	10.5
R11.3	Kleck (Co. Maintained)	-	7.4
R12.1	Russell Rd (Co. Maintained)	-	1.2
R12.2	Russell Rd (Co. Maintained)	-	3.4
R12.3	Russell Rd (Co. Maintained)	0.4	8.1
R13.1	Private Rd (E of Russell)	-	16.5
R14.1	Ag Apron (S of Louis Johnson)	-	22.6
R14.2	Ag Apron (S of Louis Johnson)	-	3.0
R14.3	Ag Apron (S of Louis Johnson)	-	9.4
R15.1	Ag Apron (S of Louis Johnson)	-	11.7
R15.2	Ag Apron (S of Louis Johnson)	1.0	32.9
R15.3	Ag Apron (S of Louis Johnson)	1.0	38.4
R16.1	Ag Apron (S of Louis Johnson)	-	7.3
R20.1	Barnes 2	-	17.0
R20.2	Barnes 2	0.3	18.2
R20.3	Barnes 2	0.4	21.2
F1.1	Field Ag Apron	-	10.2
F1.2	Field Ag Apron	1.9	12.7
F1.3	Field Ag Apron	-	5.8
F2.1	Field N of Storey	-	13.5
F2.2	Field N of Storey	5.9	15.5
F2.3	Field N of Storey	-	1.1
F3.1	Cotton Field	-	1.0
F3.2	Cotton Field	1.4	32.1
F3.3	Cotton Field	-	17.3

APPENDIX A

Chain of Custody Forms

May 9, 2013; 8:10 A.M

Received 56 soil samples From ADEQ for Moisture and Silt Analysis

[signature]

JBR Environmental Consultants

[signature] 5/9/13

Arizona Dept. of Env. Quality

ADEQ - Air Quality / Pinal County Air Quality

Sample Chain of Custody

Project Name Pinal Soil Sampling May 2013
Project Contact Bryan Paris
Contact Phone Number 602-771-7665

Sample No.	Description	Date Taken	Time Taken	Coordinates	Surface Area (ft2)	Comments	Requested Analysis: Soil Moisture ASTM D-2216	Requested Analysis: Sieve Analysis ASTM C-136
R1.1	Ag Apron Rd	5/8/2013	9:45am	32°55'22.1N 111°29'05.2W	11.5	Appearance of Heavily traffic	X	X
R1.2	Ag Apron Rd	5/8/2013	10:05am	32°55'18.6N 111°29'05.3W	21.0	Appearance of Heavily traffic	X	X
R1.3	Ag Apron Rd	5/8/2013	10:15am	32°55'16.0N 111°29'05.5W	10.0	Appearance of Heavily traffic	X	X
R2.1	Ag Apron Rd	5/8/2013	10:25am	32°55'13.3N 111°29'03.4W	13.0	less loose soil, parallel to canal	X	X
R2.2	Ag Apron Rd	5/8/2013	10:25am	32°55'13.2N 111°28'57.6W	15.6	less loose soil, parallel to canal	X	X
R2.3	Ag Apron Rd	5/8/2013	10:35am	32°55'13.4N 111°28'53.8W	15.0	less loose soil, parallel to canal	X	X
R3.1	Fasttrack S.	5/8/2013	10:45am	32°55'20.9N 111°28'49.8W	13.6		X	X
R3.2	Fasttrack S.	5/8/2013	10:50am	32°55'14.6N 111°28'49.8W	15.1		X	X
R3.3	Fasttrack S.	5/8/2013	10:55am	32°55'06.1N 111°28'50.0W	15.1		X	X
R4.1	Randolph Rd (Co. Maintained)	5/8/2013	10:50am	32°55'22.99N 111°28'52.84W	9.3	large amount of loose soil	X	X
R4.2	Randolph Rd (Co. Maintained)	5/8/2013	10:57am	32°55'23.13N 111°29'13.24W	10.5	large amount of loose soil	X	X
R4.3	Randolph Rd (Co. Maintained)	5/8/2013	11:05am	32°55'22.81N 111°29'39.34W	8.5	large amount of loose soil	X	X
R5.1	Storey W.	5/8/2013	11:44am	32°53'39.5N 111°35'36.6W	13.8		X	X
R5.2	Storey W.	5/8/2013	11:57am	32°53'39.5N 111°35'49.2W	13.1		X	X
R5.3	Storey W.	5/8/2013	12:11pm	32°53'39.5N 111°35'23.7W	14.1		X	X
R6.1	Curry Apron W.	5/8/2013	12:23pm	32°54'18.5N 111°35'35.9W	11.1		X	X
R6.2	Curry Apron W.	5/8/2013	12:36pm	32°54'18.5N 111°35'50.6W	11.1		X	X
R6.3	Curry Apron W.	5/8/2013	12:44pm	32°54'18.6N 111°36'01.9W	10.1		X	X
R7.1	Russell Apron E.	5/8/2013	2:31pm	32°50'06.8N 111°54'50.2W	10.9		X	X
R7.2	Russell Apron E.	5/8/2013	2:37pm	32°50'06.8N 111°54'31.4W	12.2		X	X
R7.3	Russell Apron E.	5/8/2013	2:42pm	32°50'06.8N 111°54'24.7W	13.0		X	X
R8.1	Louis Johnson W.	5/8/2013	3:34pm	32°56'23.2N 112°03'02.6W	11.7		X	X
R8.2	Louis Johnson W.	5/8/2013	3:45pm	32°56'23.2N 112°03'10.2W	10.1		X	X
R8.3	Louis Johnson W.	5/8/2013	3:52pm	32°56'23.0N 112°03'50.7W	8.1		X	X
R9.1	Barnes	5/8/2013	3:58pm	32°55'48.5N 112°03'54.8W	10.4	parallel to R14, same road as R9 (not Barnes)	X	X
R9.2	Barnes	5/8/2013	4:03pm	32°55'48.8N 112°03'41.3W	10.8	parallel to R14, same road as R9 (not Barnes)	X	X
R9.3	Barnes	5/8/2013	4:11pm	32°55'48.5N 112°03'26.1W	10.0	parallel to R14, same road as R9 (not Barnes)	X	X
R10.1	Ag Apron (N of Storey)	5/8/2013	12:00pm	32°53'43.98N 111°35'34.83W	15.0		X	X
R10.2	Ag Apron (N of Storey)	5/8/2013	12:20pm	32°54'07.50N 111°35'34.07W	14.5		X	X
R10.3	Ag Apron (N of Storey)	5/8/2013	12:30pm	32°53'29.05N 111°35'33.89W	9.0		X	X
R11.1	Kleck (Co. Maintained)	5/8/2013	12:50pm	32°54'31.87N 111°35'17.24W	11.0		X	X
R11.2	Kleck (Co. Maintained)	5/8/2013	12:52pm	32°54'32.0N 111°35'34.8W	17.6		X	X
R11.3	Kleck (Co. Maintained)	5/8/2013	12:55pm	32°54'32.17N 111°36'09.51W	25.5		X	X
R12.1	Russell Rd (Co. Maintained)	5/8/2013	2:36pm	32°49'58.76N 111°54'42.95W	12.0		X	X
R12.2	Russell Rd (Co. Maintained)	5/8/2013	2:43pm	32°50'29.24N 111°54'42.96W	11.0		X	X
R12.3	Russell Rd (Co. Maintained)	5/8/2013	2:50pm	32°51'06.88N 111°54'43.25W	11.5		X	X
R13.1	Private Rd (E of Russell)	5/8/2013	3:00pm	32°50'59.41N 111°54'39.80W	17.0	elevated road, little loose soil	X	X
R14.1	Ag Apron (S of Louis Johnson)	5/8/2013	3:45pm	32°56'20.62N 112°03'26.80W	10.0	evidence of recent grading	X	X
R14.2	Ag Apron (S of Louis Johnson)	5/8/2013	3:50pm	32°56'02.58N 112°03'26.68W	13.0	evidence of recent grading	X	X

R14.3	Ag Apron (S of Louis Johnson)	5/8/2013	3:58pm	32°55'52.10N 112°03'26.63W	12.5	evidence of recent grading	X	X
R15.1	Ag Apron (S of Louis Johnson)	5/8/2013	4:10pm	32°55'48.33N 112°03'07.35W	9.5	located between R9/R16 and crop field	X	X
R15.2	Ag Apron (S of Louis Johnson)	5/8/2013	4:25pm	32°55'48.49N 112°03'29.08W	11.0	located between R9/R16 and crop field	X	X
R15.3	Ag Apron (S of Louis Johnson)	5/8/2013	4:30pm	32°55'48.40N 112°03'41.08W	10.5	located between R9/R16 and crop field	X	X
R16.1	Ag Apron (S of Louis Johnson)	5/8/2013	4:15pm	32°55'48.80N 112°03'07.48W	13.0	parallel to R14, same road as R9	X	X
R20.1	Barnes 2	5/8/2013	4:30pm	32°55'22.5N 112°03'56.9W	8.6		X	X
R20.2	Barnes 2	5/8/2013	4:37pm	32°55'22.5N 112°03'46.2W	9.0		X	X
R20.3	Barnes 2	5/8/2013	4:42pm	32°55'22.6N 112°03'28.3W	9.0		X	X
F1.1	Field Ag Apron	5/8/2013	9:55am	32°55'21.1N 111°29'05.0W	NA	inactive, previously cotton	X	X
F1.2	Field Ag Apron	5/8/2013	10:10am	32°55'18.6N 111°29'05.2W	NA	inactive, previously cotton	X	X
F1.3	Field Ag Apron	5/8/2013	10:15am	32°55'13.3N 111°29'05.4W	NA	inactive, previously cotton	X	X
F2.1	Field N of Storey	5/8/2013	12:10pm	32°53'45.58N 111°35'35.15W	NA	Active field	X	X
F2.2	Field N of Storey	5/8/2013	12:25pm	32°54'20.30N 111°35'34.26W	NA	Active field	X	X
F2.3	Field N of Storey	5/8/2013	12:35pm	32°54'29.02N 111°35'33.93W	NA	Active field	X	X
F3.1	Cotton Field	5/8/2013	4:40pm	32°55'22.25N 112°03'56.90W	NA	Active field	X	X
F3.2	Cotton Field	5/8/2013	4:45pm	32°55'22.02N 112°03'45.10W	NA	Active field	X	X
F3.3	Cotton Field	5/8/2013	4:50pm	32°55'22.10N 112°03'17.60W	NA	Active field	X	X

Relinquished by Signature___ Print Name___Bryan Paris___ Company__Arizona Department of Environmental Quality___ Date__May 9, 2013___ Time___0810___	**Received by** Signature___ Print Name____Louis Thanukos___ Company___JBR Environmental Consultants, Inc.___ Date____May 9, 2013___ Time_____0810___
Relinquished by Signature___ Print Name___ Company___ Date___ Time___	**Received by** Signature___ Print Name___ Company___ Date___ Time___

Samples Delivered/Shipped to_____JBR Environmental Consultants, Inc.___

Location____1553 W. Elna Rae, Ste. 101 Tempe, AZ 85281___

APPENDIX B

Laboratory Data

creating solutions for today's environment

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R1.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	470.6
20 min	520.7
30 min	560.4
40 min	589.5

Sample Weight (g) 1646.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	553.6	46.6	2.8
# 20	428.1	995.4	567.3	34.5
#40	385.0	631.2	246.2	15.0
#100	346.1	878.0	531.9	32.3
#140	333.3	335.7	2.4	0.1
# 200	337.9	370.8	32.9	2.0
Pan[a]	370.5	589.5	219.0	13.3
		Total Silt	219.0	13.3

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R1.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	378.6
20 min	399.4
30 min	416.8
40 min	435.0

Sample Weight (g) 1673.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	544.4	37.4	2.2
# 20	428.1	976.8	548.7	32.8
#40	385.0	638.9	253.9	15.2
#100	346.1	1073.6	727.5	43.5
#140	333.3	336.6	3.3	0.2
# 200	337.9	376.4	38.5	2.3
Pan[a]	370.5	435.0	64.5	3.9
		Total Silt	64.5	3.9

[a] Pan = collects all material that passes the #200 sieve

creating solutions for today's environment

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R1.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1648.1
Sample Weight Before Drying (g) 1630.9
% Moisture 1.0

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	607.1
20 min	659.2
30 min	672.5
40 min	683.8

Sample Weight (g) 1652.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	541.4	34.2	2.1
# 20	429.0	924.8	495.8	30.0
#40	385.3	644.0	258.7	15.7
#100	346.5	716.7	370.2	22.4
#140	333.3	336.5	3.2	0.2
# 200	338.1	514.8	176.7	10.7
Pan[a]	370.5	683.8	313.3	19.0
		Total Silt	313.3	19.0

[a] Pan = collects all material that passes the #200 sieve

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R2.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	470.4
20 min	555.6
30 min	574.2
40 min	585.8

Sample Weight (g) 1485.7

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	540.2	33.2	2.2
# 20	428.1	821.7	393.6	26.5
#40	385.0	664.5	279.5	18.8
#100	346.1	768.5	422.4	28.4
#140	333.3	377.4	44.1	3.0
# 200	337.9	435.5	97.6	6.6
Pan[a]	370.5	585.8	215.3	14.5
		Total Silt	215.3	14.5

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R2.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	528.2
20 min	564.4
30 min	597.2
40 min	617.5

Sample Weight (g) 1910.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	533.2	26.0	1.4
# 20	429.0	918.9	489.9	25.6
#40	385.3	756.0	370.7	19.4
#100	346.5	922.9	576.4	30.2
#140	333.3	386.8	53.5	2.8
# 200	338.1	484.6	146.5	7.7
Pan[a]	370.5	617.5	247.0	12.9
		Total Silt	247.0	12.9

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R2.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	534.8
20 min	565.7
30 min	586.5
40 min	600.0

Sample Weight (g) 1455.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	528.6	21.6	1.5
# 20	428.1	746.9	318.8	21.9
#40	385.0	668.4	283.4	19.5
#100	346.1	793.3	447.2	30.7
#140	333.3	336.5	3.2	0.2
# 200	337.9	490.1	152.2	10.5
Pan[a]	370.5	600.0	229.5	15.8
		Total Silt	229.5	15.8

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R3.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	383.8
20 min	397.2
30 min	406.6
40 min	418.8

Sample Weight (g) 1789.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	539.4	32.4	1.8
# 20	428.1	953.1	525.0	29.3
#40	385.0	727.7	342.7	19.2
#100	346.1	1053.8	707.7	39.6
#140	333.3	340.6	7.3	0.4
# 200	337.9	463.8	125.9	7.0
Pan[a]	370.5	418.8	48.3	2.7
		Total Silt	48.3	2.7

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R3.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1447.9
Sample Weight Before Drying (g) 1444.7
% Moisture 0.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	502.4
20 min	523.7
30 min	534.6
40 min	

Sample Weight (g) 1454.5

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	541.4	33.6	2.3
# 20	428.1	788.6	360.5	24.8
#40	385.0	641.0	256.0	17.6
#100	346.1	768.0	421.9	29.0
#140	333.3	350.6	17.3	1.2
# 200	337.9	529.2	191.3	13.2
Pan[a]	370.5	544.4	173.9	12.0
		Total Silt	173.9	12.0

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R3.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	463.2
20 min	505.3
30 min	532.5
40 min	557.1

Sample Weight (g) 2208.2

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	558.3	51.3	2.3
# 20	428.1	1023.1	595.0	26.9
#40	385.0	771.6	386.6	17.5
#100	346.1	1246.9	900.8	40.8
#140	333.3	340.5	7.2	0.3
# 200	337.9	418.6	80.7	3.7
Pan[a]	370.5	557.1	186.6	8.5
		Total Silt	186.6	8.5

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R4.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	433.9
20 min	463.3
30 min	482.9
40 min	519.2

Sample Weight (g) 2252.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	654.4	147.4	6.5
# 20	428.1	1166.3	738.2	32.8
#40	385.0	760.7	375.7	16.7
#100	346.1	941.7	595.6	26.4
#140	333.3	404.0	70.7	3.1
# 200	337.9	514.4	176.5	7.8
Pan[a]	370.5	519.2	148.7	6.6
		Total Silt	148.7	6.6

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R4.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	382.5
20 min	391.4
30 min	411.2
40 min	422.3

Sample Weight (g) 1915.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	617.5	110.5	5.8
# 20	428.1	1119.1	691.0	36.1
#40	385.0	687.0	302.0	15.8
#100	346.1	985.4	639.3	33.4
#140	333.3	337.4	4.1	0.2
# 200	337.9	454.3	116.4	6.1
Pan[a]	370.5	422.3	51.8	2.7
		Total Silt	51.8	2.7

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R4.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.8
10 min	405.0
20 min	446.8
30 min	461.5
40 min	470.2

Sample Weight (g) 2105.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.5	610	88.5	4.2
# 20	423.9	1096.7	672.8	32.0
#40	380.9	728.4	347.5	16.5
#100	344.6	989.3	644.7	30.6
#140	332.3	373.6	41.3	2.0
# 200	337.5	548.4	210.9	10.0
Pan[a]	370.8	470.2	99.4	4.7
		Total Silt	99.4	4.7

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R5.1

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1604.9
Sample Weight Before Drying (g) 1599.5
% Moisture 0.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.8
10 min	460.8
20 min	489.6
30 min	507.7
40 min	543.6

Sample Weight (g) 1600.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.5	581.1	59.6	3.7
# 20	423.9	799.6	375.7	23.5
#40	380.9	608.0	227.1	14.2
#100	344.6	835.4	490.8	30.7
#140	332.3	447.0	114.7	7.2
# 200	337.5	496.8	159.3	10.0
Pan[a]	370.8	543.6	172.8	10.8
		Total Silt	172.8	10.8

[a] Pan = collects all material that passes the #200 sieve

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R5.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1100.2
Sample Weight Before Drying (g) 1097.3
% Moisture 0.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.9
10 min	381.5
20 min	392.1
30 min	399.6
40 min	

Sample Weight (g) 1097.4

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.9	547.2	25.3	2.3
# 20	427.9	705.6	277.7	25.3
#40	387.9	602.4	214.5	19.5
#100	347.7	885.5	537.8	49.0
#140	333.9	336.2	2.3	0.2
# 200	338.9	345.1	6.2	0.6
Pan[a]	370.9	404.5	33.6	3.1
		Total Silt	33.6	3.1

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R5.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 2005.3
Sample Weight Before Drying (g) 2000.9
% Moisture 0.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.9
10 min	456.5
20 min	468.9
30 min	487.1
40 min	501.1

Sample Weight (g) 1316.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.8	652.2	130.4	9.9
# 20	427.5	483.6	56.1	4.3
#40	386.2	648.2	262.0	19.9
#100	347.1	923.4	576.3	43.8
#140	334.0	372.6	38.6	2.9
# 200	338.4	461.4	123.0	9.3
Pan[a]	370.9	501.1	130.2	9.9
		Total Silt	130.2	9.9

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R6.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	406.2
20 min	410.6
30 min	414.6
40 min	418.1

Sample Weight (g) 277.5

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	523.4	16.4	5.9
# 20	428.1	457.4	29.3	10.6
#40	385.0	438.6	53.6	19.3
#100	346.1	447.6	101.5	36.6
#140	333.3	346.3	13.0	4.7
# 200	337.9	354.0	16.1	5.8
Pan[a]	370.5	418.1	47.6	17.2
		Total Silt	47.6	17.2

[a] Pan = collects all material that passes the #200 sieve

JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

creating solutions for today's environment

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R6.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	479.2
20 min	491.8
30 min	499.5
40 min	505.6

Sample Weight (g) 795.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	529.2	22.0	2.8
# 20	429.0	560.4	131.4	16.5
#40	385.3	535.5	150.2	18.9
#100	346.5	607.6	261.1	32.8
#140	333.3	334.4	1.1	0.1
# 200	338.1	432.5	94.4	11.9
Pan[a]	370.5	505.6	135.1	17.0
		Total Silt	135.1	17.0

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R6.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	498.4
20 min	528.8
30 min	544.9
40 min	556.0

Sample Weight (g) 1991.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	532.2	25.0	1.3
# 20	429.0	506.2	77.2	3.9
#40	385.3	651.7	266.4	13.4
#100	346.5	1581.0	1234.5	62.0
#140	333.3	333.9	0.6	0.0
# 200	338.1	540.7	202.6	10.2
Pan[a]	370.5	556.0	185.5	9.3
		Total Silt	185.5	9.3

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R7.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	422.7
20 min	460.6
30 min	483.7
40 min	512.5

Sample Weight (g) 2045.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	572.4	65.4	3.2
# 20	428.1	934.7	506.6	24.8
#40	385.0	929.7	544.7	26.6
#100	346.1	1108.4	762.3	37.3
#140	333.3	337.0	3.7	0.2
# 200	337.9	359.0	21.1	1.0
Pan[a]	370.5	512.5	142.0	6.9
		Total Silt	142.0	6.9

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R7.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1229.1
Sample Weight Before Drying (g) 1223.1
% Moisture 0.5

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.9
10 min	503.4
20 min	523.7
30 min	542.8
40 min	553.5

Sample Weight (g) 1225.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	524.5	16.7	1.4
# 20	428.1	677.8	249.7	20.4
#40	385.0	607.5	222.5	18.2
#100	346.1	751.9	405.8	33.1
#140	333.3	347.5	14.2	1.2
# 200	337.9	471.7	133.8	10.9
Pan[a]	370.9	553.5	182.6	14.9
		Total Silt	182.6	14.9

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R7.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	470.9
20 min	493.4
30 min	506.2
40 min	514.1

Sample Weight (g) 1113.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	546.4	39.2	3.5
# 20	429.0	674.9	245.9	22.1
#40	385.3	576.8	191.5	17.2
#100	346.5	709.4	362.9	32.6
#140	333.3	355.4	22.1	2.0
# 200	338.1	446.2	108.1	9.7
Pan[a]	370.5	514.1	143.6	12.9
		Total Silt	143.6	12.9

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R8.1

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1353.9
Sample Weight Before Drying (g) 1351.3
% Moisture 0.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.7
10 min	471.7
20 min	482.1
30 min	490.5
40 min	499.5

Sample Weight (g) 1353.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.7	555.2	33.5	2.5
# 20	427.4	927.8	500.4	37.0
#40	384.2	648.6	264.4	19.5
#100	345.2	636.9	291.7	21.6
#140	333.0	367.3	34.3	2.5
# 200	337.8	438.0	100.2	7.4
Pan[a]	370.7	499.5	128.8	9.5
		Total Silt	128.8	9.5

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R8.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1368.7
Sample Weight Before Drying (g) 1365.8
% Moisture 0.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	371.0
10 min	466.2
20 min	479.9
30 min	491.1
40 min	500.7

Sample Weight (g) 1359.4

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	522	552.6	30.6	2.3
# 20	426.6	828.6	402.0	29.6
#40	384.6	654.4	269.8	19.8
#100	346.6	719.2	372.6	27.4
#140	333.8	388.5	54.7	4.0
# 200	338.5	438.5	100.0	7.4
Pan[a]	371.0	500.7	129.7	9.5
		Total Silt	129.7	9.5

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R8.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	448.2
20 min	488.4
30 min	511.2
40 min	528.0

Sample Weight (g) 2337.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	592.6	85.6	3.7
# 20	428.1	1139.5	711.4	30.4
#40	385.0	869.8	484.8	20.7
#100	346.1	1052.9	706.8	30.2
#140	333.3	357.2	23.9	1.0
# 200	337.9	504.9	167.0	7.1
Pan[a]	370.5	528.0	157.5	6.7
		Total Silt	157.5	6.7

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R9.1

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 673.6
Sample Weight Before Drying (g) 672.5
% Moisture 0.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.3
10 min	430.5
20 min	438.8
30 min	445.0
40 min	449.0

Sample Weight (g) 673.5

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	522	653.2	131.2	19.5
# 20	428.3	715.2	286.9	42.6
#40	386.5	461.5	75.0	11.1
#100	347.6	419.0	71.4	10.6
#140	333.6	334.5	0.9	0.1
# 200	338.4	367.8	29.4	4.4
Pan[a]	370.3	449.0	78.7	11.7
		Total Silt	78.7	11.7

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R9.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1270.4
Sample Weight Before Drying (g) 1267.0
% Moisture 0.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.8
10 min	535.4
20 min	556.3
30 min	565.3
40 min	573.0

Sample Weight (g) 1257.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.7	562.2	40.5	3.2
# 20	425.2	1045.6	620.4	49.3
#40	384.2	542.4	158.2	12.6
#100	346.8	501.0	154.2	12.3
#140	333.1	347.2	14.1	1.1
# 200	337.5	405.5	68.0	5.4
Pan[a]	370.8	573.0	202.2	16.1
		Total Silt	202.2	16.1

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R9.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 872.8
Sample Weight Before Drying (g) 869.6
% Moisture 0.4

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	521.8
20 min	531.8
30 min	539.1
40 min	544.3

Sample Weight (g) 872.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	633	125.2	14.4
# 20	428.1	761.5	333.4	38.2
#40	385.0	460.9	75.9	8.7
#100	346.1	454.9	108.8	12.5
#140	333.3	334.6	1.3	0.1
# 200	337.9	391.6	53.7	6.2
Pan[a]	370.5	544.3	173.8	19.9
		Total Silt	173.8	19.9

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R10.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	434.0
20 min	475.7
30 min	501.1
40 min	519.8

Sample Weight (g) 1581.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	540.4	33.4	2.1
# 20	428.1	579.5	151.4	9.6
#40	385.0	526.0	141.0	8.9
#100	346.1	995.1	649.0	41.0
#140	333.3	502.6	169.3	10.7
# 200	337.9	626.1	288.2	18.2
Pan[a]	370.5	519.8	149.3	9.4
		Total Silt	149.3	9.4

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R10.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1710.5
Sample Weight Before Drying (g) 1700.2
% Moisture 0.6

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	428.6
20 min	432.1
30 min	438.3
40 min	

Sample Weight (g) 1715.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.3	543.4	36.1	2.1
# 20	428.3	783.0	354.7	20.7
#40	385.6	579.6	194.0	11.3
#100	346.5	1321.0	974.5	56.8
#140	333.0	340.6	7.6	0.4
# 200	338.3	413.2	74.9	4.4
Pan[a]	370.5	443.7	73.2	4.3
		Total Silt	73.2	4.3

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R10.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1334.9
Sample Weight Before Drying (g) 1324.2
% Moisture 0.8

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	432.4
20 min	465.5
30 min	491.1
40 min	501.9

Sample Weight (g) 1341.2

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	565.7	57.9	4.3
# 20	428.1	724.5	296.4	22.1
#40	385.0	524.0	139.0	10.4
#100	346.1	883.3	537.2	40.1
#140	333.3	351.0	17.7	1.3
# 200	337.9	499.5	161.6	12.0
Pan[a]	370.5	501.9	131.4	9.8
		Total Silt	131.4	9.8

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R11.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	444.4
20 min	485.6
30 min	507.3
40 min	518.0

Sample Weight (g) 1233.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	573.1	66.1	5.4
# 20	428.1	809.8	381.7	31.0
#40	385.0	527.1	142.1	11.5
#100	346.1	699.3	353.2	28.6
#140	333.3	337.1	3.8	0.3
# 200	337.9	476.6	138.7	11.2
Pan[a]	370.5	518.0	147.5	12.0
		Total Silt	147.5	12.0

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R11.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1297.6
Sample Weight Before Drying (g) 1293.2
% Moisture 0.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.4
10 min	459.5
20 min	482.2
30 min	494.9
40 min	505.9

Sample Weight (g) 1294.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	522	587.1	65.1	5.0
# 20	427.9	805.8	377.9	29.2
#40	386.1	579.3	193.2	14.9
#100	347.1	722.0	374.9	29.0
#140	333.6	342.9	9.3	0.7
# 200	338.1	476.2	138.1	10.7
Pan[a]	370.4	505.9	135.5	10.5
		Total Silt	135.5	10.5

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R11.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	429.5
20 min	467.0
30 min	482.2
40 min	494.1

Sample Weight (g) 1674.1

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	563.8	56.8	3.4
# 20	428.1	821.8	393.7	23.5
#40	385.0	639.4	254.4	15.2
#100	346.1	903.3	557.2	33.3
#140	333.3	342.0	8.7	0.5
# 200	337.9	617.6	279.7	16.7
Pan[a]	370.5	494.1	123.6	7.4
		Total Silt	123.6	7.4

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R12.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	379.9
20 min	383.0
30 min	387.4
40 min	390.8

Sample Weight (g) 1670.4

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	555.2	48.2	2.9
# 20	428.1	877.4	449.3	26.9
#40	385.0	733.7	348.7	20.9
#100	346.1	1105.7	759.6	45.5
#140	333.3	337.5	4.2	0.3
# 200	337.9	378.0	40.1	2.4
Pan[a]	370.5	390.8	20.3	1.2
		Total Silt	20.3	1.2

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R12.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	401.1
20 min	412.5
30 min	424.4
40 min	440.4

Sample Weight (g) 2027.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	653.5	146.5	7.2
# 20	428.1	1180.8	752.7	37.1
#40	385.0	712.1	327.1	16.1
#100	346.1	1011.3	665.2	32.8
#140	333.3	355.8	22.5	1.1
# 200	337.9	381.6	43.7	2.2
Pan[a]	370.5	440.4	69.9	3.4
		Total Silt	69.9	3.4

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R12.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1410.6
Sample Weight Before Drying (g) 1404.8
% Moisture 0.4

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	416.7
20 min	466.8
30 min	477.2
40 min	485.9

Sample Weight (g) 1420.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	569.4	61.6	4.3
# 20	428.1	859.0	430.9	30.3
#40	385.0	671.9	286.9	20.2
#100	346.1	759.6	413.5	29.1
#140	333.3	355.5	22.2	1.6
# 200	337.9	428.3	90.4	6.4
Pan[a]	370.5	485.9	115.4	8.1
		Total Silt	115.4	8.1

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R13.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	471.2
20 min	481.8
30 min	490.2
40 min	498.8

Sample Weight (g) 777.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	550.7	43.5	5.6
# 20	429.0	570.9	141.9	18.2
#40	385.3	527.3	142.0	18.3
#100	346.5	598.7	252.2	32.4
#140	333.3	371.6	38.3	4.9
# 200	338.1	369.8	31.7	4.1
Pan[a]	370.5	498.8	128.3	16.5
		Total Silt	128.3	16.5

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R14.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	368.8
10 min	516.0
20 min	632.8
30 min	712.3
40 min	750.1

Sample Weight (g) 1689.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	520	524.3	4.3	0.3
#20	424.9	1001.5	576.6	34.1
#40	383.1	639.5	256.4	15.2
#100	346.0	590.8	244.8	14.5
#140	332.5	382.2	49.7	2.9
#200	337.6	513.5	175.9	10.4
Pan[a]	368.8	750.1	381.3	22.6
		Total Silt	381.3	22.6

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R14.2

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	396.4
20 min	413.5
30 min	426.3
40 min	434.3

Sample Weight (g) 2095.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	529.7	22.7	1.1
# 20	428.1	1292.2	864.1	41.2
#40	385.0	688.9	303.9	14.5
#100	346.1	968.7	622.6	29.7
#140	333.3	338.0	4.7	0.2
# 200	337.9	551.9	214.0	10.2
Pan[a]	370.5	434.4	63.9	3.0
		Total Silt	63.9	3.0

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R14.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	468.3
20 min	523.2
30 min	548.3
40 min	568.7

Sample Weight (g) 2109.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	526.7	19.7	0.9
# 20	428.1	1397.5	969.4	45.9
#40	385.0	734.4	349.4	16.6
#100	346.1	874.4	528.3	25.0
#140	333.3	340.3	7.0	0.3
# 200	337.9	375.7	37.8	1.8
Pan[a]	370.5	568.7	198.2	9.4
		Total Silt	198.2	9.4

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R15.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	530.7
20 min	575.4
30 min	608.6
40 min	631.6

Sample Weight (g) 2241.2

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	537.2	30.2	1.3
# 20	428.1	1077.6	649.5	29.0
#40	385.0	702.7	317.7	14.2
#100	346.1	682.8	336.7	15.0
#140	333.3	339.8	6.5	0.3
# 200	337.9	977.4	639.5	28.5
Pan[a]	370.5	631.6	261.1	11.7
		Total Silt	261.1	11.7

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R15.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1311.8
Sample Weight Before Drying (g) 1298.7
% Moisture 1.0

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.3
10 min	727.4
20 min	774.0
30 min	793.1
40 min	

Sample Weight (g) 1333.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	527	20.0	1.5
# 20	428.0	792.5	364.5	27.3
#40	385.0	564.0	179.0	13.4
#100	346.5	546.7	200.2	15.0
#140	333.7	335.0	1.3	0.1
# 200	338.0	467.6	129.6	9.7
Pan[a]	370.3	809.3	439.0	32.9
		Total Silt	439.0	32.9

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R15.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1316.1
Sample Weight Before Drying (g) 1303.4
% Moisture 1.0

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	765.8
20 min	815.7
30 min	848.9
40 min	875.8

Sample Weight (g) 1316.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	533.8	26.0	2.0
# 20	428.1	734.0	305.9	23.2
#40	385.0	554.0	169.0	12.8
#100	346.1	527.0	180.9	13.7
#140	333.3	341.4	8.1	0.6
# 200	337.9	459.6	121.7	9.2
Pan[a]	370.5	875.8	505.3	38.4
		Total Silt	505.3	38.4

[a] Pan = collects all material that passes the #200 sieve

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R16.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	423.9
20 min	458.2
30 min	477.4
40 min	496.2

Sample Weight (g) 1719.2

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	616.9	109.9	6.4
# 20	428.1	1225.3	797.2	46.4
#40	385.0	566.4	181.4	10.6
#100	346.1	799.2	453.1	26.4
#140	333.3	335.3	2.0	0.1
# 200	337.9	387.8	49.9	2.9
Pan[a]	370.5	496.2	125.7	7.3
		Total Silt	125.7	7.3

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R20.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	537.6
20 min	602.8
30 min	618.3
40 min	632.5

Sample Weight (g) 1545.7

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	543.7	36.5	2.4
# 20	429.0	1169.1	740.1	47.9
#40	385.3	575.0	189.7	12.3
#100	346.5	546.0	199.5	12.9
#140	333.3	338.2	4.9	0.3
# 200	338.1	451.1	113.0	7.3
Pan[a]	370.5	632.5	262.0	17.0
		Total Silt	262.0	17.0

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R20.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1383.4
Sample Weight Before Drying (g) 1379.3
% Moisture 0.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.9
10 min	589.3
20 min	601.9
30 min	612.0
40 min	621.2

Sample Weight (g) 1378.8

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	521.7	530.2	8.5	0.6
# 20	425.8	1009.2	583.4	42.3
#40	385.6	617.5	231.9	16.8
#100	346.5	555.9	209.4	15.2
#140	333.3	345.6	12.3	0.9
# 200	338.1	421.1	83.0	6.0
Pan[a]	370.9	621.2	250.3	18.2
		Total Silt	250.3	18.2

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: R20.3

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1173.0
Sample Weight Before Drying (g) 1168.4
% Moisture 0.4

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	586.1
20 min	603.6
30 min	614.1
40 min	620.7

Sample Weight (g) 1177.7

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	537.9	30.1	2.6
# 20	428.1	923.3	495.2	42.0
#40	385.0	545.6	160.6	13.6
#100	346.1	499.7	153.6	13.0
#140	333.3	334.2	0.9	0.1
# 200	337.9	425.0	87.1	7.4
Pan[a]	370.5	620.7	250.2	21.2
		Total Silt	250.2	21.2

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F1.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	510.5
20 min	545.0
30 min	574.4
40 min	593.6

Sample Weight (g) 2178.7

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	1018.3	511.3	23.5
# 20	428.1	773.9	345.8	15.9
#40	385.0	736.6	351.6	16.1
#100	346.1	875.6	529.5	24.3
#140	333.3	345.7	12.4	0.6
# 200	337.9	542.9	205.0	9.4
Pan[a]	370.5	593.6	223.1	10.2
		Total Silt	223.1	10.2

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F1.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 1879.2
Sample Weight Before Drying (g) 1844.0
% Moisture 1.9

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	521.2
20 min	550.4
30 min	571.1
40 min	604.8

Sample Weight (g) 1845.2

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	590.3	82.5	4.5
# 20	428.1	793.0	364.9	19.8
#40	385.0	739.1	354.1	19.2
#100	346.1	907.4	561.3	30.4
#140	333.3	385.8	52.5	2.8
# 200	337.9	533.5	195.6	10.6
Pan[a]	370.5	604.8	234.3	12.7
		Total Silt	234.3	12.7

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F1.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	462.7
20 min	482.8
30 min	498.5
40 min	522.3

Sample Weight (g) 2596.9

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	555.2	48.2	1.9
# 20	428.1	1064.1	636.0	24.5
#40	385.0	1192.0	807.0	31.1
#100	346.1	1160.6	814.5	31.4
#140	333.3	374.0	40.7	1.6
# 200	337.9	436.6	98.7	3.8
Pan[a]	370.5	522.3	151.8	5.8
		Total Silt	151.8	5.8

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F2.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	533.3
20 min	589.2
30 min	625.5
40 min	655.3

Sample Weight (g) 2102.6

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	546.6	39.6	1.9
# 20	428.1	570.4	142.3	6.8
#40	385.0	614.9	229.9	10.9
#100	346.1	1057.2	711.1	33.8
#140	333.3	352.4	19.1	0.9
# 200	337.9	1013.7	675.8	32.1
Pan[a]	370.5	655.3	284.8	13.5
		Total Silt	284.8	13.5

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

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PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F2.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 2487.0
Sample Weight Before Drying (g) 2340.3
% Moisture 5.9

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	598.6
20 min	646.7
30 min	673.4
40 min	730.6

Sample Weight (g) 2328.3

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.8	539.3	31.5	1.4
# 20	428.1	523.2	95.1	4.1
#40	385.0	631.7	246.7	10.6
#100	346.1	1336.8	990.7	42.6
#140	333.3	442.1	108.8	4.7
# 200	337.9	833.3	495.4	21.3
Pan[a]	370.5	730.6	360.1	15.5
		Total Silt	360.1	15.5

[a] Pan = collects all material that passes the #200 sieve

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JBR ENVIRONMENTAL CONSULTANTS, INC.
LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F2.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	377.5
20 min	379.9
30 min	382.6
40 min	385.9

Sample Weight (g) 1343.5

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	559.8	52.6	3.9
# 20	429.0	942.5	513.5	38.2
#40	385.3	677.5	292.2	21.7
#100	346.5	806.5	460.0	34.2
#140	333.3	341.7	8.4	0.6
# 200	338.1	339.5	1.4	0.1
Pan[a]	370.5	385.9	15.4	1.1
		Total Silt	15.4	1.1

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F3.1

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	371.8
20 min	376.2
30 min	377.3
40 min	383.7

Sample Weight (g) 1290.0

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	530.1	23.1	1.8
# 20	428.1	1544.7	1116.6	86.6
#40	385.0	496.5	111.5	8.6
#100	346.1	361.4	15.3	1.2
#140	333.3	336.7	3.4	0.3
# 200	337.9	344.8	6.9	0.5
Pan[a]	370.5	383.7	13.2	1.0
		Total Silt	13.2	1.0

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F3.2

MOISTURE ANALYSIS

Sample Weight Before Drying (g) 2145.3
Sample Weight Before Drying (g) 2114.4
% Moisture 1.4

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	724.1
20 min	903.3
30 min	982.3
40 min	1046.0

Sample Weight (g) 2107.4

Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507.2	536.9	29.7	1.4
# 20	429.0	824.5	395.5	18.8
#40	385.3	650.4	265.1	12.6
#100	346.5	769.2	422.7	20.1
#140	333.3	352.1	18.8	0.9
# 200	338.1	638.2	300.1	14.2
Pan[a]	370.5	1046.0	675.5	32.1
		Total Silt	675.5	32.1

[a] Pan = collects all material that passes the #200 sieve

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LABORATORY RESULTS

PROJECT: ADEQ Dust Study

SAMPLE SOURCE: ADEQ
DATE SAMPLED: 5/8/2013
SAMPLE NUMBER: F3.3

SIEVE ANALYSIS (ASTM C136)

SIEVING	
Pan Tare Wt. (g)	370.5
10 min	494.6
20 min	513.8
30 min	528.8
40 min	554.4

Sample Weight (g) 1062.9

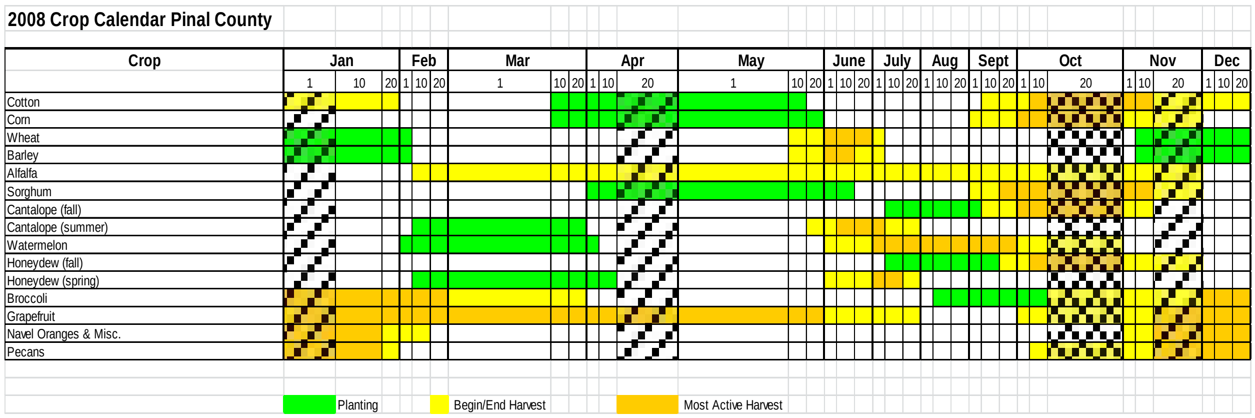
Filter/Screen	Tare Weight (g) (Filter or Pan)	Final Weight (g) (Filter or Pan + Sample)	Net Weight (g) (Sample)	Percent of Sample
#4	507	528.6	21.6	2.0
# 20	428.1	571.2	143.1	13.5
#40	385.0	522.3	137.3	12.9
#100	346.1	587.5	241.4	22.7
#140	333.3	345.8	12.5	1.2
# 200	337.9	661.0	323.1	30.4
Pan[a]	370.5	554.4	183.9	17.3
		Total Silt	183.9	17.3

[a] Pan = collects all material that passes the #200 sieve

Appendix 3

Pinal County Crops Calendar
Provided by Pinal County Air Quality Control District

Pinal County Crops Calendar



Source: Pinal County Air Quality Control District

Appendix 4

Traffic Counts (ADT levels) for the Unpaved Roads in Each of the Modeling Domain

Figure 1
ADTs of the Unpaved Roads for North Cowtown Stagnation Day and Low wind Hour Modeling Domain

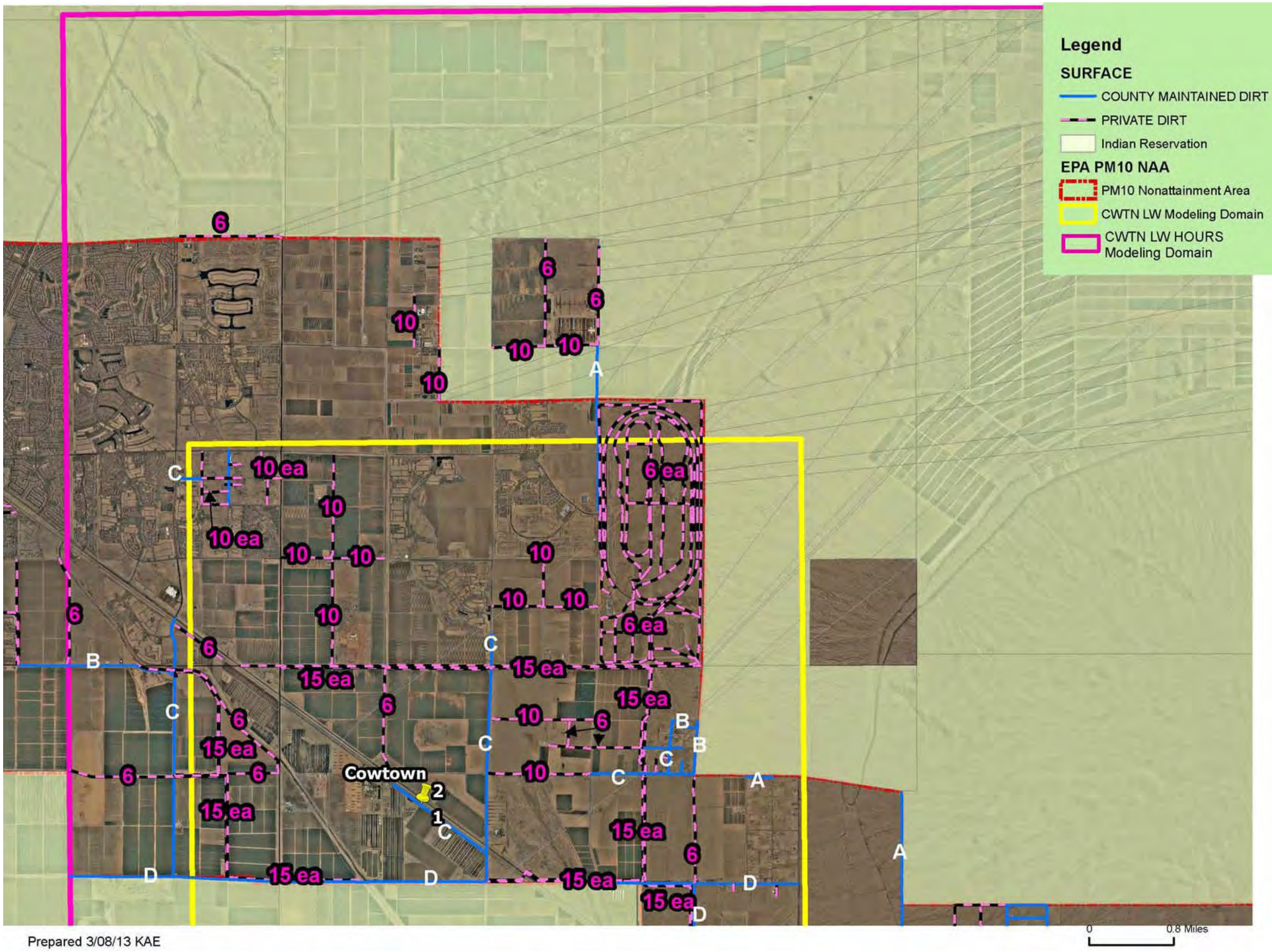


Figure 2
ADTs of the Unpaved Roads for South Cowtown Stagnation Day and Low wind Hour Modeling Domain

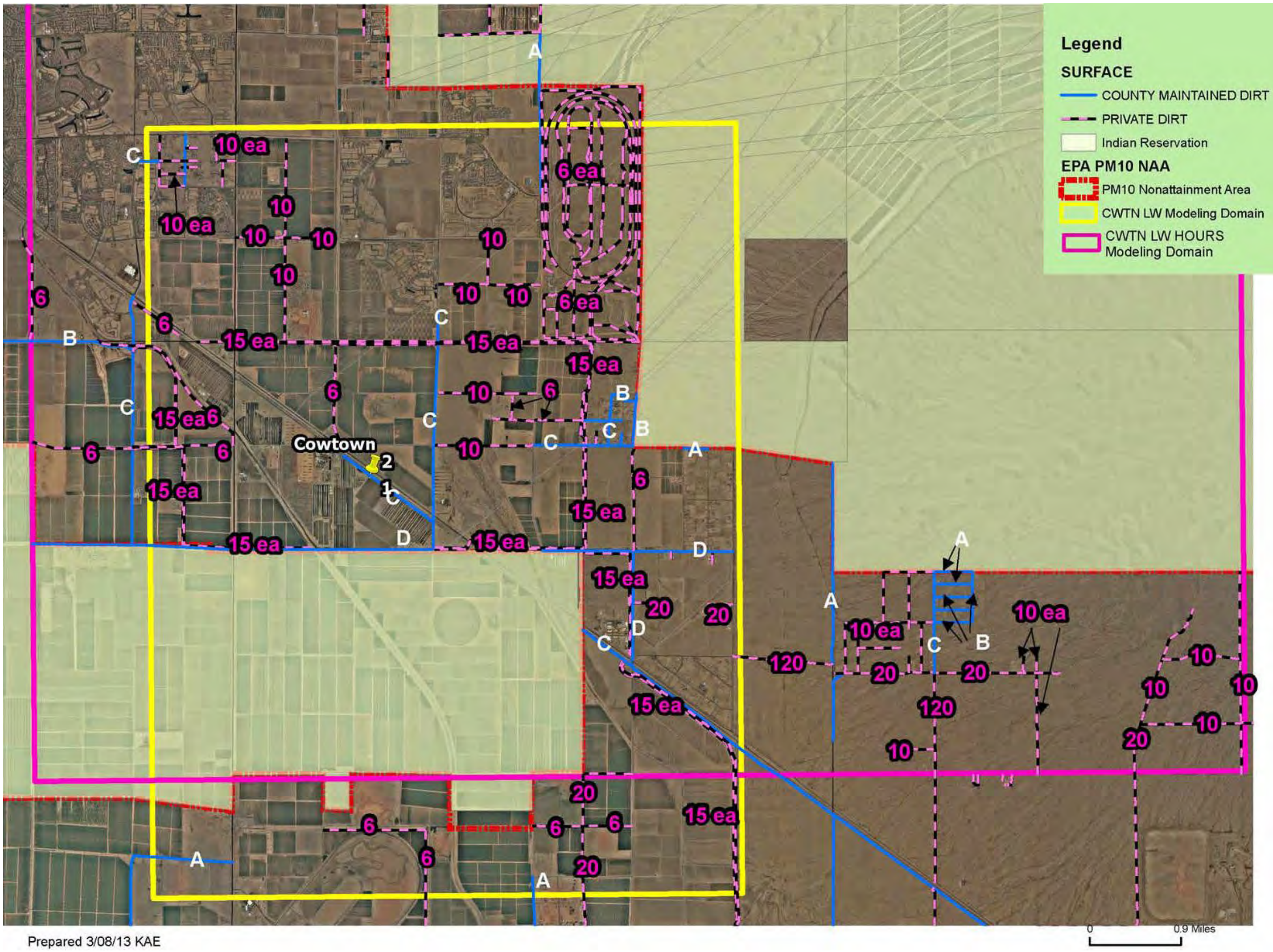


Figure 3
ADTs of the Unpaved Roads for Maricopa Low wind Hour Modeling Domain (Eastern half)

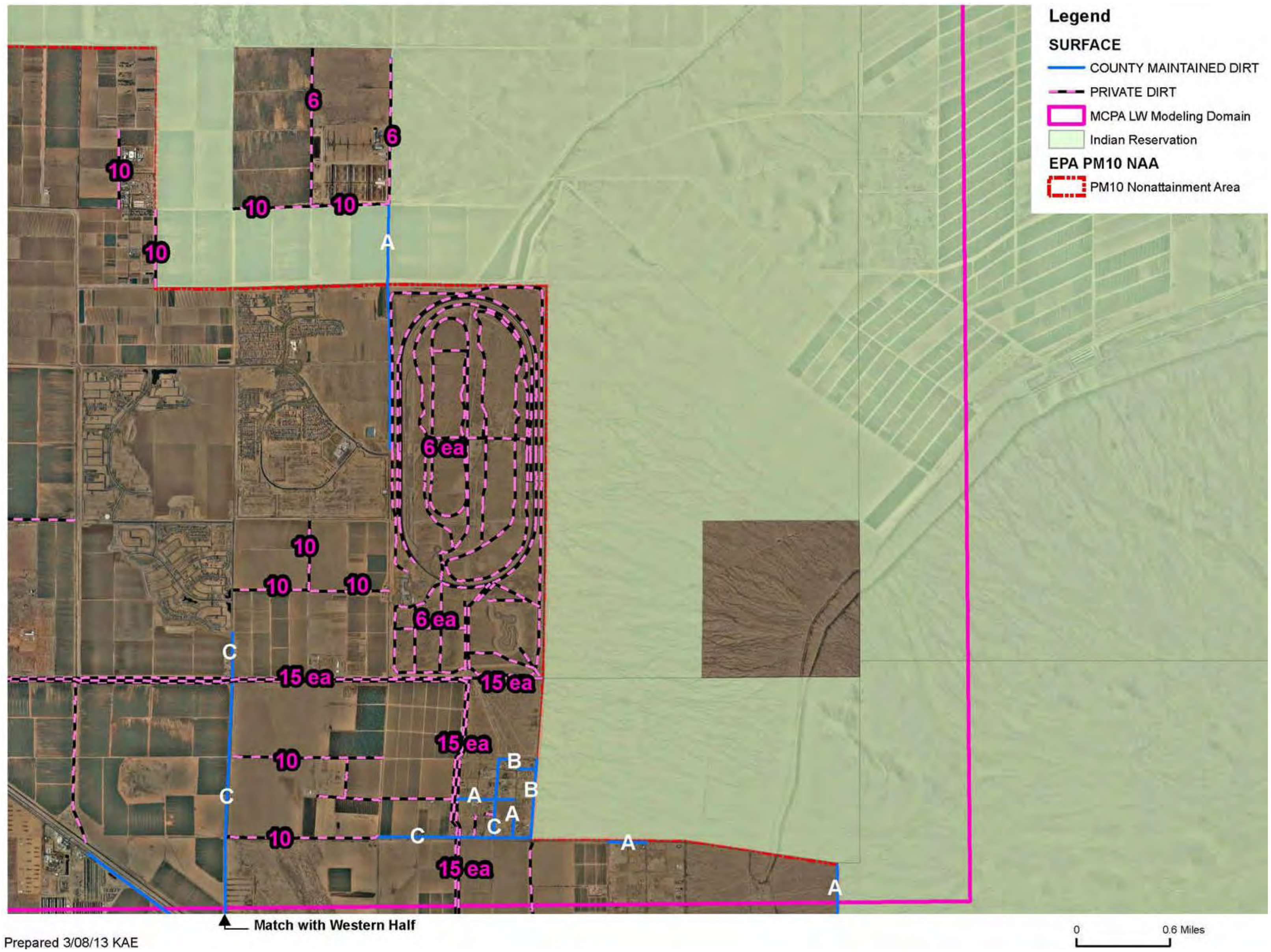


Figure 4
ADTs of the Unpaved Roads for Maricopa Low wind Hour Modeling Domain (Western half)

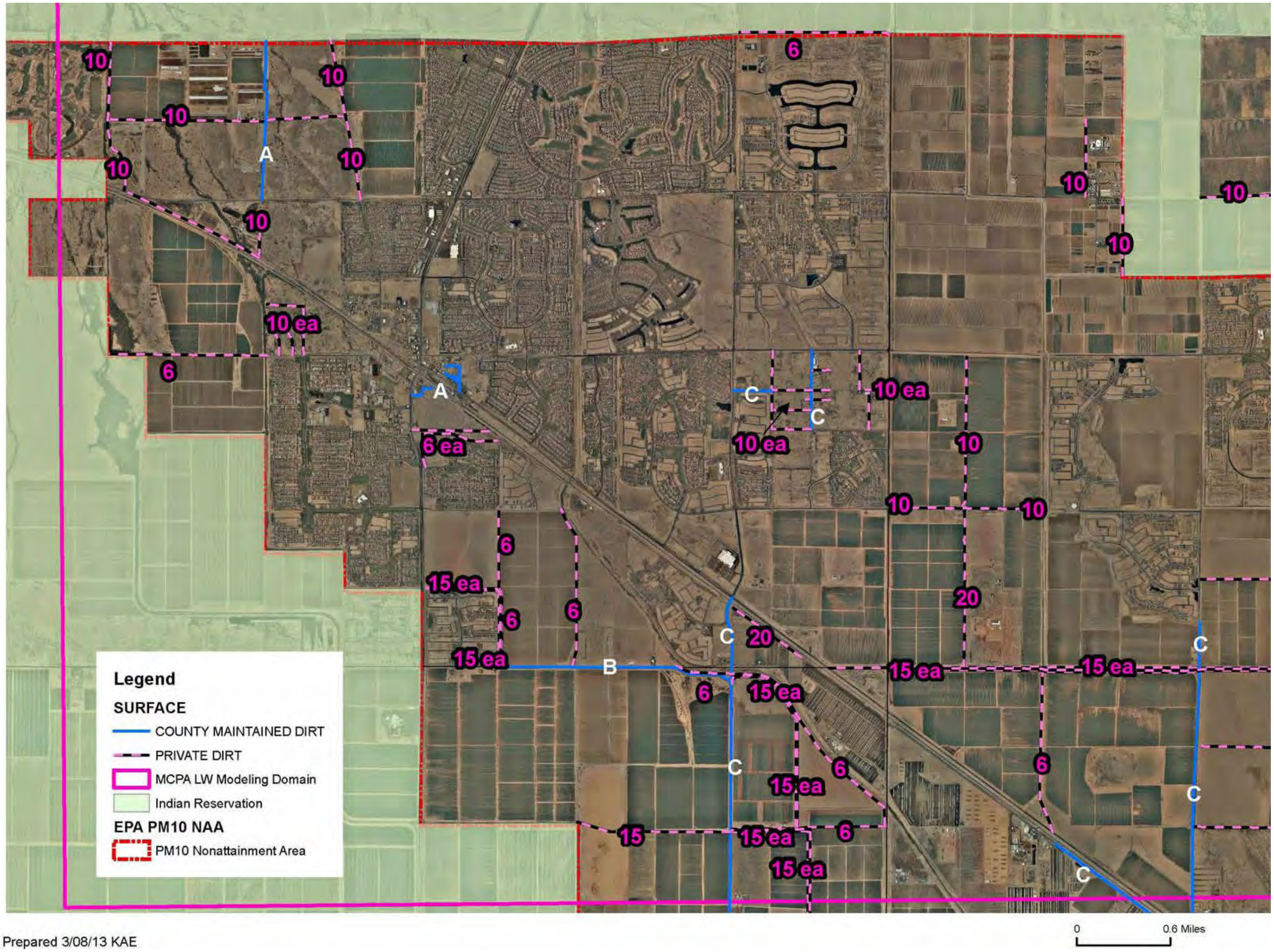


Figure 5
ADTs of the Unpaved Roads for Pinal County Housing Stagnation Day Modeling Domain

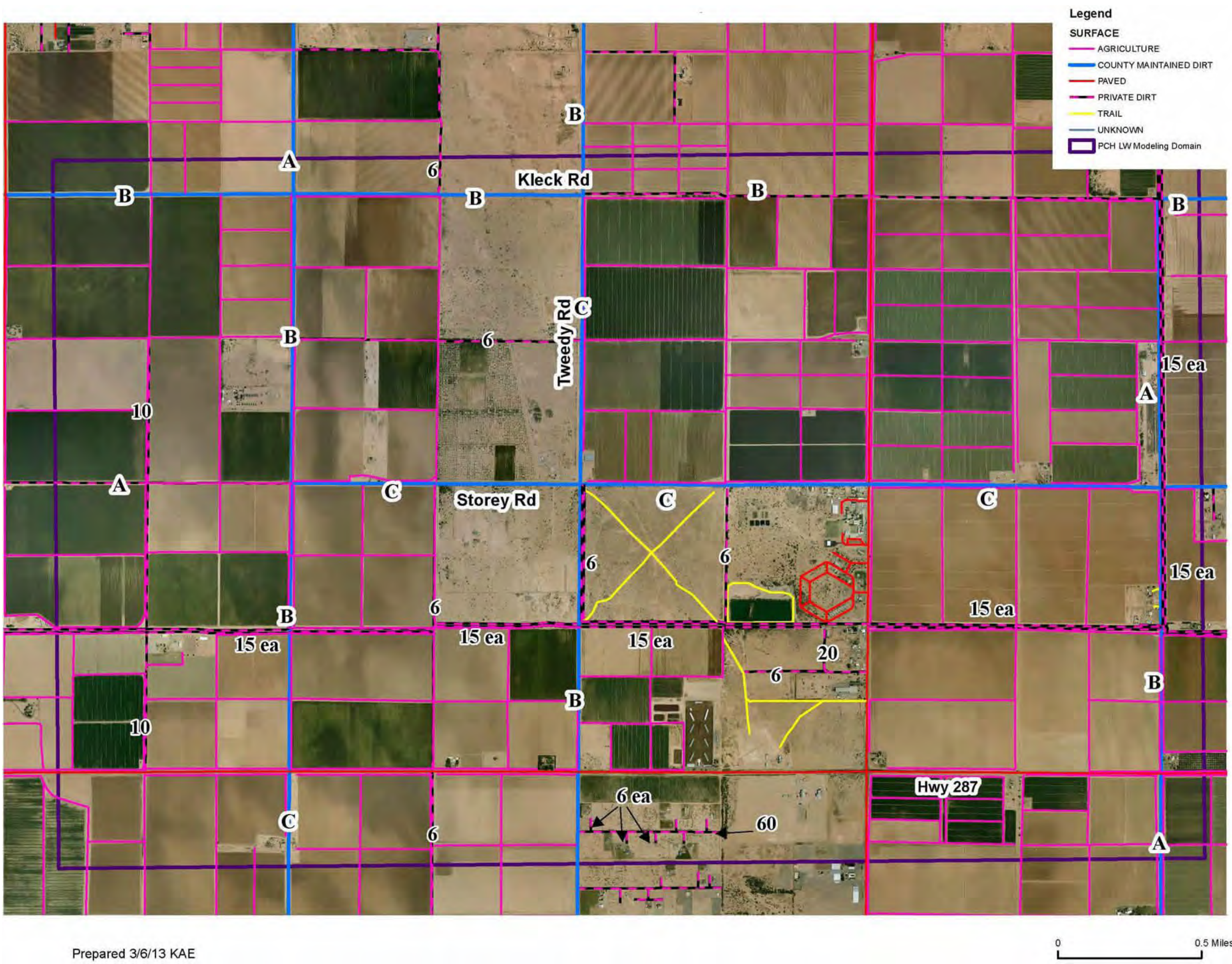


Figure 6
ADTs of the Unpaved Roads for Pinal County Housing Low Wind Hour Modeling Domain

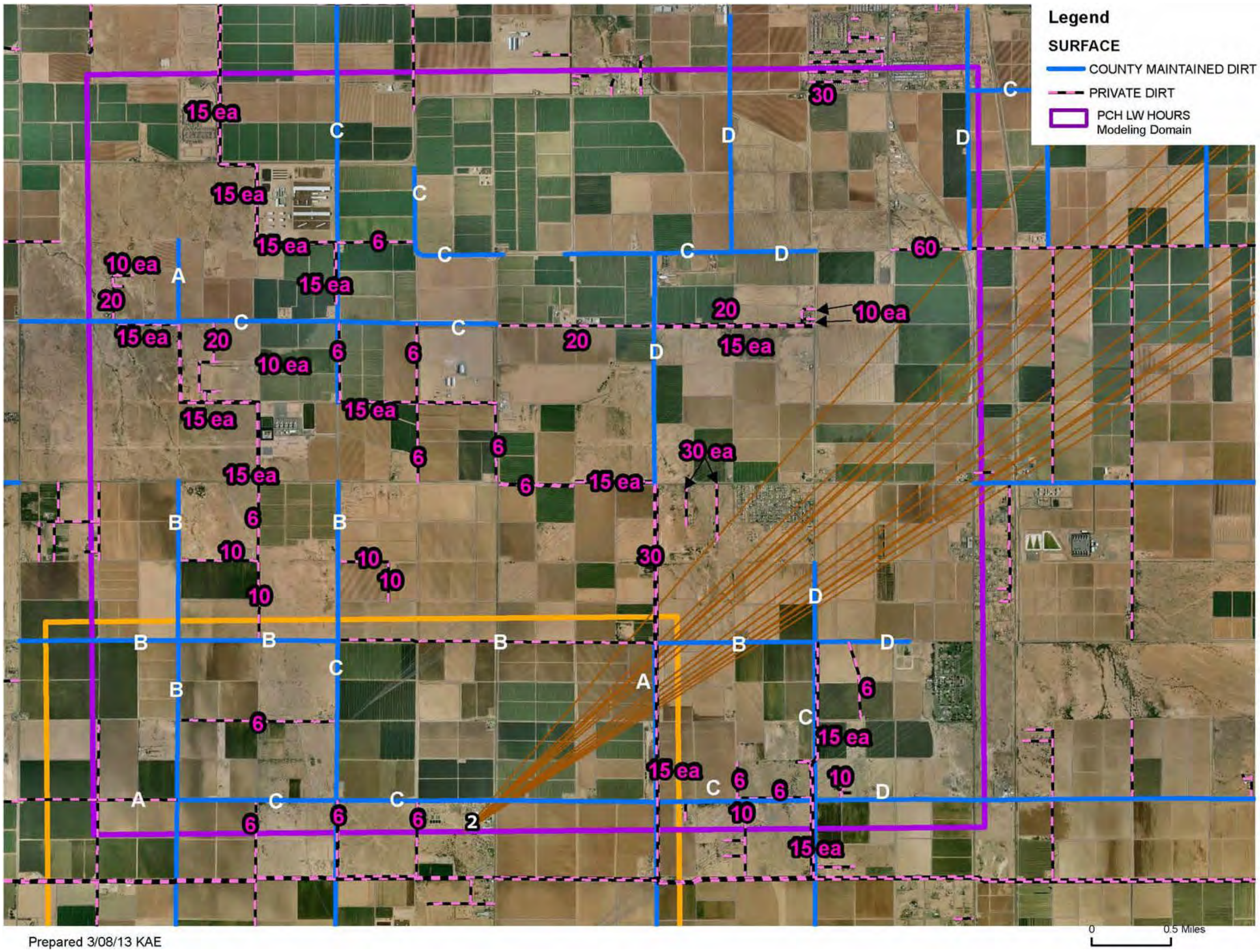


Figure 7
ADTs of the Unpaved Roads for Stanfield Stagnation Day and Low Wind Hour (Western half) Modeling Domain

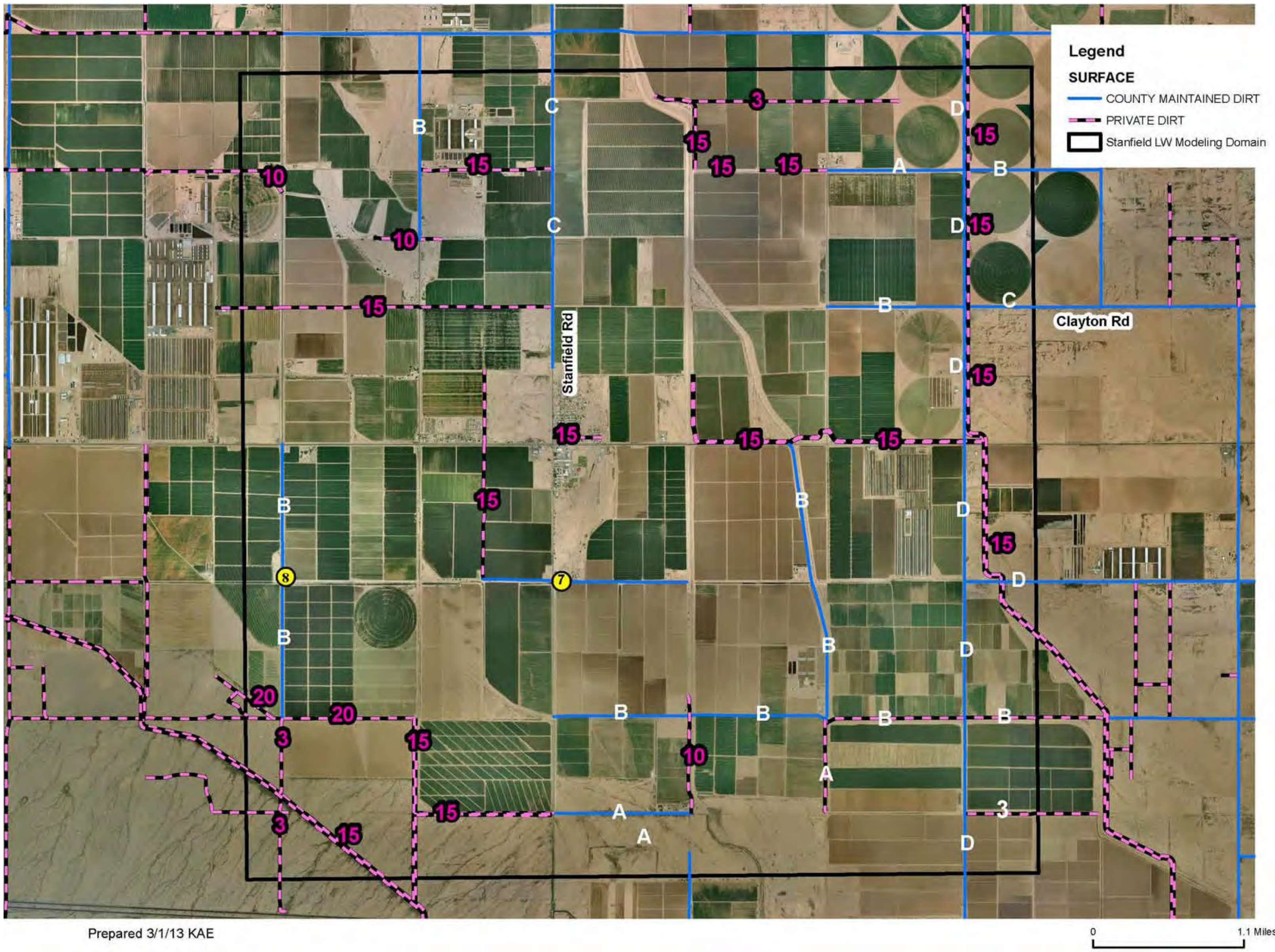
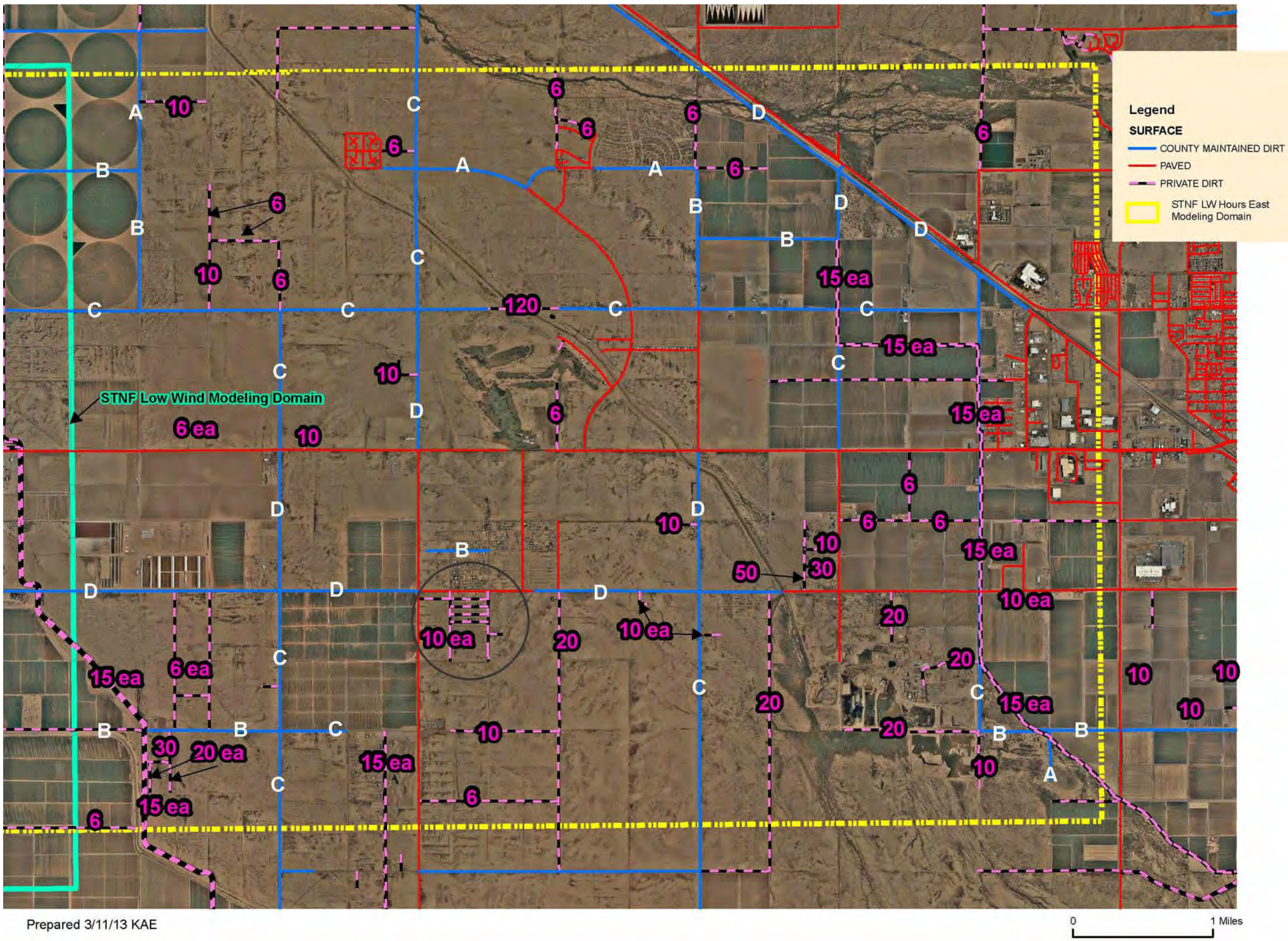


Figure 8
ADTs of the Unpaved Roads for Low Wind Hour (Eastern half) Modeling Domain



Appendix 5

Methodology for Estimating Windblown Emission Factors
Within 5 MPH Wind Speed Bins

Methodology for Estimating Windblown Emission Factors Within 5 MPH Wind Speed Bins

In the emission inventory for the Maricopa Association of Government's (MAG) Five Percent PM10 Nonattainment Plan, windblown PM10 emissions were estimated on an annual basis for the base year of 2008. Because high wind emission rates are more closely correlated with wind gust velocities, MAG staff used average wind speeds measured over the shortest intervals reported by the Maricopa County Air Quality Department's continuous monitors, which was 5-minute averaging periods. Five-minute average wind speeds exceeding 12 mph, the threshold speed for dust entrainment determined by MAG on the basis of region-wide monitoring data, were extracted from the meteorological datasets and sorted into wind speed bins generally spanning 5 mph intervals. The wind speed bins were set at 12 – 15 mph, 15 – 20 mph, 20 – 25 mph, 25 – 30 mph, and 30 – 35 mph in order to develop disturbed soil emission factors within each wind speed bin. The upper range of these bins was dictated by the highest 5-minute average wind speed recorded in the MAG PM10 nonattainment area in 2008.

Emission factors were computed for each wind speed bin on the basis of wind tunnel studies of exposed soils in Maricopa and Pinal Counties conducted by Nickling and Gillies.[1] MAG staff concluded from this study that emission factors for the soils categorized by land use type were sufficiently similar to each other as to allow for the use of a single composite emission factor to represent and be used to compute emissions from all soils in the nonattainment area with the exception of those used for agricultural cultivation. The composite emission factor used in the Five Percent Plan for windblownPM10 from disturbed non-agricultural soils was $4.36 \times 10^{-15} u*^{4.3961}$ g/cm^2-sec, where u* was the average friction velocity reported by Nickling and Gillies for all non-agricultural soils tested.

Since the Five Percent Plan emission inventory was designed to be an annual inventory, windblown PM10 emissions were computed on an annual basis. To do this, MAG staff first converted the wind speed representing the midpoint of each wind speed bin to an equivalent friction velocity using the Prandtl equation[2], and then computed the PM10 emission rate for winds within each speed bin from the bin-specific friction velocity using the composite Nickling and Gillies emission factor equation (above). Emission rates, in tons/acre-5 minute period, were multiplied by the total number of 5-minute periods in each speed bin and then summed over all speed bins to develop an annual emission rate for disturbed soils. The ratio of PM10 emissions measured in more recent wind tunnel testing near Barstow, California of disturbed and undisturbed soils was applied to the annual emission factor for disturbed soils to derive an annual emission factor for undisturbed soils in the MAG nonattainment area. Total annual windblown PM10 emissions in the Plan were then computed by multiplying these emissions factors by the total estimated areas of disturbed and undisturbed soils in the nonattainment area.

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[1] Evaluation of Aerosol Production Potential of Type Surfaces in Arizona, prepared for Engineering-Science by W.G. Nickling and J.A. Gillies, for EPA Contract No. 68-02-380, September 1986.

[2] The fluid dynamics Prandtl equation: $U = (u^*/k) \times \ln(z/z_0)$, where U is the wind speed measured at an amemometer z meters above the ground surface, u* is the friction velocity, k is the Von Karmen constant approximating 0.4, and z_0 is the roughness height of the ground surface.

In deriving windblown PM10 emission factors for the Pinal County PM10 design day emission inventories, Sierra used the basic MAG approach as this methodology was approved by EPA. Wind speed data reported as hourly averages has been recorded by the Pinal County Air Quality Control District (PCAQCD) for a number of years at each of the Pinal County Housing, Cowtown, and Stanfield monitoring stations for which attainment demonstrations are required. Only in more recent years have the meteorological dataloggers at these sites been programmed to record wind speed averages at 5-minute resolution, however. As a result, to match the MAG approach as best as possible, the available 5-minute high wind data were used to calculate equivalent hourly average emission factors with the same wind speed bins used by MAG, and these factors were then applied to hours on attainment demonstration design days when hourly average wind speeds were within the same speed bin.

The calculation of equivalent hourly emission factors from 5-minute emission factors was done by preparing histograms of 5-minute wind speeds within each hourly average wind speed bin. At each monitor, hourly wind speed data exceeding 12 mph were extracted from the recent year records and sorted into the same wind speed bins used by MAG. Then, the 5-minute average wind speed data recorded during all of the hours listed within a single hourly wind speed bin were extracted from the same database and also sorted into the same wind speed bin design. The numbers of 5-minute averages within each bin were totaled and used to populate the histogram of 5-minute wind speed periods within each hourly wind speed bin. An example table of this distribution for the Pinal County Housing site in 2012 is presented in Table 1.

Table 1
Distribution of 5-Minute Wind Speed Periods in Each Hourly Wind Speed Bin

Count of mph	Column Labels				
Row Labels	0.00	12.00	15.00	20.00	25.00	Grand Total
12.00	200	402	163	3		768
15.00	5	74	323	42		444
20.00			27	44	1	72
Grand Total	**205**	**476**	**513**	**89**	**1**	**1284**

In this example, for the hourly wind speed bin of 12 – 15 mph, approximately 26% of 5-minute wind speed averages were less than 12 mph (= 200/768), 52% were between 12 - 15 mph (= 402/768), 21% were between 15 – 20 mph, and 0.4% were between 20 – 25 mph (= 3/768). Emission factors were computed for each of the midpoints of these wind speed ranges, and these factors were (1) multiplied by the corresponding fractions of 5-minute periods contained each range, and (2) the products from each range were summed together to produce an equivalent hourly emission factor for each speed bin range that represents the contributions of the 5-minute average emission factors for the same hours.

At the Pinal County Housing site, no hourly wind speed higher than 25 mph was recorded in the recent year data. Thus, the highest hourly wind speed range for which an emission factor was computed was the 20 – 25 mph range. The composite hourly emission factors developed for each wind speed bin were then applied to all disturbed soils in the modeling domain on each hour of the attainment design day of 1/1/2008 at the Pinal County Housing site on which the hourly average wind speed fell within the same speed bin. Corresponding emission factors for undisturbed soils in the modeling domain were computed by applying the Barstow emission factor ratio[3] for disturbed to undisturbed soils to the disturbed soil emission factors in each wind speed bin.

[3] See Appendix 4 of the 2008 Maricopa PM10 Periodic Emission Inventory: "As a surrogate, the ratio of stable to disturbed vertical fluxes found in the wind tunnel studies performed in Barstow, California (Macpherson et al., 2008) was used to develop the vertical flux for stable land uses."
http://www.maricopa.gov/aq/divisions/planning_analysis/docs/2008_PM10/App4_WindblownDust.pdf

Appendix 6

Evaluation of a Wind Erosion PM10 Emission Equation for
Agricultural Lands in the Western Pinal County PM10 Nonattainment Area

Evaluation of a Wind Erosion PM10 Emission Equation for Agricultural Lands in the Western Pinal County PM10 Nonattainment Area

In the compilation of emission factors for windblown PM10 in the Maricopa County Air Quality Department's (MCAQD) 2008 Periodic Emission Inventory (PEI) for PM10 and the Maricopa Association of Government's (MAG) 2012 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area, different equations were used to compute factors for agricultural and non-agricultural lands. The equation chosen for agricultural lands did not account for wind speed, which the bulk of windblown dust research has demonstrated is one of the dominant factors influencing the magnitude emissions rates. Because of the clear relationship between hourly-average wind speed and PM10 concentrations at each of the Pinal County PM10 monitoring stations for which a 24-hour attainment demonstration was proposed, Sierra Research concluded that the MAG equation for agricultural lands was not satisfactory and the development of a windspeed-based equation was undertaken. This appendix summarizes the effort to evaluate and select a substitute equation for quantifying windblown PM10 emissions in the Pinal County PM10 nonattainment area.

Nickling and Gillies Study – In 1986, W.G Nickling and J.A. Gillies[1] conducted portable wind tunnel tests of the windblown PM10 potential of soil surfaces at 13 sites in Arizona to assess emission thresholds and rates in support of several objectives. These objectives included the development of an analytical tool for estimating total PM10 emissions of anthropogenically disturbed soils during a regional high event, and to quantify the particle size distribution of windblown dust from these surfaces for use in constructing emission inventories for the then-proposed PM10 national ambient air quality standard. Sites that were tested were located primarily in Maricopa and Pinal Counties in central Arizona.

Many of the wind tunnel tests were conducted on soils that had been freshly disturbed for economic or recreational reasons. Such lands included active construction sites, agricultural fields, mine tailings piles, off-road vehicle use areas, and disturbed desert lands. The remainder of tests were conducted on soils that were relatively undisturbed, such as dry river bottoms, isolated desert lands, and abandoned agricultural lands. In each test, measurements were made of threshold velocities for the wind entrainment of dust, and vertical and horizontal particulate and sand flux rates as functions of wind speed. At the conclusion of data collection and analysis, the authors attempted to relate PM10 emissions rates to different soil characteristics with limited success.

MCAQD 2008 PEI Windblown PM10 Methodology – The windblown PM10 emission inventory that is contained in the MCAQD 2008 Periodic Emission Inventory (PEI)[2] is calculated using two different emission factor equations: one equation, derived from the Nickling and Gillies 1986 study, was applied to all non-agricultural lands; a second equation, derived from research conducted by the U.S. Department of Agriculture's Soil Conservation Service, was applied to agricultural lands.

[1] "Evaluation of Aerosol Production Potential of Type Surfaces in Arizona," prepared for Engineering-Science by W.G. Nickling and J.A. Gillies, for EPA Contract No. 68-02-380, September 1986.
[2] "2008 PM10 Periodic Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area," Maricopa County Air Quality Department.

Analysis conducted by MCAQD of the relationships between shear velocity (a measure of the rate at which wind speed near the ground increases with height above the ground) and PM10 emissions concluded that agricultural soils behaved differently than non-agricultural soils. This conclusion was based on an analysis that combined data from three tests conducted on agricultural soils at University of Arizona Experimental Farms in Mesa, Maricopa, and Yuma, Arizona. As described in the Nickling and Gillies report, the surface roughness values of the three sites varied significantly. The Maricopa site had been recently tilled while the soil was moist and the surface was extremely cloddy. The Mesa and Yuma sites had also been recently tilled, but the soil moistures there were extremely low and the roughness heights were in the middle of the range representing the non-agricultural sites. Elimination of the data from the Maricopa site resulted in a relationship between shear velocity and PM10 emissions for the remaining two agricultural sites that was similar to the relationship for non-agricultural soils.

Conclusion – Because the soil textures, roughness heights, and relationships between shear velocity and PM10 emissions of the agricultural soils, with the exception of the Maricopa roughness height, were similar to those of the non-agricultural soils, the agricultural soils should behave much like the non-agricultural soils with respect to PM10 emission rates. As a result, the emission equation developed by MCAQD for use in the 2008 PEI in Maricopa County was determined to be reasonably representative of windblown PM10 emissions from disturbed soils on both agricultural and non-agricultural lands within the Pinal County PM10 nonattainment area.

Appendix 7

Ambient Monitoring Data Based
Emission Factor Adjustment

Arizona Department of Environmental Quality (ADEQ)
Air Quality Division
4/10/2013

Ambient Monitoring Data Based Emission Factor Adjustments

April 10th, 2013

FINAL REPORT

Arizona Department of

Environmental Quality

Introduction

This document provides an overview of the development and testing of a method which attempts to account for particulate matter concentration variation in Pinal County, Arizona during sustained high wind (>12 mph) events. Emission factors (EFs) are often an estimation of maximum emission potential and are not always representative of the actual environment. This adjustment methodology would be applied to the emission factors developed in the Maricopa Association of Governments (MAG) 5% Plan high wind methodology which has already been approved by EPA[1]. Land use dependent EFs derived from literature assume static emission rates, usually altering with wind speed, but do not account for temporal variation of these EFs. The method outlined below attempts to account for environmental factors, ranging from the lack of substantial airborne particles available for dust re-entrainment in the early hours of a high wind event to reservoir depletion in the later hours of a sustained high wind event, in an attempt to address temporal changes in emission rates during windblown dust events. To this end, PM_{10} atmospheric concentrations measured at Pinal County, Arizona monitors during high wind events were utilized to create emission factor adjustment curves at each of the four design day monitors for the Pinal County PM_{10} State Implementation Plan creation (Cowtown, Maricopa, Stanfield, and Pinal County Housing). These adjustment curves are presented as a method of altering the MAG 5% Plan high wind EFs for each of the 4 monitors in the modeling of design days for the Pinal County State Implementation Plan Emission Inventory. These adjustment curves will be applied to emission factors in future design day modeling in an attempt to account for the temporal variability in particulate emissions during sustained high wind events.

Methodology

This section outlines the methods used to create the adjustment curves.

Hourly monitor measurements of PM_{10} concentrations and meteorology were compiled for 4 monitors (Cowtown, Maricopa, Stanfield, and Pinal County Housing) located in the Pinal County nonattainment area for the year 2008. Data sets for each monitor were processed separately. Datasets were screened for high wind events meeting the following criteria:

1. An event begins when an hourly wind speed exceeds 12 mph and ends when a consecutive hourly wind speed drops below 12 mph (wind speeds were adjusted to standardized 10 m height equivalents),
2. Events must contain five or more consecutive hours of wind speeds greater than 12 mph,
3. Only one event could occur on a given day and must be the first event to occur on that day,

[1] Maricopa Association of Governments (MAG), 2012. MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area.

4. Events must contain peak monitor PM_{10} concentrations which exceed 200 $\mu g/m^3$, and
5. Events which occurred during the monsoon summer months of July, August, and September must not be tagged as 'Exceptional Events' by Pinal County Air Quality Department (PCAQD).

For each monitor, events were separated based on the above criteria and were normalized on an hourly basis to percentages of peak PM_{10} concentrations measured. This calculation was performed by assuming the peak measured monitor concentration was equal to 100% for a given event and each previous and subsequent hourly measured concentration was some percentage of the event peak concentration. A sample is given below:

<u>Example1: Cowtown 5/5/2008 High Wind Hours</u>

Table 1 presents the high wind hours for 5/5/2008 and the calculated adjustment distribution.

Table 1: Cowtown 5/5/2008 High Wind Event

DATE	TIME	Peak Relative Time	Monitor PM_{10} [$\mu g/m^3$]	Adjustment Distribution [%]
5-May-08	12:00	-2	278.5	82%
5-May-08	13:00	-1	187.3	55%
5-May-08	14:00	0	340.5	100%
5-May-08	15:00	1	155.0	46%
5-May-08	16:00	2	167.7	49%
5-May-08	17:00	3	67.1	20%

In the case of this example, the event lasted 6 hours with a peak concentration of 340.5 $\mu g/m^3$ measured at 14:00 hours. Peak Relative Time (PRT) [hr] was calculated as the number of hours prior to or following the peak concentration hour. Adjustment distribution percentage was calculated using the following equation:

$$D_n = 100 * \left(\frac{C_n}{C_{pk}} \right)$$

where:
D_n is the percentage of the event peak concentration for a monitor concentration on a given hour, n;
C_{pk} is the peak PM_{10} concentration measured at the monitor for a given event [$\mu g/m^3$]; and
C_n is the PM_{10} concentration measured at the monitor for a given hour, n.

Once all events for a given monitor within the year of 2008 had been processed, a standard adjustment distribution curve for the monitor was created by averaging all events by hour, based on the PRT. Examples of how these averages occurred can be found in Tables 2-5.

Results

The following subsections present the average adjustment distribution curves for each of the 4 monitors (Cowtown, Maricopa, Pinal County Housing (PCH), and Stanfield). Tables 2, 3, 4, and 5 show the adjustment distribution curves [% of peak] for each event identified using the criteria previously presented and the average adjustment distribution for Cowtown, Maricopa, PCH, and Stanfield respectively. Figures 1, 3, 5, and 7 present graphical representations of the average adjustment distribution curves for each site with calculated error in the form of one standard deviation of the mean for each hour calculated. Figures 2, 4, 6, and 8 present comparisons of the adjustment distribution curves and hourly measured PM_{10} concentrations for the Cowtown, Maricopa, PCH, and Stanfield design days. For these figures, the adjustment distribution curves were scaled so that the peak of the adjustment curve matched the peak of the monitor measured concentrations and the adjustment curves were cut to only those hours on the design days which experienced winds greater than 12 mph.

Cowtown EF Adjustment Curve

Table 2: Cowtown high wind event day distributions. Columns represent separate events. All events were normalized so that event peak monitor measured concentrations occurred at a PRT=0.

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Avg	Std Dev
-5																			19%							19%	
-4						23%				43%				77%			44%		12%							40%	25%
-3			73%			82%				82%				39%			54%		20%		33%					55%	25%
-2	15%		29%	62%	45%	96%				31%				45%	82%	76%	88%		35%	18%	35%				50%	51%	26%
-1	51%	20%	20%	22%	33%	93%				51%			69%	55%	55%	18%	70%	98%	78%	27%	24%		24%		34%	47%	26%
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%
1	28%	54%	52%	70%	37%		85%	95%	23%		23%	12%	45%		46%	18%		36%	60%	44%	23%	44%	48%	45%	53%	45%	21%
2	23%	10%	46%	54%	21%		70%	73%	8%		17%	14%	56%		49%	22%		44%	57%	28%	6%	13%	44%	27%	9%	33%	21%
3	39%	86%	13%	78%	85%		46%	82%	16%		28%	8%	92%		20%	54%		60%	30%	10%	7%	36%	64%	27%	7%	42%	30%
4	20%	21%		43%			53%	25%	3%		42%	4%						81%	22%	42%	6%	51%	67%	24%	5%	32%	24%
5	7%	17%		73%			94%	26%			28%	4%						38%	49%		4%	14%		11%	6%	29%	28%
6	12%	19%		66%			48%				26%	3%										22%		9%		26%	21%
7	16%	39%					91%					8%												7%		32%	35%
8	17%	52%					60%																	5%		33%	27%
9	10%						43%																	6%		20%	20%
10	8%																							6%		7%	2%
11	11%																							3%		7%	5%
12	19%																							4%		12%	10%
13	12%																							4%		8%	5%
14	10%																									10%	
15	10%																									10%	
16	11%																									11%	
17	7%																									7%	
18	9%																									9%	
19	5%																									5%	
20	2%																									2%	
21	3%																									3%	

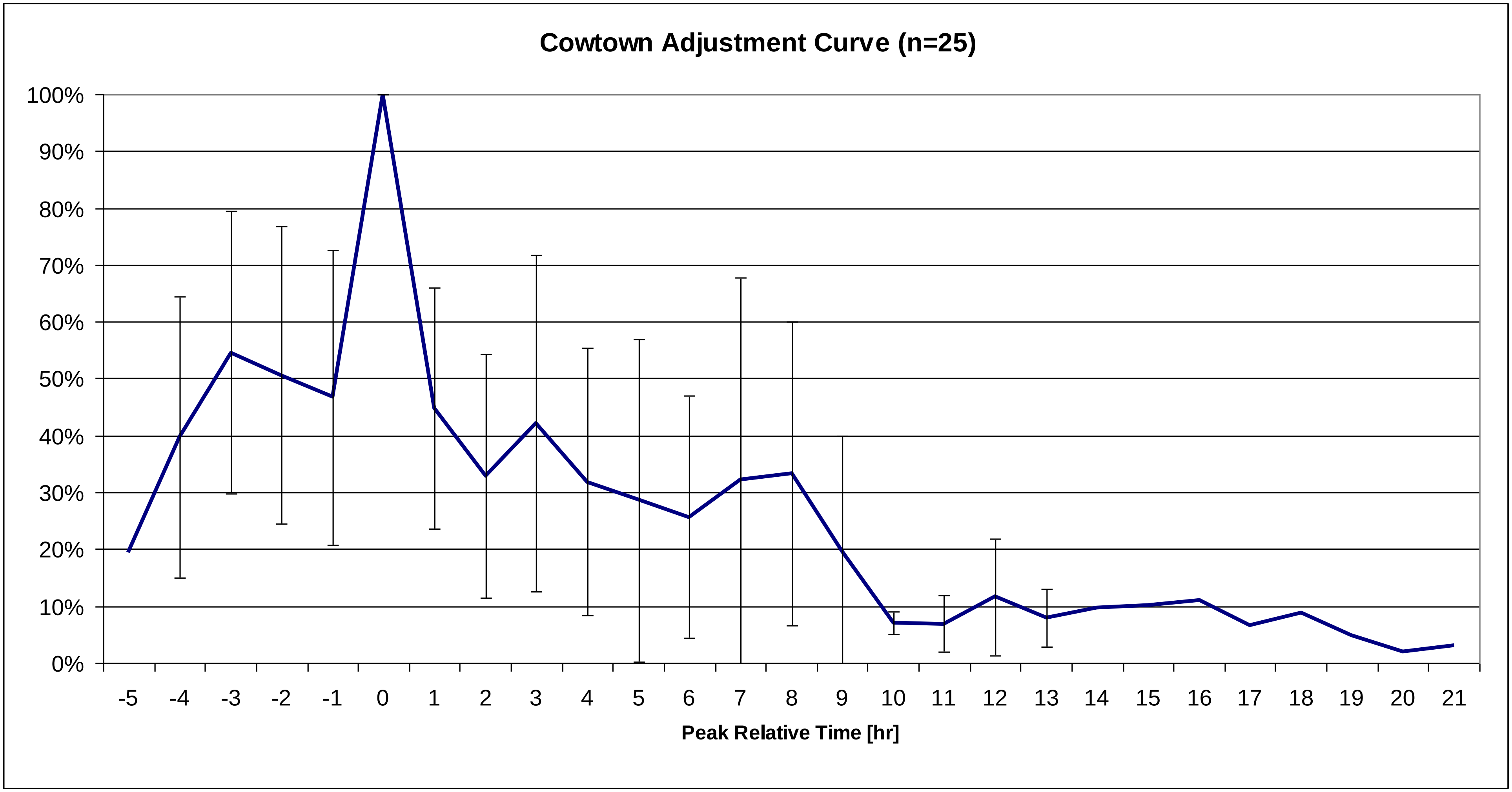

Figure 1: Cowtown adjustment curve for the year of 2008. Event sample size was 25. Error bars represent one standard deviation.

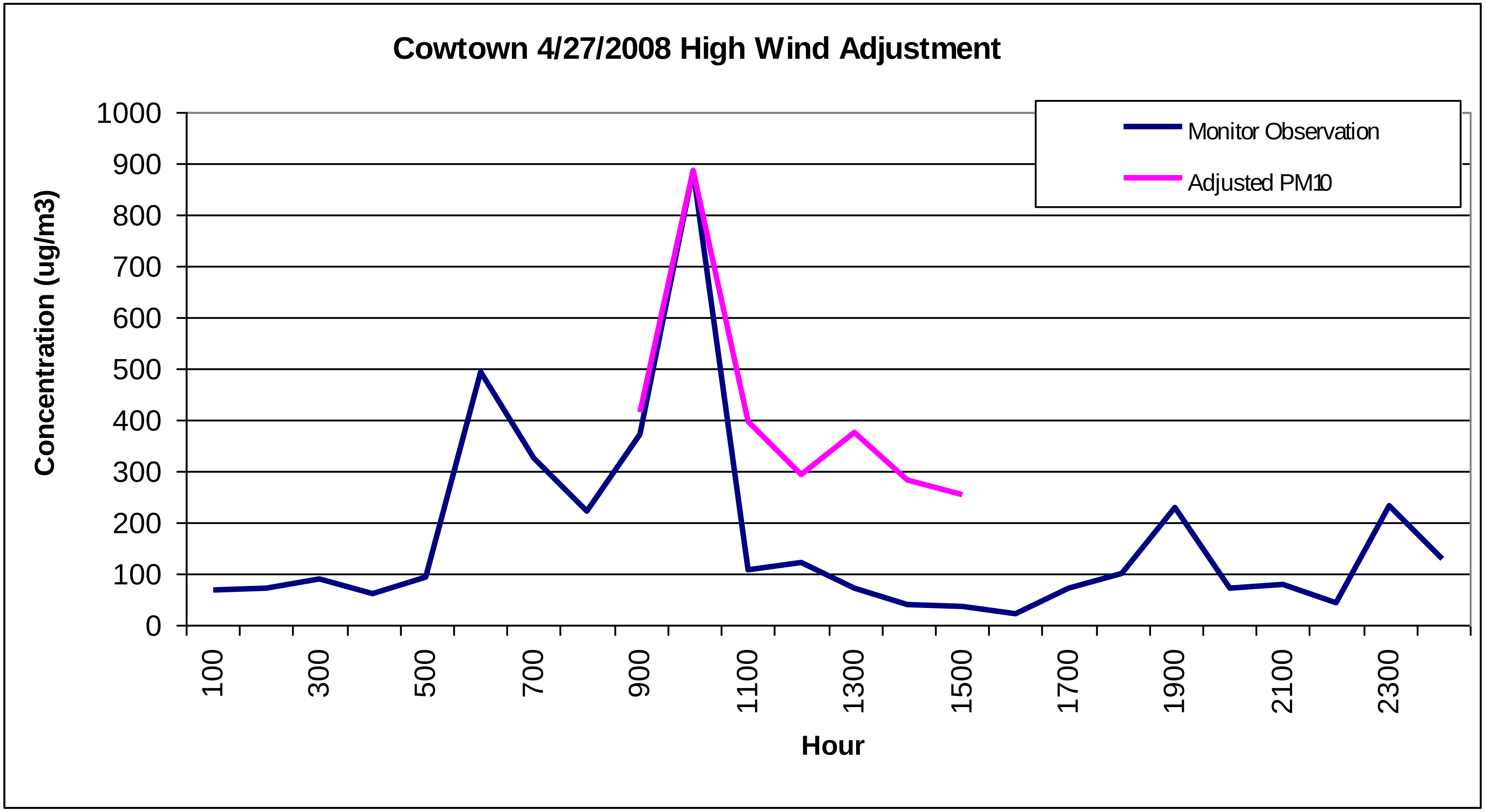

Figure 2: Cowtown adjustment curve (pink) for the year of 2008 normalized to the peak concentration for the 4/27/2008 design day. Monitor observed concentrations are shown in blue for curve comparison.

Maricopa EF Adjustment Curve

Table 3: Maricopa high wind event day distributions. Columns represent separate events. All events were normalized so that event peak monitor measured concentrations occurred at a PRT=0.

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	Average	Std Dev
-13	6%													6%	
-12	6%													6%	
-11	7%													7%	
-10	38%													38%	
-9	36%													36%	
-8	20%													20%	
-7	11%													11%	
-6	6%						9%							8%	2%
-5	8%						9%			75%				31%	38%
-4	8%						22%	26%		31%			66%	30%	22%
-3	19%	39%					51%	28%		54%			83%	46%	23%
-2	39%	13%	12%	31%	40%	37%	28%	32%		52%			75%	36%	18%
-1	97%	8%	20%	27%	82%	61%	54%	52%	8%	64%		46%	59%	48%	28%
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%
1	91%	14%	75%	54%	31%	39%	40%	70%	50%	15%	58%	47%		49%	23%
2	56%	57%	35%	27%	28%	43%	34%	72%	18%	14%	34%	48%		39%	17%
3	34%	9%	21%	14%	20%		19%	96%	12%	24%	21%	28%		27%	24%
4	23%			15%			9%	59%	5%		17%	18%		21%	18%
5	13%						9%	33%	5%		10%	14%		14%	10%
6	8%						4%	31%	3%		9%	14%		12%	10%
7	13%								4%		8%			8%	4%
8	7%								6%		7%			7%	1%
9	5%								5%		7%			5%	1%
10	5%										5%			5%	0%
11											4%			4%	
12											4%			4%	
13											4%			4%	

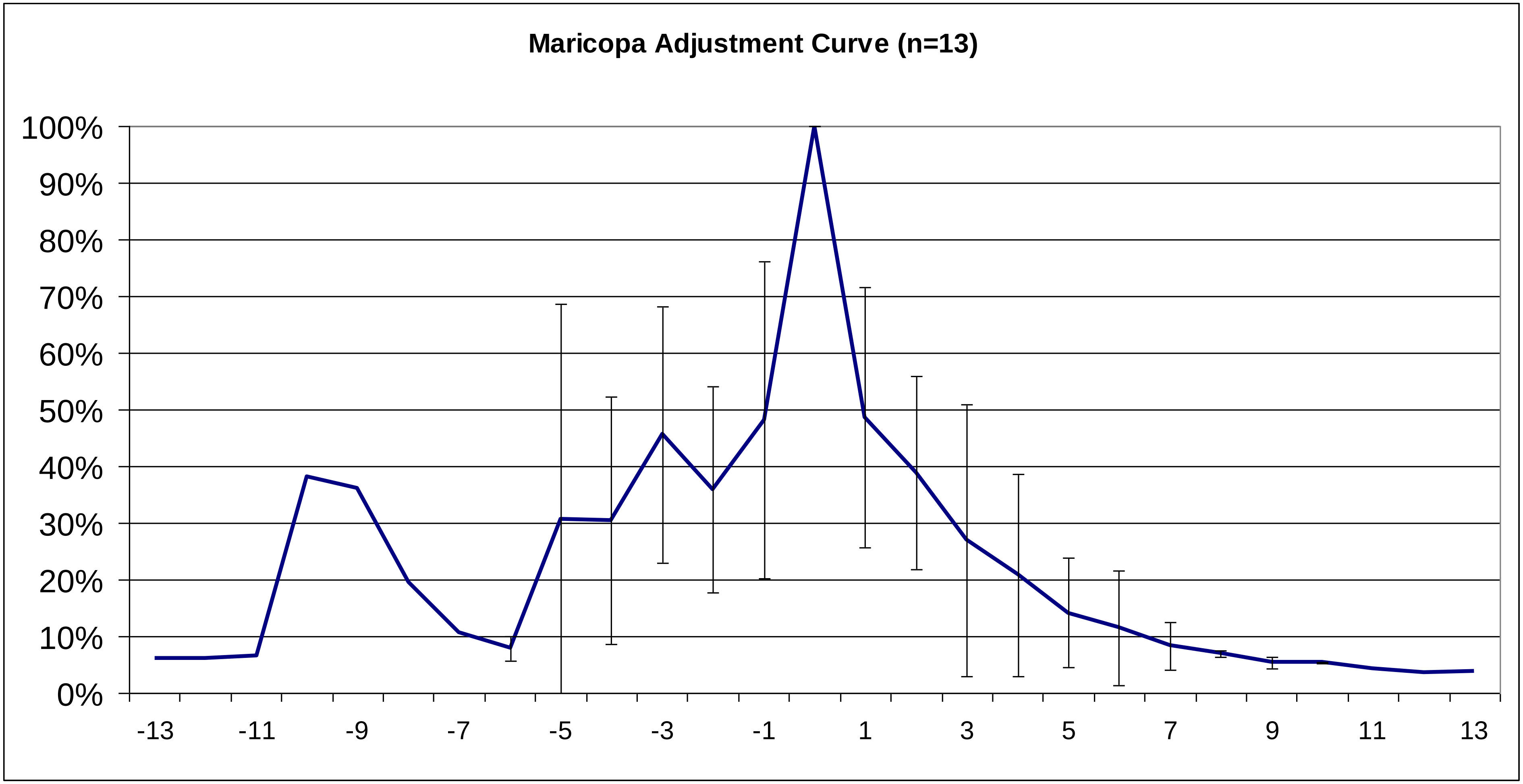

Figure 3: Maricopa EF adjustment curve for the year of 2008. Event sample size was 13. Error bars represent one standard deviation.

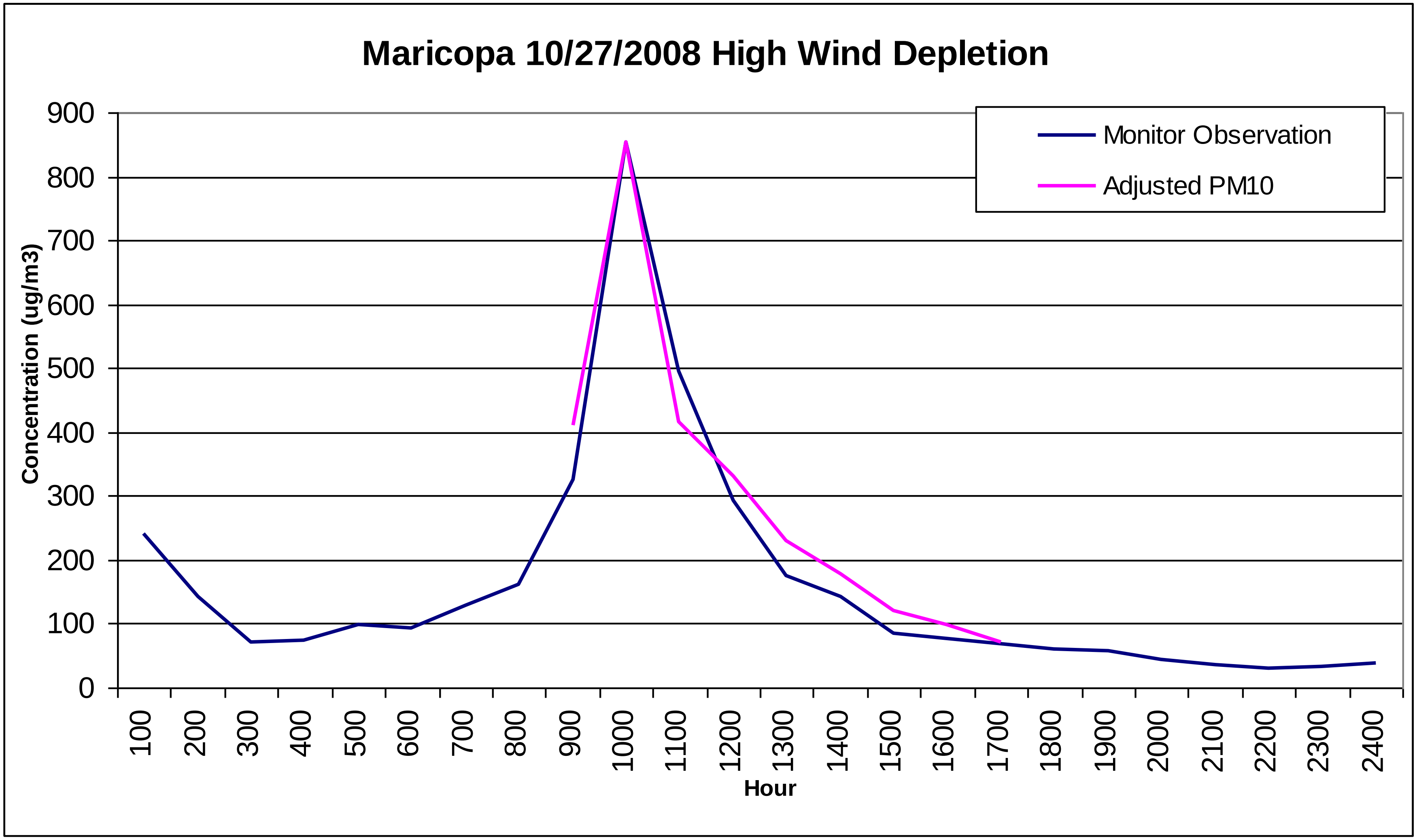

Figure 4: Maricopa adjustment curve (pink) for the year of 2008 normalized to the peak concentration for the 4/27/2008 design day. Monitor observed concentrations are shown in blue for curve comparison.

PCH EF Adjustment Curve

Table 4: Maricopa high wind event day distributions. Columns represent separate events. All events were normalized so that event peak monitor measured concentrations occurred at a PRT=0.

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Avg	S.D.
-6											19%								19%	
-5		17%									19%					22%			19%	3%
-4		14%		23%							33%					49%			30%	15%
-3		13%		15%						8%	17%					39%			18%	12%
-2	77%	6%		38%						15%	34%	22%				38%		59%	36%	23%
-1	81%	4%		69%	70%	55%	80%		66%	6%	21%	36%	35%	64%		72%	62%	81%	54%	26%
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%
1	70%	13%	58%	67%	36%	40%	65%	48%	53%	11%	8%	76%	19%	66%	70%	61%	89%	62%	51%	24%
2	83%	12%	16%	55%	10%	33%	37%	39%	20%		20%	52%	3%	5%	10%	42%	46%	39%	31%	22%
3	28%		0%	35%	9%	50%	38%	19%	14%		17%	63%		2%	8%	51%	23%	27%	26%	19%
4	35%		31%		8%	40%		14%			11%	96%		2%	7%	24%	49%	33%	29%	26%
5	25%		45%		6%	71%		13%			8%	25%					36%	32%	29%	20%
6	6%		51%			43%		10%				21%					27%		26%	18%
7	4%											11%					16%		10%	6%
8	5%											17%							11%	8%
9	6%											13%							10%	5%
10	6%											10%							8%	3%
11	3%											10%							6%	5%
12	12%											11%							12%	1%
13	3%											12%							7%	7%
14	3%																		3%	
15	3%																		3%	
16	2%																		2%	
17	1%																		1%	
18	3%																		3%	
19	5%																		5%	
20	4%																		4%	
21	4%																		4%	
22	6%																		6%	
23	11%																		11%	
24	13%																		13%	

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Avg	S.D.
25	16%																		16%	
26	11%																		11%	
27	5%																		5%	
28	3%																		3%	
29	3%																		3%	
30	45%																		45%	
31	3%																		3%	

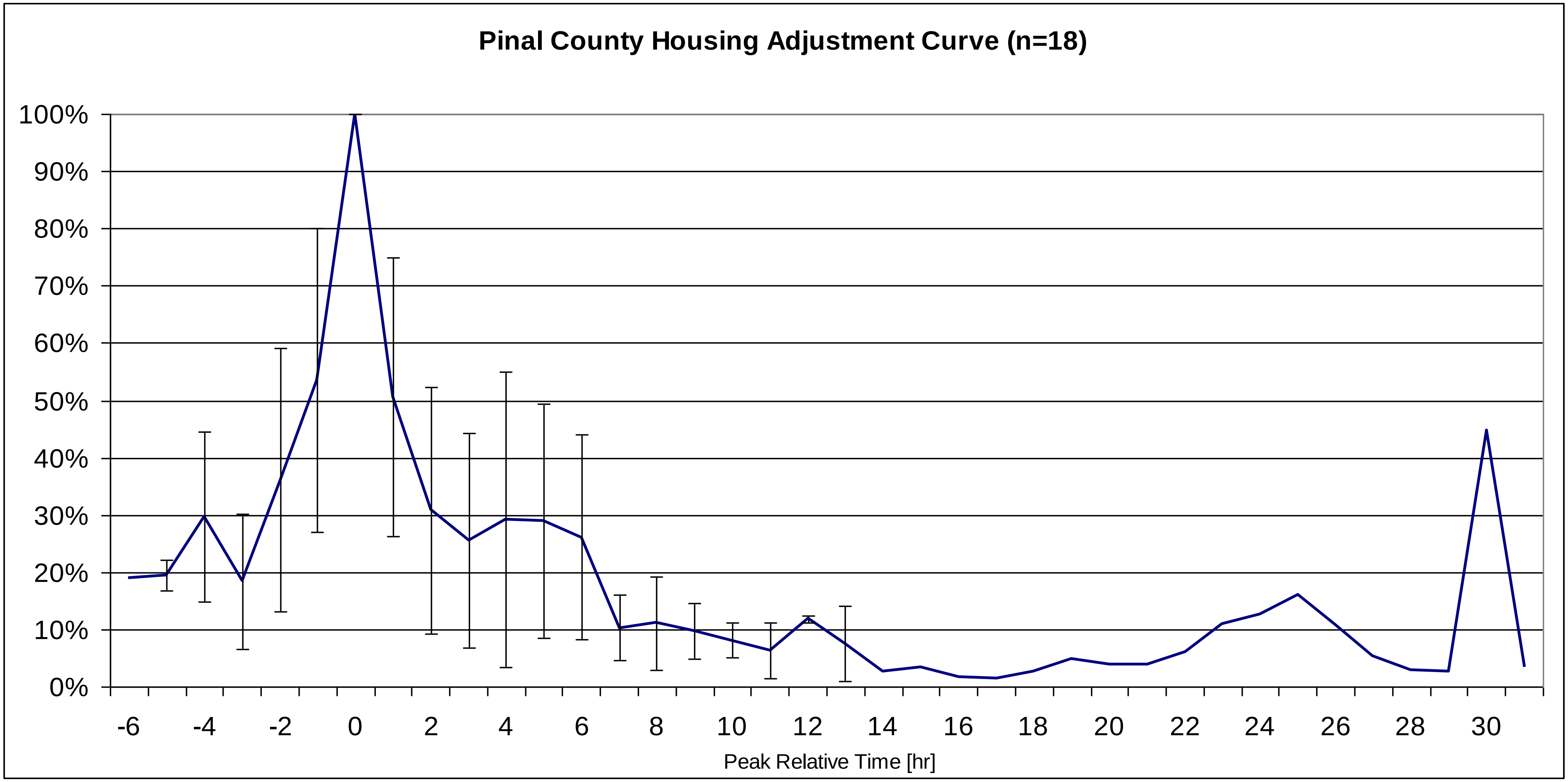

Figure 5: Pinal County Housing EF adjustment curve for the year of 2008. Event sample size was 18. Error bars represent one standard deviation.

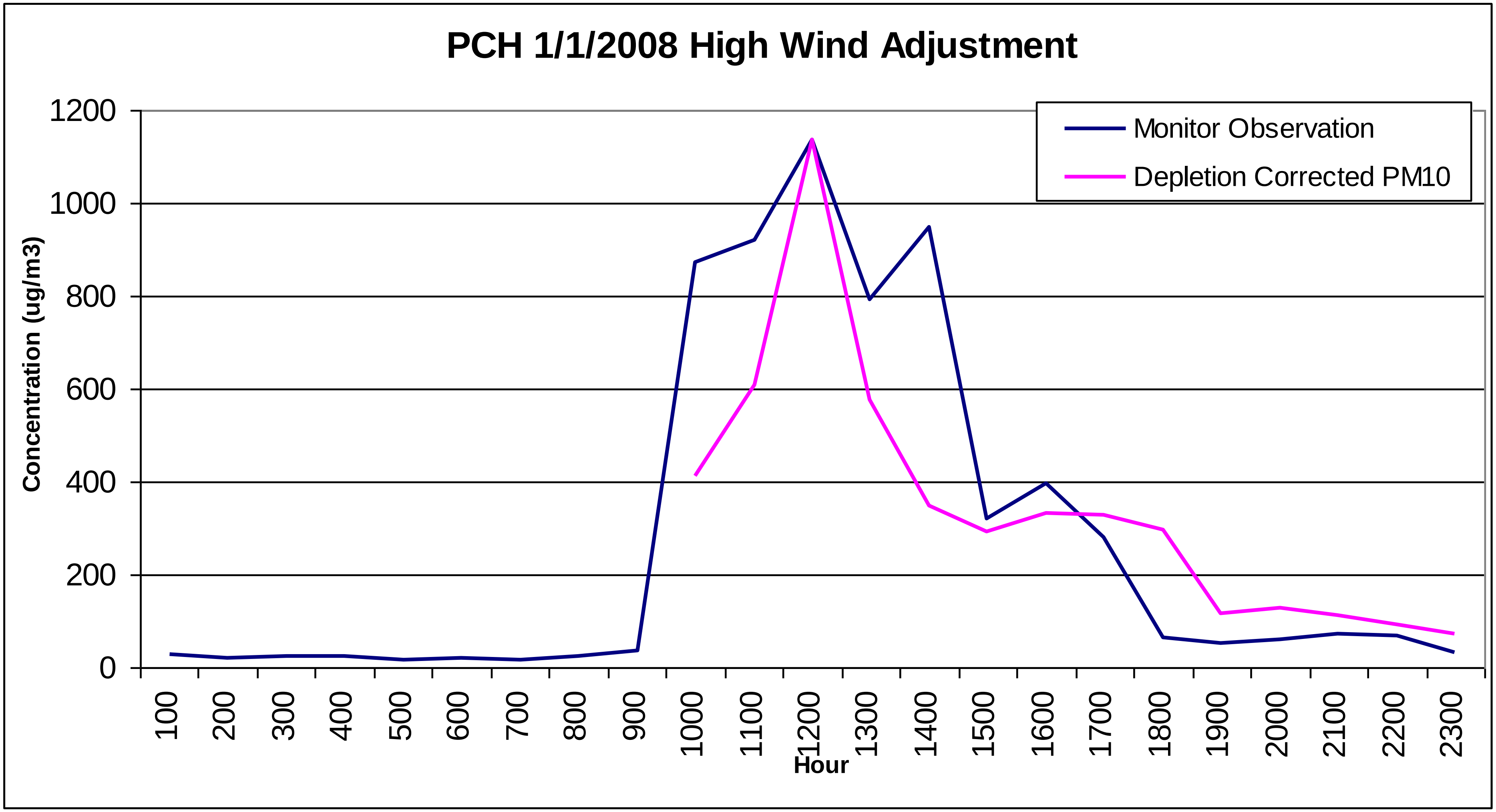

Figure 6: Pinal County Housing EF adjustment curve (pink) for the year of 2008 normalized to the peak concentration for the 4/27/2008 design day. Monitor observed concentrations are shown in blue for curve comparison.

Stanfield EF Adjustment Curve

Table 5: Maricopa high wind event day distributions. Columns represent separate vents. All events were normalized so that event peak monitor measured concentrations occurred at a PRT=0.

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	Average	Std Dev
-10					9%									9%	
-9					10%									10%	
-8					13%									13%	
-7					6%									6%	
-6					16%									16%	
-5			5%		17%			36%						19%	16%
-4		33%	5%		23%			39%	45%					29%	16%
-3		24%	7%		39%			55%	54%					36%	20%
-2		18%	50%		29%			78%	70%				61%	51%	24%
-1	37%	22%	13%	40%	21%	60%		72%	66%		30%	76%	56%	45%	22%
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%
1	43%	29%	26%	29%		47%	88%	22%	24%	76%	96%	44%	73%	50%	27%
2	11%	8%	3%	11%		22%	37%	68%	16%	79%	76%	15%	57%	34%	29%
3	5%	10%		3%		14%	9%	60%	35%	35%	35%	10%	32%	23%	18%
4	5%						22%	44%	34%	21%	19%	6%	16%	21%	13%
5	2%						24%	34%	14%	8%		5%	11%	14%	11%
6	2%						38%	34%	7%	14%		3%	11%	16%	14%
7	5%							31%		9%				15%	14%
8	20%							25%		11%				19%	7%
9	3%							25%		10%				13%	11%
10	2%													2%	
11	2%													2%	
12	1%													1%	
13	1%													1%	
14	1%													1%	
15	1%													1%	
16	1%													1%	
17	1%													1%	
18	1%													1%	
19	1%													1%	

PRT	1	2	3	4	5	6	7	8	9	10	11	12	13	Average	Std Dev
20	1%													1%	
21	4%													4%	
22	17%													17%	
23	9%													9%	
24	5%													5%	
25	3%													3%	
26	2%													2%	
27	2%													2%	
28	2%													2%	
29	1%													1%	
30	1%													1%	

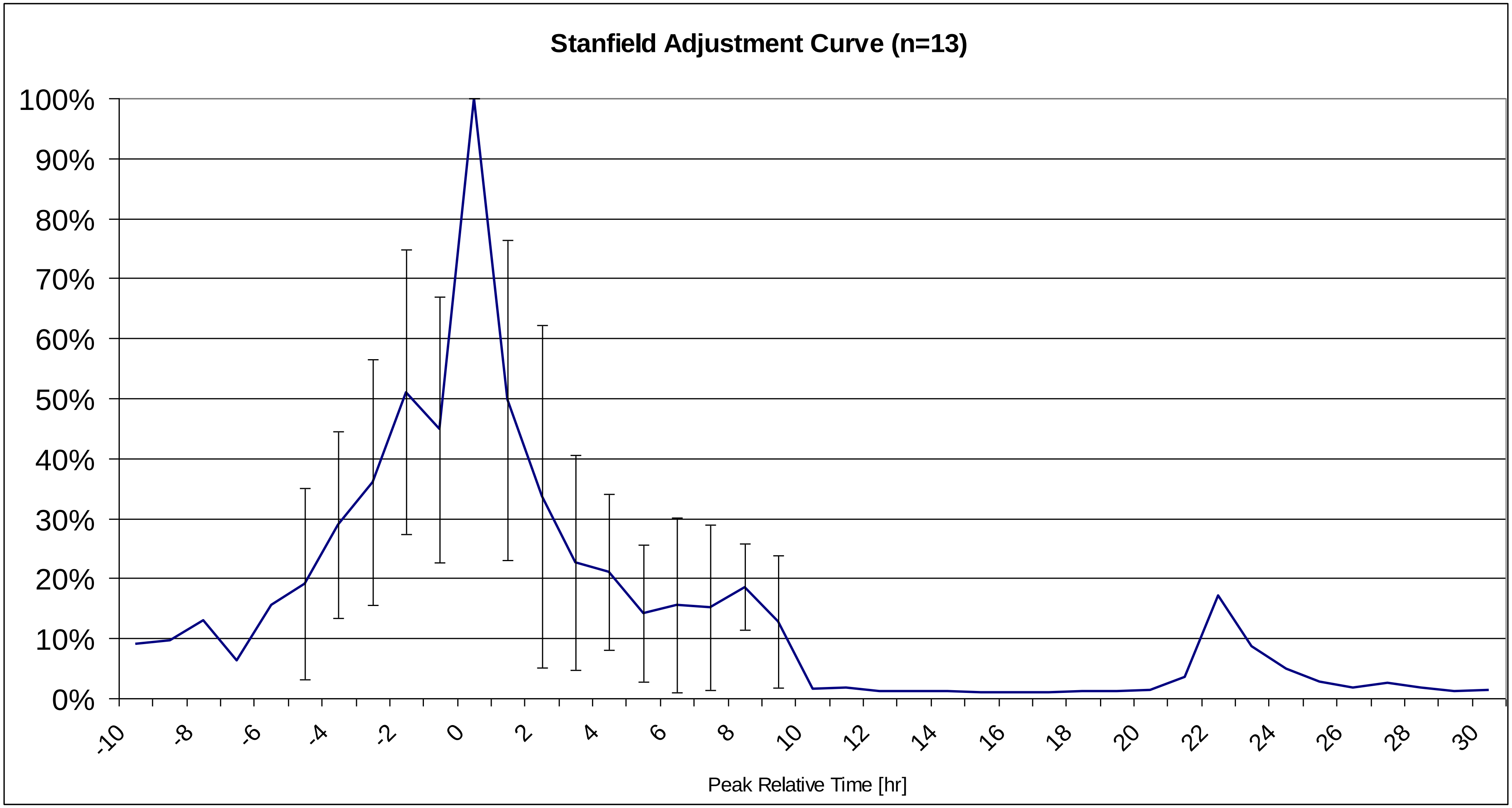

Figure 7: Stanfield EF adjustment curve for the year of 2008. Event sample size was 13. Error bars represent one standard deviation.

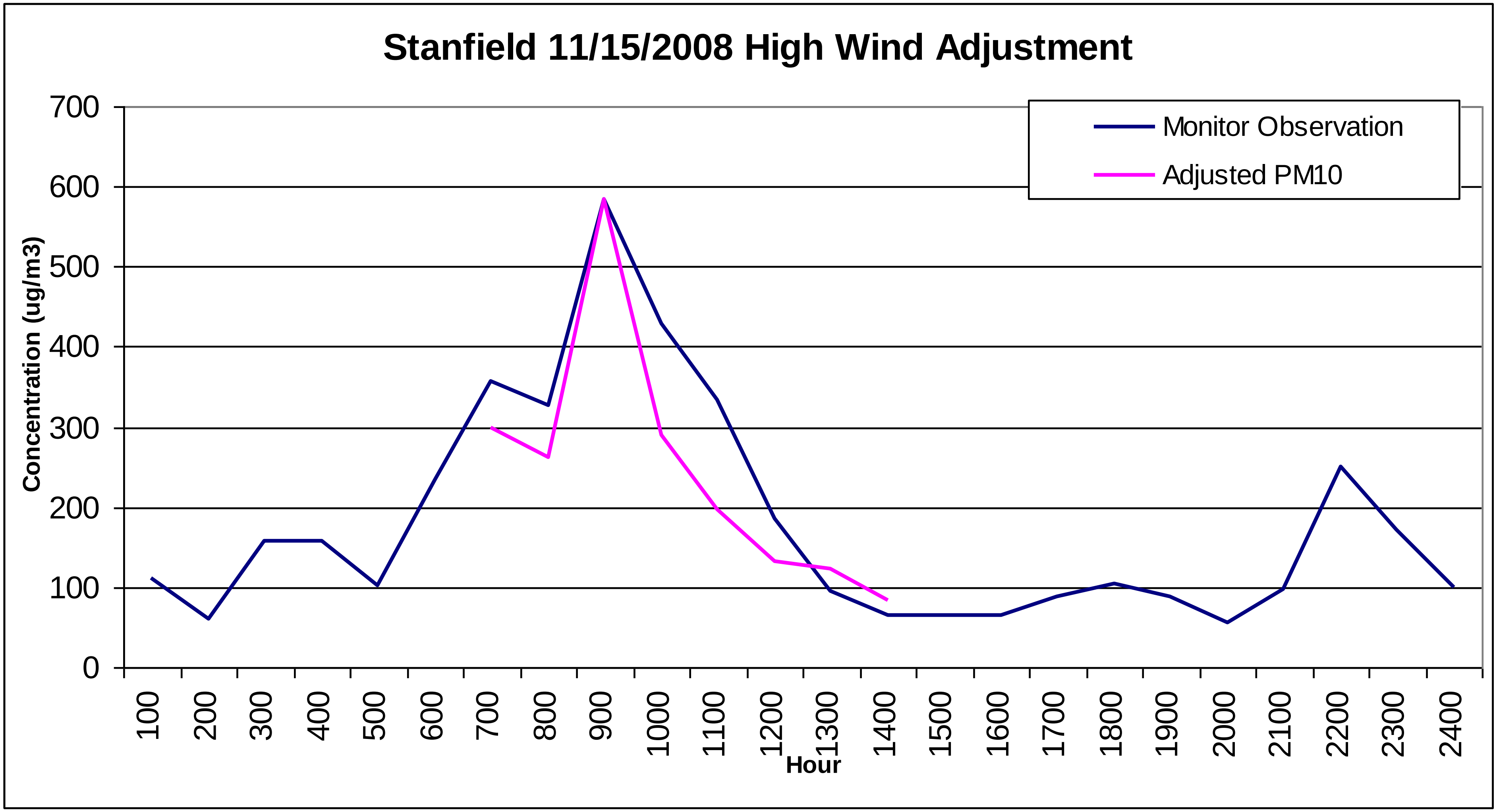

Figure 8: Stanfield EF adjustment curve (pink) for the year of 2008 normalized to the peak concentration for the 4/27/2008 design day. Monitor observed concentrations are shown in blue for curve comparison.

EF Adjustment Curve Comparison

EF adjustment curves for the four monitors are presented in tabular (Table 6) and graphical (Figure 9) form in this section for comparison of how local conditions alter the adjustment curves throughout the nonattainment area. Future modeling would apply these curves to all land use emission factors for high wind events at a particular monitor by assuming peak monitor concentrations occur at PRT = 0 and applying emission factors which are multiplied by the percentages listed below for each previous and subsequent hour prior to modeling individual hours of the day.

Table 6: This table shows the EF adjustment curves for each of the monitoring locations. The EF adjustment curves exhibited are truncated to those hours for each monitor for which standard deviations could be calculated.

PRT	Stanfield	PCH	Maricopa	Cowtown
-6			8%	
-5	19%	19%	31%	
-4	29%	30%	30%	40%
-3	36%	18%	46%	55%
-2	51%	36%	36%	51%
-1	45%	54%	48%	47%
0	100%	100%	100%	100%
1	50%	51%	49%	45%
2	34%	31%	39%	33%
3	23%	26%	27%	42%
4	21%	29%	21%	32%
5	14%	29%	14%	29%
6	16%	26%	12%	26%
7	15%	10%	8%	32%
8	19%	11%	7%	33%
9	13%	10%	5%	20%
10		8%	5%	7%
11		6%		7%
12		12%		12%
13		7%		8%
14				10%

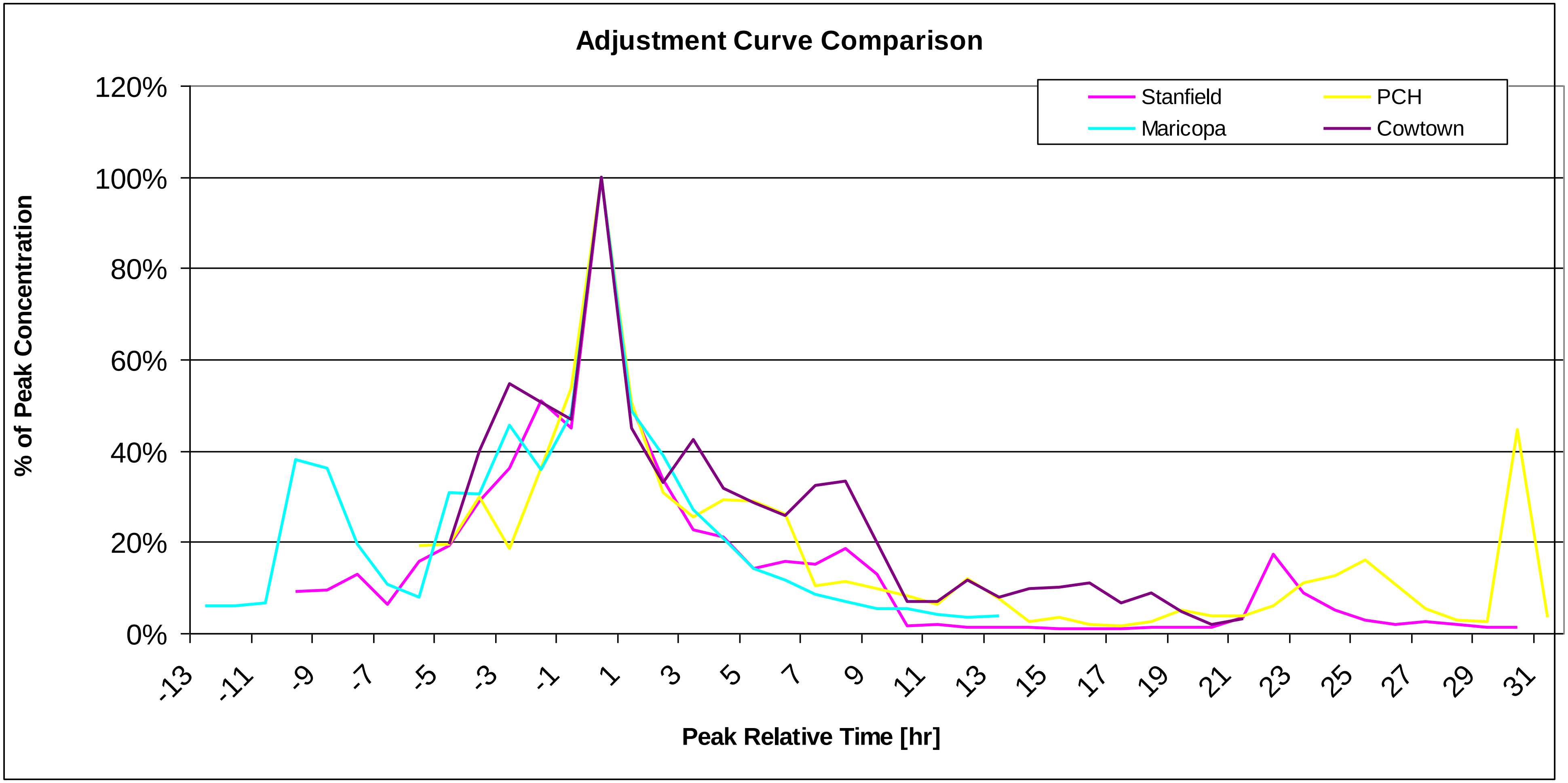

Figure 9: Site specific adjustment curve comparison for 4 monitors within the Pinal County nonattainment area.

PCH Test

Examination of Figures 2, 4, 6, and 8 revealed that the EF adjustment curve for Maricopa matched the design day concentration curve very well and Cowtown and Stanfield EF adjustment curves matched design day concentration curves well, while the Pinal County Housing EF adjustment curve failed to account for the multiple PM_{10} concentration spikes seen on the design day. Therefore, PCH can be considered a worse case scenario when applying the EF adjustment curve. With this information in mind, ADEQ decided to take AERMOD modeling results for the PCH design day and apply the EF adjustment curve to the modeling results to determine if the modeling accuracy would improve with the application of these hourly adjustments.

Previous AERMOD modeling of the PCH design day tested two sets of EFs (MAG EFs and Back Calculation EFs). This testing showed that the MAG EFs calculated PM_{10} concentrations better in the early high wind hours of the design day, while failing to do so in later high wind hours when monitor measured concentrations decreased despite sustained high winds. The Back Calculation EFs overestimated PM_{10} concentrations during early high wind hours of the design day, but better estimated the later high wind hours when monitor measured concentrations decreased.

While the intent is to apply the EF adjustment curve to EFs prior to modeling, below ADEQ provides the results of a quick test of the PCH adjustment curve application to the MAG PM_{10} concentrations output from the AERMOD model. In this exercise the EF adjustment curve was applied by examining the monitor PM_{10} concentrations and determining the PM_{10} peak concentration hour, 12:00. This was assumed to be equal to a Peak Relative Time (PRT) of zero. The EF adjustment curve was then applied on an hour by hour basis so that the MAG PM_{10} hourly AERMOD concentrations were multiplied by the corresponding adjustment curve %. The equation used is given below:

$$PM_{MAG\text{-}adj} = PM_{MAG} * (D/100)$$

where $PM_{MAG\text{-}adj}$ is the adjustment curve corrected MAG AERMOD concentration for an individual hour [$\mu g/m^3$], PM_{MAG} is the MAG AERMOD concentration for the same hour, and D is the adjustment curve value [%] for the PRT which corresponds to the same hour.

The monitor observed PM_{10} concentrations (PM_{obs}) and results for the PCH design day AERMOD run using the Back Calculation EFs ($PM_{BackCalc}$), the MAG EFs (PM_{MAG}), and EF adjustment curve correcting the MAG AERMOD results ($PM_{MAG\text{-}adj}$) are presented in Table 7 and in Figure 10. The average absolute modeling bias for the back calculation, MAG, and MAG adjusted AERMOD results were 271%, 587%, and 53% showing the drastic improvement that the application of the EF adjustment curve can have for the MAG EFs. However, it is seen that the $PM_{MAG\text{-}adj}$ have fairly consistently under predicted early high wind PM_{10} concentrations. This problem should easily be addressed during design day model calibration. The PCH design day is unique in that there are 3 distinct spikes in monitor observed PM_{10} concentrations at 12:00, 14:00, and 16:00. The 12:00 and 16:00 peaks are captured by the PCH adjustment curve, but the 14:00 is not. While this may be a small concern for the PCH design day, Maricopa, Cowtown, and

Stanfield exhibited much better agreement between the monitor observed concentration curve and the adjustment curve; therefore, this is believed to be a problem unique to the PCH design day.

Table 7: Pinal County Housing (1/1/2008) AERMOD modeling and EF adjustment results and the calculated biases for each hour of high wind (>12 mph) activity.

		PM_{10} Concentrations [μg/m^3]				Modeling Bias [%]		
Hour	Adjustment Curve	PM_{obs}	$PM_{BackCalc}$	PM_{MAG}	$PM_{MAG-adj}$	$PM_{BackCalc}$	PM_{MAG}	$PM_{MAG-adj}$
10:00	36%	871	946	648	234	8.6%	-25.6%	-73.1%
11:00	54%	919	2182	1112	596	137.4%	21.0%	-35.2%
12:00	100%	1136	1867	951	951	64.3%	-16.3%	-16.3%
13:00	51%	791	1986	1012	512	151.1%	27.9%	-35.3%
14:00	31%	946	2049	1044	321	116.6%	10.4%	-66.0%
15:00	26%	320	2445	575	147	664.1%	79.7%	-54.0%
16:00	29%	398	138	1072	314	-65.3%	169.3%	-21.2%
17:00	29%	282	211	666	193	-25.2%	136.2%	-31.7%
18:00	26%	66	409	864	226	519.7%	1209.1%	242.1%
19:00	10%	51	395	826	85	674.5%	1519.6%	66.9%
20:00	11%	62	222	676	76	258.1%	990.3%	21.8%
21:00	10%	71	221	682	66	211.3%	860.6%	-6.8%
22:00	8%	68	223	685	55	227.9%	907.4%	-18.6%
23:00	6%	33	253	772	49	666.7%	2239.4%	48.3%
					Average	**270.8%**	**586.6%**	**52.7%**

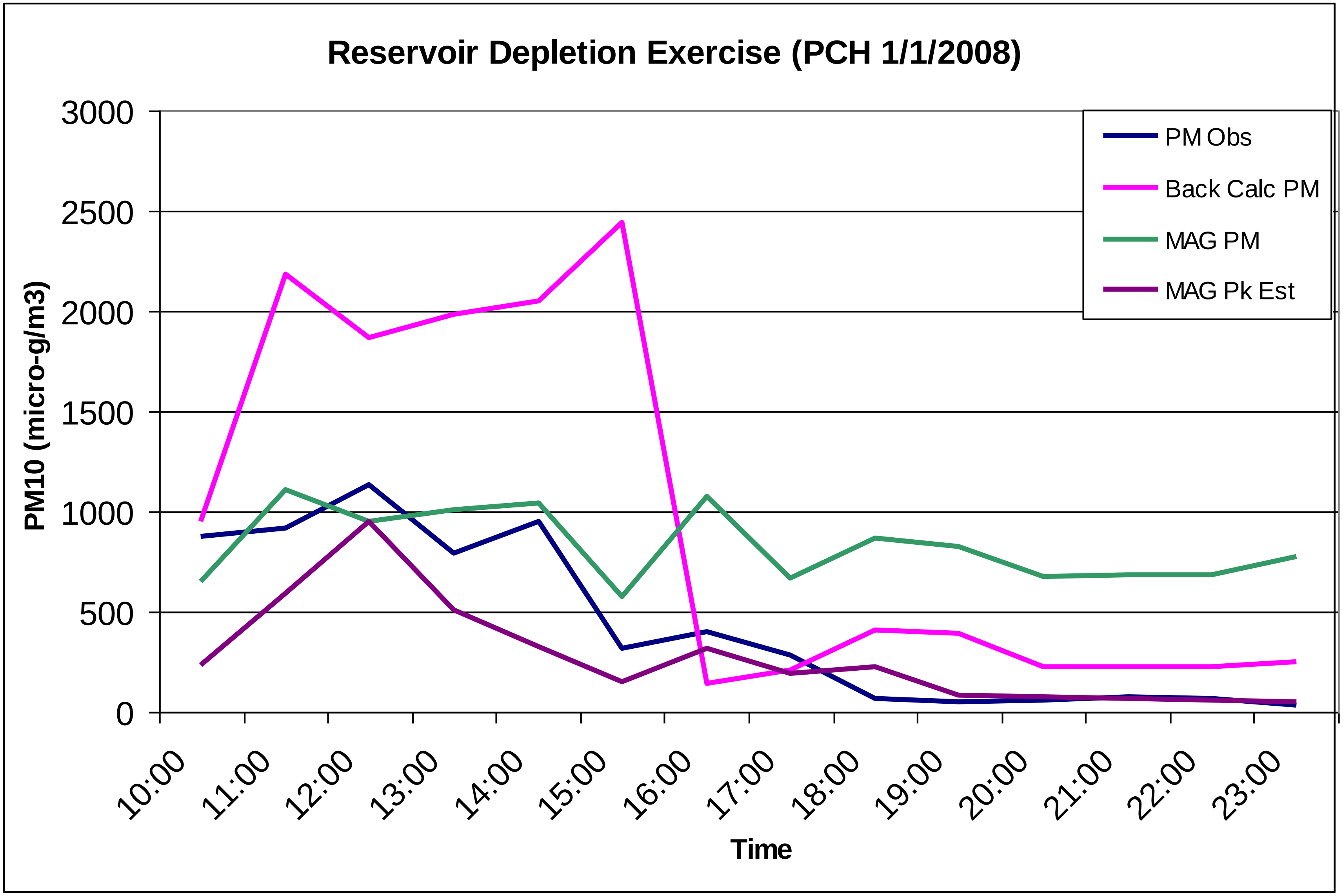

Figure 10: Modeled PM_{10} concentrations [$\mu g/m^3$] for the Back Calculation EFs (Back Calc PM), MAG EFs (MAG PM), and EF adjustment curve corrected MAG results (MAG Pk Est) as compared to monitor measured concentrations (PM Obs).

Appendix 8

NONROAD Input Files

```
Written by Nonroad interface at 7/23/2013 5:15:01 PM
This is the options file for the NONROAD program.
The data is sperated into "packets" bases on common
information.  Each packet is specified by an
identifier and a terminator. Any notes or descriptions
can be placed between the data packets.

9/2005 epa: Add growth & tech years to PERIOD packet
  and Counties & Retrofit files to RUNFILES packet.

------------------------------------------------------

                  PERIOD PACKET

This is the packet that defines the period for
which emissions are to be estimated.  The order of the
records matter.  The selection of certain parameters
will cause some of the record that follow to be ignored.
The order of the records is as follows:

1  - Char 10  - Period type for this simulation.
                  Valid responses are: ANNUAL, SEASONAL, and MONTHLY
2  - Char 10  - Type of inventory produced.
                  Valid responses are: TYPICAL DAY and PERIOD TOTAL
3  - Integer  - year of episode (4 digit year)
4  - Char 10  - Month of episode (use complete name of month)
5  - Char 10  - Type of day
                  Valid responses are: WEEKDAY and WEEKEND
------------------------------------------------------
/PERIOD/
Period type        : Monthly
Summation type     : Period total
Year of episode    : 2008
Season of year     :
Month of year      : January
Weekday or weekend : Weekday
Year of growth calc:
Year of tech sel   :
/END/

------------------------------------------------------

                  OPTIONS PACKET

This is the packet that defines some of the user
options that drive the model.  Most parameters are
used to make episode specific emission factor
adjustments. The order of the records is fixed.
The order is as follows.

1  -  Char 80  - First title on reports
2  -  Char 80  - Second title on reports
3  -  Real 10  - Fuel RVP of gasoline for this simulation
4  -  Real 10  - Oxygen weight percent of gasoline for simulation
5  -  Real 10  - Percent sulfur for gasoline
6  -  Real 10  - Percent sulfur for diesel
7  -  Real 10  - Percent sulfur for LPG/CNG
8  -  Real 10  - Minimum daily temperature (deg. F)
9  -  Real 10  - maximum daily temperature (deg. F)
10 -  Real 10  - Representative average daily temperature (deg. F)
11 -  Char 10  - Flag to determine if region is high altitude
                      Valid responses are: HIGH and LOW
12 -  Char 10  - Flag to determine if RFG adjustments are made
```

```
                      Valid responses are: YES and NO
------------------------------------------------------
/OPTIONS/
Title 1            : PINAL COUNTY, AZ
Title 2            : JANUARY 2008
Fuel RVP for gas   : 8.8
Oxygen Weight %    : 3.5
Gas sulfur %       : 0.0015
Diesel sulfur %    : 0.0006
Marine Dsl sulfur %: 0.0006
CNG/LPG sulfur %   : 0.003
Minimum temper. (F): 42
Maximum temper. (F): 67
Average temper. (F): 55
Altitude of region : LOW
EtOH Blend % Mkt   : 100
EtOH Vol %         : 10
/END/

------------------------------------------------------
                  REGION PACKET

This is the packet that defines the region for which
emissions are to be estimated.

The first record tells the type of region and
allocation to perform.

Valid responses are:
US TOTAL    -  emissions are for entire USA without state
               breakout.

50STATE     -  emissions are for all 50 states
               and Washington D.C., by state.

STATE       -  emissions are for a select group of states
               and are state-level estimates

COUNTY      -  emissions are for a select group of counties
               and are county level estimates.  If necessary,
               allocation from state to county will be performed.

SUBCOUNTY   -  emissions are for the specified sub counties
               and are subcounty level estimates.  If necessary,
               county to subcounty allocation will be performed.

The remaining records define the regions to be included.
The type of data which must be specified depends on the
region level.

US TOTAL    -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

50STATE     -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

STATE       -  state FIPS codes

COUNTY      -  state or county FIPS codes.  State FIPS
               code means include all counties in the
               state.

SUBCOUNTY   -  county FIPS code and subregion code.
```

```
------------------------------------------------------
/REGION/
Region Level       : COUNTY
Pinal County AZ    : 04021
/END/

or use -
Region Level       : STATE
Michigan           : 26000
------------------------------------------------------

                  SOURCE CATEGORY PACKET

This packet is used to tell the model which source
categories are to be processed.  It is optional.
If used, only those source categories list will
appear in the output data file.  If the packet is
not found, the model will process all source
categories in the population files.
------------------------------------------------------


Diesel Only -
                   :2270000000
                   :2282020000
                   :2285002015
Spark Ignition Only -
                   :2260000000
                   :2265000000
                   :2267000000
                   :2268000000
                   :2282005010
                   :2282005015
                   :2282010005
                   :2285004015
                   :2285006015
------------------------------------------------------
 This is the packet that lists the names of output files
 and some of the input data files read by the model.  If
 a drive:\path\ is not given, the location of the
 NONROAD.EXE file itself is assumed.  You will probably
 want to change the names of the Output and Message files
 to match that of the OPTion file, e.g., MICH-97.OPT,
 MICH-97.OUT, MICH-97.MSG, and if used MICH-97.AMS.
------------------------------------------------------
/RUNFILES/
ALLOC XREF         : data\allocate\allocate.xrf
ACTIVITY           : data\activity\activity.dat
EXH TECHNOLOGY     : data\tech\tech-exh.dat
EVP TECHNOLOGY     : data\tech\tech-evp.dat
SEASONALITY        : data\season\season.dat
REGIONS            : data\season\season.dat
MESSAGE            : c:\nonroad\outputs\p08_jan.msg
OUTPUT DATA        : c:\nonroad\outputs\p08_jan.out
EPS2 AMS           :
US COUNTIES FIPS   : c:\nonroad\data\allocate\fips.dat
RETROFIT           :
/END/

------------------------------------------------------
This is the packet that defines the equipment population
files read by the model.
------------------------------------------------------
```

```
/POP FILES/
Population File    : c:\nonroad\data\pop\az.pop
/END/

POPULATION FILE    : c:\nonroad\data\POP\MI.POP


-------------------------------------------------------
This is the packet that defines the growth files
files read by the model.
-------------------------------------------------------
/GROWTH FILES/
National defaults  : data\growth\nation.grw
/END/


/ALLOC FILES/
Air trans. empl.   :c:\nonroad\data\allocate\az_airtr.alo
Undergrnd coal prod:c:\nonroad\data\allocate\az_coal.alo
Construction cost  :c:\nonroad\data\allocate\az_const.alo
Harvested acres    :c:\nonroad\data\allocate\az_farms.alo
Golf course estab. :c:\nonroad\data\allocate\az_golf.alo
Wholesale estab.   :c:\nonroad\data\allocate\az_holsl.alo
Family housing     :c:\nonroad\data\allocate\az_house.alo
Logging employees  :c:\nonroad\data\allocate\az_loggn.alo
Landscaping empl.  :c:\nonroad\data\allocate\az_lscap.alo
Manufacturing empl.:c:\nonroad\data\allocate\az_mnfg.alo
Oil & gas employees:c:\nonroad\data\allocate\az_oil.alo
Census population  :c:\nonroad\data\allocate\az_pop.alo
Allocation File    :c:\nonroad\data\allocate\az_rail.alo
RV Park establish. :c:\nonroad\data\allocate\az_rvprk.alo
Snowblowers comm.  :c:\nonroad\data\allocate\az_sbc.alo
Snowblowers res.   :c:\nonroad\data\allocate\az_sbr.alo
Snowmobiles        :c:\nonroad\data\allocate\az_snowm.alo
Rec marine inboard :c:\nonroad\data\allocate\az_wib.alo
Rec marine outboard:c:\nonroad\data\allocate\az_wob.alo
/END/
-------------------------------------------------------
This is the packet that defines the emssions factors
files read by the model.
-------------------------------------------------------
/EMFAC FILES/
THC exhaust        : data\emsfac\exhthc.emf
CO exhaust         : data\emsfac\exhco.emf
NOX exhaust        : data\emsfac\exhnox.emf
PM exhaust         : data\emsfac\exhpm.emf
BSFC               : data\emsfac\bsfc.emf
Crankcase          : data\emsfac\crank.emf
Spillage           : data\emsfac\spillage.emf
Diurnal            : data\emsfac\evdiu.emf
Tank Perm          : data\emsfac\evtank.emf
Non-RM Hose Perm   : data\emsfac\evhose.emf
RM Fill Neck Perm  : data\emsfac\evneck.emf
RM Supply/Return   : data\emsfac\evsupret.emf
RM Vent Perm       : data\emsfac\evvent.emf
Hot Soaks          : data\emsfac\evhotsk.emf
RuningLoss         : data\emsfac\evrunls.emf
/END/

-------------------------------------------------------
This is the packet that defines the deterioration factors
files read by the model.
-------------------------------------------------------
```

```
/DETERIORATE FILES/
THC exhaust         : data\detfac\exhthc.det
CO exhaust          : data\detfac\exhco.det
NOX exhaust         : data\detfac\exhnox.det
PM exhaust          : data\detfac\exhpm.det
Diurnal             : data\detfac\evdiu.det
Tank Perm           : data\detfac\evtank.det
Non-RM Hose Perm    : data\detfac\evhose.det
RM Fill Neck Perm   : data\detfac\evneck.det
RM Supply/Return    : data\detfac\evsupret.det
RM Vent Perm        : data\detfac\evvent.det
Hot Soaks           : data\detfac\evhotsk.det
RuningLoss          : data\detfac\evrunls.det
/END/

Optional Packets - Add initial slash "/" to activate

/STAGE II/
Control Factor      : 0
/END/
Enter percent control: 95 = 95% control = 0.05 x uncontrolled
Default should be zero control.

/MODELYEAR OUT/
EXHAUST BMY OUT     :
EVAP BMY OUT        :
/END/

SI REPORT/
SI report file-CSV :OUTPUTS\NRPOLLUT.CSV
/END/

/DAILY FILES/
DAILY TEMPS/RVP     :
/END/

PM Base Sulfur
 cols 1-10: dsl tech type;
 11-20: base sulfur wt%; or '1.0' means no-adjust (cert= in-use)
/PM BASE SULFUR/
T2        0.0350    0.02247
T3        0.2000    0.02247
T3B       0.0500    0.02247
T4A       0.0500    0.02247
T4B       0.0015    0.02247
T4        0.0015    0.30
T4N       0.0015    0.30
T2M       0.0350    0.02247
T3M       1.0       0.02247
T4M       1.0       0.02247
/END/
```

```
Written by Nonroad interface at 7/23/2013 3:45:00 PM
This is the options file for the NONROAD program.
The data is sperated into "packets" bases on common
information.  Each packet is specified by an
identifier and a terminator. Any notes or descriptions
can be placed between the data packets.

9/2005 epa: Add growth & tech years to PERIOD packet
  and Counties & Retrofit files to RUNFILES packet.

------------------------------------------------------

                  PERIOD PACKET

This is the packet that defines the period for
which emissions are to be estimated.  The order of the
records matter.  The selection of certain parameters
will cause some of the record that follow to be ignored.
The order of the records is as follows:

1  - Char 10  - Period type for this simulation.
                  Valid responses are: ANNUAL, SEASONAL, and MONTHLY
2  - Char 10  - Type of inventory produced.
                  Valid responses are: TYPICAL DAY and PERIOD TOTAL
3  - Integer  - year of episode (4 digit year)
4  - Char 10  - Month of episode (use complete name of month)
5  - Char 10  - Type of day
                  Valid responses are: WEEKDAY and WEEKEND
------------------------------------------------------
/PERIOD/
Period type        : Monthly
Summation type     : Period total
Year of episode    : 2008
Season of year     :
Month of year      : April
Weekday or weekend : Weekday
Year of growth calc:
Year of tech sel   :
/END/

------------------------------------------------------

                  OPTIONS PACKET

This is the packet that defines some of the user
options that drive the model.  Most parameters are
used to make episode specific emission factor
adjustments. The order of the records is fixed.
The order is as follows:

1  -  Char 80  - First title on reports
2  -  Char 80  - Second title on reports
3  -  Real 10  - Fuel RVP of gasoline for this simulation
4  -  Real 10  - Oxygen weight percent of gasoline for simulation
5  -  Real 10  - Percent sulfur for gasoline
6  -  Real 10  - Percent sulfur for diesel
7  -  Real 10  - Percent sulfur for LPG/CNG
8  -  Real 10  - Minimum daily temperature (deg. F)
9  -  Real 10  - maximum daily temperature (deg. F)
10 -  Real 10  - Representative average daily temperature (deg. F)
11 -  Char 10  - Flag to determine if region is high altitude
                      Valid responses are: HIGH and LOW
12 -  Char 10  - Flag to determine if RFG adjustments are made
```

```
                      Valid responses are: YES and NO
------------------------------------------------------
/OPTIONS/
Title 1             : PINAL COUNTY, AZ
Title 2             : APRIL 2008
Fuel RVP for gas    : 8.8
Oxygen Weight %     : 3.5
Gas sulfur %        : 0.0015
Diesel sulfur %     : 0.0006
Marine Dsl sulfur %: 0.0006
CNG/LPG sulfur %    : 0.003
Minimum temper. (F): 53
Maximum temper. (F): 86
Average temper. (F): 69
Altitude of region : LOW
EtOH Blend % Mkt    : 100
EtOH Vol %          : 10
/END/

------------------------------------------------------
                  REGION PACKET

This is the packet that defines the region for which
emissions are to be estimated.

The first record tells the type of region and
allocation to perform.

Valid responses are:
US TOTAL    -  emissions are for entire USA without state
               breakout.

50STATE     -  emissions are for all 50 states
               and Washington D.C., by state.

STATE       -  emissions are for a select group of states
               and are state-level estimates

COUNTY      -  emissions are for a select group of counties
               and are county level estimates.  If necessary,
               allocation from state to county will be performed.

SUBCOUNTY  -  emissions are for the specified sub counties
               and are subcounty level estimates.  If necessary,
               county to subcounty allocation will be performed.

The remaining records define the regions to be included.
The type of data which must be specified depends on the
region level.

US TOTAL    -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

50STATE     -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

STATE       -  state FIPS codes

COUNTY      -  state or county FIPS codes.  State FIPS
               code means include all counties in the
               state.

SUBCOUNTY  -  county FIPS code and subregion code.
```

```
-------------------------------------------------------
/REGION/
Region Level       : COUNTY
Pinal County AZ    : 04021
/END/

or use -
Region Level       : STATE
Michigan           : 26000
-------------------------------------------------------

                  SOURCE CATEGORY PACKET

This packet is used to tell the model which source
categories are to be processed.  It is optional.
If used, only those source categories list will
appear in the output data file.  If the packet is
not found, the model will process all source
categories in the population files.
-------------------------------------------------------


Diesel Only -
                   :2270000000
                   :2282020000
                   :2285002015
Spark Ignition Only -
                   :2260000000
                   :2265000000
                   :2267000000
                   :2268000000
                   :2282005010
                   :2282005015
                   :2282010005
                   :2285004015
                   :2285006015
-------------------------------------------------------
 This is the packet that lists the names of output files
 and some of the input data files read by the model.  If
 a drive:\path\ is not given, the location of the
 NONROAD.EXE file itself is assumed.  You will probably
 want to change the names of the Output and Message files
 to match that of the OPTion file, e.g., MICH-97.OPT,
 MICH-97.OUT, MICH-97.MSG, and if used MICH-97.AMS.
-------------------------------------------------------
/RUNFILES/
ALLOC XREF         : data\allocate\allocate.xrf
ACTIVITY           : data\activity\activity.dat
EXH TECHNOLOGY     : data\tech\tech-exh.dat
EVP TECHNOLOGY     : data\tech\tech-evp.dat
SEASONALITY        : data\season\season.dat
REGIONS            : data\season\season.dat
MESSAGE            : c:\nonroad\outputs\p08_apr.msg
OUTPUT DATA        : c:\nonroad\outputs\p08_apr.out
EPS2 AMS           :
US COUNTIES FIPS   : c:\nonroad\data\allocate\fips.dat
RETROFIT           :
/END/

-------------------------------------------------------
This is the packet that defines the equipment population
files read by the model.
-------------------------------------------------------
```

```
/POP FILES/
Population File    : c:\nonroad\data\pop\az.pop
/END/

POPULATION FILE    : c:\nonroad\data\POP\MI.POP


------------------------------------------------------
This is the packet that defines the growth files
files read by the model.
------------------------------------------------------
/GROWTH FILES/
National defaults  : data\growth\nation.grw
/END/


/ALLOC FILES/
Air trans. empl.   :c:\nonroad\data\allocate\az_airtr.alo
Undergrnd coal prod:c:\nonroad\data\allocate\az_coal.alo
Construction cost  :c:\nonroad\data\allocate\az_const.alo
Harvested acres    :c:\nonroad\data\allocate\az_farms.alo
Golf course estab. :c:\nonroad\data\allocate\az_golf.alo
Wholesale estab.   :c:\nonroad\data\allocate\az_holsl.alo
Family housing     :c:\nonroad\data\allocate\az_house.alo
Logging employees  :c:\nonroad\data\allocate\az_loggn.alo
Landscaping empl.  :c:\nonroad\data\allocate\az_lscap.alo
Manufacturing empl.:c:\nonroad\data\allocate\az_mnfg.alo
Oil & gas employees:c:\nonroad\data\allocate\az_oil.alo
Census population  :c:\nonroad\data\allocate\az_pop.alo
Allocation File    :c:\nonroad\data\allocate\az_rail.alo
RV Park establish. :c:\nonroad\data\allocate\az_rvprk.alo
Snowblowers comm.  :c:\nonroad\data\allocate\az_sbc.alo
Snowblowers res.   :c:\nonroad\data\allocate\az_sbr.alo
Snowmobiles        :c:\nonroad\data\allocate\az_snowm.alo
Rec marine inboard :c:\nonroad\data\allocate\az_wib.alo
Rec marine outboard:c:\nonroad\data\allocate\az_wob.alo
/END/
------------------------------------------------------
This is the packet that defines the emssions factors
files read by the model.
------------------------------------------------------
/EMFAC FILES/
THC exhaust        : data\emsfac\exhthc.emf
CO exhaust         : data\emsfac\exhco.emf
NOX exhaust        : data\emsfac\exhnox.emf
PM exhaust         : data\emsfac\exhpm.emf
BSFC               : data\emsfac\bsfc.emf
Crankcase          : data\emsfac\crank.emf
Spillage           : data\emsfac\spillage.emf
Diurnal            : data\emsfac\evdiu.emf
Tank Perm          : data\emsfac\evtank.emf
Non-RM Hose Perm   : data\emsfac\evhose.emf
RM Fill Neck Perm  : data\emsfac\evneck.emf
RM Supply/Return   : data\emsfac\evsupret.emf
RM Vent Perm       : data\emsfac\evvent.emf
Hot Soaks          : data\emsfac\evhotsk.emf
RuningLoss         : data\emsfac\evrunls.emf
/END/

------------------------------------------------------
This is the packet that defines the deterioration factors
files read by the model.
------------------------------------------------------
```

```
/DETERIORATE FILES/
THC exhaust         : data\detfac\exhthc.det
CO exhaust          : data\detfac\exhco.det
NOX exhaust         : data\detfac\exhnox.det
PM exhaust          : data\detfac\exhpm.det
Diurnal             : data\detfac\evdiu.det
Tank Perm           : data\detfac\evtank.det
Non-RM Hose Perm    : data\detfac\evhose.det
RM Fill Neck Perm   : data\detfac\evneck.det
RM Supply/Return    : data\detfac\evsupret.det
RM Vent Perm        : data\detfac\evvent.det
Hot Soaks           : data\detfac\evhotsk.det
RuningLoss          : data\detfac\evrunls.det
/END/

Optional Packets - Add initial slash "/" to activate

/STAGE II/
Control Factor      : 0
/END/
Enter percent control: 95 = 95% control = 0.05 x uncontrolled
Default should be zero control.

/MODELYEAR OUT/
EXHAUST BMY OUT     :
EVAP BMY OUT        :
/END/

SI REPORT/
SI report file-CSV :OUTPUTS\NRPOLLUT.CSV
/END/

/DAILY FILES/
DAILY TEMPS/RVP     :
/END/

PM Base Sulfur
 cols 1-10: dsl tech type;
 11-20: base sulfur wt%; or '1.0' means no-adjust (cert= in-use)
/PM BASE SULFUR/
T2        0.0350    0.02247
T3        0.2000    0.02247
T3B       0.0500    0.02247
T4A       0.0500    0.02247
T4B       0.0015    0.02247
T4        0.0015    0.30
T4N       0.0015    0.30
T2M       0.0350    0.02247
T3M       1.0       0.02247
T4M       1.0       0.02247
/END/
```

```
Written by Nonroad interface at 7/23/2013 5:04:04 PM
This is the options file for the NONROAD program.
The data is sperated into "packets" bases on common
information.  Each packet is specified by an
identifier and a terminator. Any notes or descriptions
can be placed between the data packets.

9/2005 epa: Add growth & tech years to PERIOD packet
  and Counties & Retrofit files to RUNFILES packet.

------------------------------------------------------

                  PERIOD PACKET

This is the packet that defines the period for
which emissions are to be estimated.  The order of the
records matter.  The selection of certain parameters
will cause some of the record that follow to be ignored.
The order of the records is as follows:

1  - Char 10  - Period type for this simulation.
                  Valid responses are: ANNUAL, SEASONAL, and MONTHLY
2  - Char 10  - Type of inventory produced.
                  Valid responses are: TYPICAL DAY and PERIOD TOTAL
3  - Integer  - year of episode (4 digit year)
4  - Char 10  - Month of episode (use complete name of month)
5  - Char 10  - Type of day
                  Valid responses are: WEEKDAY and WEEKEND
------------------------------------------------------
/PERIOD/
Period type        : Monthly
Summation type     : Period total
Year of episode    : 2008
Season of year     :
Month of year      : October
Weekday or weekend : Weekday
Year of growth calc:
Year of tech sel   :
/END/

------------------------------------------------------

                  OPTIONS PACKET

This is the packet that defines some of the user
options that drive the model.  Most parameters are
used to make episode specific emission factor
adjustments. The order of the records is fixed.
The order is as follows:

1  -  Char 80  - First title on reports
2  -  Char 80  - Second title on reports
3  -  Real 10  - Fuel RVP of gasoline for this simulation
4  -  Real 10  - Oxygen weight percent of gasoline for simulation
5  -  Real 10  - Percent sulfur for gasoline
6  -  Real 10  - Percent sulfur for diesel
7  -  Real 10  - Percent sulfur for LPG/CNG
8  -  Real 10  - Minimum daily temperature (deg. F)
9  -  Real 10  - maximum daily temperature (deg. F)
10 -  Real 10  - Representative average daily temperature (deg. F)
11 -  Char 10  - Flag to determine if region is high altitude
                      Valid responses are: HIGH and LOW
12 -  Char 10  - Flag to determine if RFG adjustments are made
```

Valid responses are: YES and NO

```
-------------------------------------------------------
/OPTIONS/
Title 1            : PINAL COUNTY, AZ
Title 2            : OCTOBER 2008
Fuel RVP for gas   : 8.8
Oxygen Weight %    : 3.5
Gas sulfur %       : 0.0015
Diesel sulfur %    : 0.0006
Marine Dsl sulfur %: 0.0006
CNG/LPG sulfur %   : 0.003
Minimum temper. (F): 59
Maximum temper. (F): 88
Average temper. (F): 73
Altitude of region : LOW
EtOH Blend % Mkt   : 100
EtOH Vol %         : 10
/END/

-------------------------------------------------------
                  REGION PACKET

This is the packet that defines the region for which
emissions are to be estimated.

The first record tells the type of region and
allocation to perform.

Valid responses are:
US TOTAL   -  emissions are for entire USA without state
              breakout.

50STATE    -  emissions are for all 50 states
              and Washington D.C., by state.

STATE      -  emissions are for a select group of states
              and are state-level estimates

COUNTY     -  emissions are for a select group of counties
              and are county level estimates.  If necessary,
              allocation from state to county will be performed.

SUBCOUNTY  -  emissions are for the specified sub counties
              and are subcounty level estimates.  If necessary,
              county to subcounty allocation will be performed.

The remaining records define the regions to be included.
The type of data which must be specified depends on the
region level.

US TOTAL   -  Nothing needs to be specified.  The FIPS
              code 00000 is used automatically.

50STATE    -  Nothing needs to be specified.  The FIPS
              code 00000 is used automatically.

STATE      -  state FIPS codes

COUNTY     -  state or county FIPS codes.  State FIPS
              code means include all counties in the
              state.

SUBCOUNTY  -  county FIPS code and subregion code.
```

```
-------------------------------------------------------
/REGION/
Region Level       : COUNTY
Pinal County AZ    : 04021
/END/

or use -
Region Level       : STATE
Michigan           : 26000
-------------------------------------------------------

                  SOURCE CATEGORY PACKET

This packet is used to tell the model which source
categories are to be processed.  It is optional.
If used, only those source categories list will
appear in the output data file.  If the packet is
not found, the model will process all source
categories in the population files.
-------------------------------------------------------


Diesel Only -
                   :2270000000
                   :2282020000
                   :2285002015
Spark Ignition Only -
                   :2260000000
                   :2265000000
                   :2267000000
                   :2268000000
                   :2282005010
                   :2282005015
                   :2282010005
                   :2285004015
                   :2285006015
-------------------------------------------------------
 This is the packet that lists the names of output files
 and some of the input data files read by the model.  If
 a drive:\path\ is not given, the location of the
 NONROAD.EXE file itself is assumed.  You will probably
 want to change the names of the Output and Message files
 to match that of the OPTion file, e.g., MICH-97.OPT,
 MICH-97.OUT, MICH-97.MSG, and if used MICH-97.AMS.
-------------------------------------------------------
/RUNFILES/
ALLOC XREF         : data\allocate\allocate.xrf
ACTIVITY           : data\activity\activity.dat
EXH TECHNOLOGY     : data\tech\tech-exh.dat
EVP TECHNOLOGY     : data\tech\tech-evp.dat
SEASONALITY        : data\season\season.dat
REGIONS            : data\season\season.dat
MESSAGE            : c:\nonroad\outputs\p08_oct.msg
OUTPUT DATA        : c:\nonroad\outputs\p08_oct.out
EPS2 AMS           :
US COUNTIES FIPS   : c:\nonroad\data\allocate\fips.dat
RETROFIT           :
/END/

-------------------------------------------------------
This is the packet that defines the equipment population
files read by the model.
-------------------------------------------------------
```

```
/POP FILES/
Population File    :c:\nonroad\data\pop\az.pop
/END/

POPULATION FILE    : c:\nonroad\data\POP\MI.POP


------------------------------------------------------
This is the packet that defines the growth files
files read by the model.
------------------------------------------------------
/GROWTH FILES/
National defaults  : data\growth\nation.grw
/END/


/ALLOC FILES/
Air trans. empl.   :c:\nonroad\data\allocate\az_airtr.alo
Undergrnd coal prod:c:\nonroad\data\allocate\az_coal.alo
Construction cost  :c:\nonroad\data\allocate\az_const.alo
Harvested acres    :c:\nonroad\data\allocate\az_farms.alo
Golf course estab. :c:\nonroad\data\allocate\az_golf.alo
Wholesale estab.   :c:\nonroad\data\allocate\az_holsl.alo
Family housing     :c:\nonroad\data\allocate\az_house.alo
Logging employees  :c:\nonroad\data\allocate\az_loggn.alo
Landscaping empl.  :c:\nonroad\data\allocate\az_lscap.alo
Manufacturing empl.:c:\nonroad\data\allocate\az_mnfg.alo
Oil & gas employees:c:\nonroad\data\allocate\az_oil.alo
Census population  :c:\nonroad\data\allocate\az_pop.alo
Allocation File    :c:\nonroad\data\allocate\az_rail.alo
RV Park establish. :c:\nonroad\data\allocate\az_rvprk.alo
Snowblowers comm.  :c:\nonroad\data\allocate\az_sbc.alo
Snowblowers res.   :c:\nonroad\data\allocate\az_sbr.alo
Snowmobiles        :c:\nonroad\data\allocate\az_snowm.alo
Rec marine inboard :c:\nonroad\data\allocate\az_wib.alo
Rec marine outboard:c:\nonroad\data\allocate\az_wob.alo
/END/
------------------------------------------------------
This is the packet that defines the emssions factors
files read by the model.
------------------------------------------------------
/EMFAC FILES/
THC exhaust        : data\emsfac\exhthc.emf
CO exhaust         : data\emsfac\exhco.emf
NOX exhaust        : data\emsfac\exhnox.emf
PM exhaust         : data\emsfac\exhpm.emf
BSFC               : data\emsfac\bsfc.emf
Crankcase          : data\emsfac\crank.emf
Spillage           : data\emsfac\spillage.emf
Diurnal            : data\emsfac\evdiu.emf
Tank Perm          : data\emsfac\evtank.emf
Non-RM Hose Perm   : data\emsfac\evhose.emf
RM Fill Neck Perm  : data\emsfac\evneck.emf
RM Supply/Return   : data\emsfac\evsupret.emf
RM Vent Perm       : data\emsfac\evvent.emf
Hot Soaks          : data\emsfac\evhotsk.emf
RuningLoss         : data\emsfac\evrunls.emf
/END/

------------------------------------------------------
This is the packet that defines the deterioration factors
files read by the model.
------------------------------------------------------
```

```
/DETERIORATE FILES/
THC exhaust         : data\detfac\exhthc.det
CO exhaust          : data\detfac\exhco.det
NOX exhaust         : data\detfac\exhnox.det
PM exhaust          : data\detfac\exhpm.det
Diurnal             : data\detfac\evdiu.det
Tank Perm           : data\detfac\evtank.det
Non-RM Hose Perm    : data\detfac\evhose.det
RM Fill Neck Perm   : data\detfac\evneck.det
RM Supply/Return    : data\detfac\evsupret.det
RM Vent Perm        : data\detfac\evvent.det
Hot Soaks           : data\detfac\evhotsk.det
RuningLoss          : data\detfac\evrunls.det
/END/

Optional Packets - Add initial slash "/" to activate

/STAGE II/
Control Factor      : 0
/END/
Enter percent control: 95 = 95% control = 0.05 x uncontrolled
Default should be zero control.

/MODELYEAR OUT/
EXHAUST BMY OUT     :
EVAP BMY OUT        :
/END/

SI REPORT/
SI report file-CSV :OUTPUTS\NRPOLLUT.CSV
/END/

/DAILY FILES/
DAILY TEMPS/RVP     :
/END/

PM Base Sulfur
 cols 1-10: dsl tech type;
 11-20: base sulfur wt%; or '1.0' means no-adjust (cert= in-use)
/PM BASE SULFUR/
T2        0.0350    0.02247
T3        0.2000    0.02247
T3B       0.0500    0.02247
T4A       0.0500    0.02247
T4B       0.0015    0.02247
T4        0.0015    0.30
T4N       0.0015    0.30
T2M       0.0350    0.02247
T3M       1.0       0.02247
T4M       1.0       0.02247
/END/
```

```
Written by Nonroad interface at 7/23/2013 5:12:06 PM
This is the options file for the NONROAD program.
The data is sperated into "packets" bases on common
information.  Each packet is specified by an
identifier and a terminator. Any notes or descriptions
can be placed between the data packets.

9/2005 epa: Add growth & tech years to PERIOD packet
  and Counties & Retrofit files to RUNFILES packet.

-------------------------------------------------------

                  PERIOD PACKET

This is the packet that defines the period for
which emissions are to be estimated.  The order of the
records matter.  The selection of certain parameters
will cause some of the record that follow to be ignored.
The order of the records is as follows:

1  - Char 10  - Period type for this simulation.
                  Valid responses are: ANNUAL, SEASONAL, and MONTHLY
2  - Char 10  - Type of inventory produced.
                  Valid responses are: TYPICAL DAY and PERIOD TOTAL
3  - Integer  - year of episode (4 digit year)
4  - Char 10  - Month of episode (use complete name of month)
5  - Char 10  - Type of day
                  Valid responses are: WEEKDAY and WEEKEND
-------------------------------------------------------
/PERIOD/
Period type        : Monthly
Summation type     : Period total
Year of episode    : 2008
Season of year     :
Month of year      : November
Weekday or weekend : Weekday
Year of growth calc:
Year of tech sel   :
/END/

-------------------------------------------------------

                  OPTIONS PACKET

This is the packet that defines some of the user
options that drive the model.  Most parameters are
used to make episode specific emission factor
adjustments. The order of the records is fixed.
The order is as follows.

1  -  Char 80  - First title on reports
2  -  Char 80  - Second title on reports
3  -  Real 10  - Fuel RVP of gasoline for this simulation
4  -  Real 10  - Oxygen weight percent of gasoline for simulation
5  -  Real 10  - Percent sulfur for gasoline
6  -  Real 10  - Percent sulfur for diesel
7  -  Real 10  - Percent sulfur for LPG/CNG
8  -  Real 10  - Minimum daily temperature (deg. F)
9  -  Real 10  - maximum daily temperature (deg. F)
10 -  Real 10  - Representative average daily temperature (deg. F)
11 -  Char 10  - Flag to determine if region is high altitude
                      Valid responses are: HIGH and LOW
12 -  Char 10  - Flag to determine if RFG adjustments are made
```

```
                      Valid responses are: YES and NO
------------------------------------------------------
/OPTIONS/
Title 1            : PINAL COUNTY, AZ
Title 2            : NOVEMBER 2008
Fuel RVP for gas   : 8.8
Oxygen Weight %    : 3.5
Gas sulfur %       : 0.0015
Diesel sulfur %    : 0.0006
Marine Dsl sulfur %: 0.0006
CNG/LPG sulfur %   : 0.003
Minimum temper. (F): 47
Maximum temper. (F): 75
Average temper. (F): 61
Altitude of region : LOW
EtOH Blend % Mkt   : 100
EtOH Vol %         : 10
/END/

------------------------------------------------------
                  REGION PACKET

This is the packet that defines the region for which
emissions are to be estimated.

The first record tells the type of region and
allocation to perform.

Valid responses are:
US TOTAL    -  emissions are for entire USA without state
               breakout.

50STATE     -  emissions are for all 50 states
               and Washington D.C., by state.

STATE       -  emissions are for a select group of states
               and are state-level estimates

COUNTY      -  emissions are for a select group of counties
               and are county level estimates.  If necessary,
               allocation from state to county will be performed.

SUBCOUNTY  -  emissions are for the specified sub counties
               and are subcounty level estimates.  If necessary,
               county to subcounty allocation will be performed.

The remaining records define the regions to be included.
The type of data which must be specified depends on the
region level.

US TOTAL    -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

50STATE     -  Nothing needs to be specified.  The FIPS
               code 00000 is used automatically.

STATE       -  state FIPS codes

COUNTY      -  state or county FIPS codes.  State FIPS
               code means include all counties in the
               state.

SUBCOUNTY  -  county FIPS code and subregion code.
```

```
------------------------------------------------------
/REGION/
Region Level       : COUNTY
Pinal County AZ    : 04021
/END/

or use -
Region Level       : STATE
Michigan           : 26000
------------------------------------------------------

                  SOURCE CATEGORY PACKET

This packet is used to tell the model which source
categories are to be processed.  It is optional.
If used, only those source categories list will
appear in the output data file.  If the packet is
not found, the model will process all source
categories in the population files.
------------------------------------------------------


Diesel Only -
                   :2270000000
                   :2282020000
                   :2285002015
Spark Ignition Only -
                   :2260000000
                   :2265000000
                   :2267000000
                   :2268000000
                   :2282005010
                   :2282005015
                   :2282010005
                   :2285004015
                   :2285006015
------------------------------------------------------
 This is the packet that lists the names of output files
 and some of the input data files read by the model.  If
 a drive:\path\ is not given, the location of the
 NONROAD.EXE file itself is assumed.  You will probably
 want to change the names of the Output and Message files
 to match that of the OPTion file, e.g., MICH-97.OPT,
 MICH-97.OUT, MICH-97.MSG, and if used MICH-97.AMS.
------------------------------------------------------
/RUNFILES/
ALLOC XREF         : data\allocate\allocate.xrf
ACTIVITY           : data\activity\activity.dat
EXH TECHNOLOGY     : data\tech\tech-exh.dat
EVP TECHNOLOGY     : data\tech\tech-evp.dat
SEASONALITY        : data\season\season.dat
REGIONS            : data\season\season.dat
MESSAGE            : c:\nonroad\outputs\p08_nov.msg
OUTPUT DATA        : c:\nonroad\outputs\p08_nov.out
EPS2 AMS           :
US COUNTIES FIPS   : c:\nonroad\data\allocate\fips.dat
RETROFIT           :
/END/

------------------------------------------------------
This is the packet that defines the equipment population
files read by the model.
------------------------------------------------------
```

```
/POP FILES/
Population File    :c:\nonroad\data\pop\az.pop
/END/

POPULATION FILE    : c:\nonroad\data\POP\MI.POP


-------------------------------------------------------
This is the packet that defines the growth files
files read by the model.
-------------------------------------------------------
/GROWTH FILES/
National defaults  : data\growth\nation.grw
/END/


/ALLOC FILES/
Air trans. empl.   :c:\nonroad\data\allocate\az_airtr.alo
Undergrnd coal prod:c:\nonroad\data\allocate\az_coal.alo
Construction cost  :c:\nonroad\data\allocate\az_const.alo
Harvested acres    :c:\nonroad\data\allocate\az_farms.alo
Golf course estab. :c:\nonroad\data\allocate\az_golf.alo
Wholesale estab.   :c:\nonroad\data\allocate\az_holsl.alo
Family housing     :c:\nonroad\data\allocate\az_house.alo
Logging employees  :c:\nonroad\data\allocate\az_loggn.alo
Landscaping empl.  :c:\nonroad\data\allocate\az_lscap.alo
Manufacturing empl.:c:\nonroad\data\allocate\az_mnfg.alo
Oil & gas employees:c:\nonroad\data\allocate\az_oil.alo
Census population  :c:\nonroad\data\allocate\az_pop.alo
Allocation File    :c:\nonroad\data\allocate\az_rail.alo
RV Park establish. :c:\nonroad\data\allocate\az_rvprk.alo
Snowblowers comm.  :c:\nonroad\data\allocate\az_sbc.alo
Snowblowers res.   :c:\nonroad\data\allocate\az_sbr.alo
Snowmobiles        :c:\nonroad\data\allocate\az_snowm.alo
Rec marine inboard :c:\nonroad\data\allocate\az_wib.alo
Rec marine outboard:c:\nonroad\data\allocate\az_wob.alo
/END/
-------------------------------------------------------
This is the packet that defines the emssions factors
files read by the model.
-------------------------------------------------------
/EMFAC FILES/
THC exhaust        : data\emsfac\exhthc.emf
CO exhaust         : data\emsfac\exhco.emf
NOX exhaust        : data\emsfac\exhnox.emf
PM exhaust         : data\emsfac\exhpm.emf
BSFC               : data\emsfac\bsfc.emf
Crankcase          : data\emsfac\crank.emf
Spillage           : data\emsfac\spillage.emf
Diurnal            : data\emsfac\evdiu.emf
Tank Perm          : data\emsfac\evtank.emf
Non-RM Hose Perm   : data\emsfac\evhose.emf
RM Fill Neck Perm  : data\emsfac\evneck.emf
RM Supply/Return   : data\emsfac\evsupret.emf
RM Vent Perm       : data\emsfac\evvent.emf
Hot Soaks          : data\emsfac\evhotsk.emf
RuningLoss         : data\emsfac\evrunls.emf
/END/

-------------------------------------------------------
This is the packet that defines the deterioration factors
files read by the model.
-------------------------------------------------------
```

```
/DETERIORATE FILES/
THC exhaust        : data\detfac\exhthc.det
CO exhaust         : data\detfac\exhco.det
NOX exhaust        : data\detfac\exhnox.det
PM exhaust         : data\detfac\exhpm.det
Diurnal            : data\detfac\evdiu.det
Tank Perm          : data\detfac\evtank.det
Non-RM Hose Perm   : data\detfac\evhose.det
RM Fill Neck Perm  : data\detfac\evneck.det
RM Supply/Return   : data\detfac\evsupret.det
RM Vent Perm       : data\detfac\evvent.det
Hot Soaks          : data\detfac\evhotsk.det
RuningLoss         : data\detfac\evrunls.det
/END/

Optional Packets - Add initial slash "/" to activate

/STAGE II/
Control Factor     : 0
/END/
Enter percent control: 95 = 95% control = 0.05 x uncontrolled
Default should be zero control.

/MODELYEAR OUT/
EXHAUST BMY OUT    :
EVAP BMY OUT       :
/END/

SI REPORT/
SI report file-CSV :OUTPUTS\NRPOLLUT.CSV
/END/

/DAILY FILES/
DAILY TEMPS/RVP    :
/END/

PM Base Sulfur
 cols 1-10: dsl tech type;
 11-20: base sulfur wt%; or '1.0' means no-adjust (cert= in-use)
/PM BASE SULFUR/
T2        0.0350    0.02247
T3        0.2000    0.02247
T3B       0.0500    0.02247
T4A       0.0500    0.02247
T4B       0.0015    0.02247
T4        0.0015    0.30
T4N       0.0015    0.30
T2M       0.0350    0.02247
T3M       1.0       0.02247
T4M       1.0       0.02247
/END/
```

Appendix 9

Agricultural Unpaved Road Activity and Speed Notes

Notes from Pinal County Agricultural meeting on 10/21/2013

Updated 10/24/13 @ 4:15 pm to add speed assumption calculation for non-harvest operations

This meeting discussed some of the assumptions made during inventory and modeling development with the Agricultural community. The following information was clarified for ADEQ during this meeting by Dan Thelander, Kevin Rogers, and Bas Aja. Where the word "trips" are used, we are assuming a one-way trip either to or from a field. Therefore, trips are equivalent to ADT, not round-trips.

On 10/29/2008, it can be assumed that ~50% of cotton farmers were performing night tilling. We can also assume that tilling practices have not changed between 2008 and 2013. For harvesting of 100 acres of cotton, the following travel on Ag roads was given:

- Four module trucks will be needed, combining for 8 total trips at an average speed between 10 and 15 mph.
- Three pickers will be needed, combining for 6 total trips at an average speed of 10-15 mph.
- Module hauler trucks will combine for a total of 46 trips and average 30 mph.
- Maintenance/pickup trucks and watering trucks will combine for 8-10 total trips at an average speed of 30 mph.

Alfalfa harvesting generally occurs once every month and occurs over a period of four days. For harvesting of 100 acres of alfalfa, the following travel on Ag roads was given:

- Swathers combine for 3 total trips at an average speed between 10 and 15 mph.
- Bailers combine for 6 total trips at an average speed of 10-15 mph.
- Road siders will combine for a total of 2 trips and average 10-15 mph.
- Semis will combine for 8 total trips at an average speed of 25 mph.
- Squeeze will account for 2 total trips at an average speed of 30 mph.

For non-harvest operations, the farmers estimated that for a 2500 acre farm running 4 maintenance trucks at an average speed of 30 mph, each truck would log a VMT of 70 miles, for a total of 280 miles per day for non-harvest operations. In addition, tractors would account for 8 additional trips each day at a speed of 10-15 mph.

ADEQ was asked to perform calculations for non-harvest maintenance trucks using the following assumptions:

- 2500 acre farm
- 4 trucks
- 30 mph
- Truck is parked 75% of the time and driving 25% of the time OR parked 90% of the time and driving 10% of the time.
- 12 hours per day

Assuming a 75/25 split, the total daily truck mileage would be 360 miles (i.e. 90 miles/truck/day). Assuming a 90/10 split, the total daily truck mileage would be 144 miles (i.e. 36 miles/truck/day). Seeing as the farmers estimated that each truck would travel 70 miles per day and this estimation is in line with average miles of daily truck traffic calculated above, 70 miles/ truck/day will be assumed.

ADEQ was also informed that a 2500 acre farm uses four maintenance trucks; therefore, ADEQ infers that a 1336 acre farm (assumed average farm size in the EI) would use two trucks for maintenance. Based on these assumptions, an average farm would drive 140 miles per day for maintenance. Since the average percentage of ag roads, in relation to total road, on a farm was calculated by ADEQ to be 63.27%, it was determined that maintenance trucks would travel 88.58 miles (i.e. 140 miles * .6327) on Ag roads per day. ADEQ further calculated that the average total ag road length per farm is 8.695 miles. Therefore, maintenance trucks make an average of 10.19 trips (i.e. 88.58 miles of ag road driven / 8.695 of ag road on a farm) across all farm roads per day, or maintenance trucks account for 10.19 ADT. In addition, ADEQ was informed that tractors average 8 trips per day. ADEQ assumes that each trip is limited to an average of one ag road. ADEQ has calculated that there is an average of 7 ag roads on an individual farm through GIS observation sampling. Therefore, tractors account for an additional average 1.14 ADT (i.e. 8 trips / 7 ag roads per farm). If these numbers are added together, we can estimate the base, non-harvest ADT on ag roads, which is found to be 11.33 ADT (i.e. 10.19 ADT + 1.14 ADT).

Therefore, ADEQ proposes to use a base, non-harvest ADT of 11.33 for ag roads and adjust this ADT to account for additional traffic during harvest periods.

Average speed for a base, non-harvest ADT was calculated to be 28.24 mph using the equation below:

$$[(10.19*30)+(1.14*12.5)]/11.33$$

Average Agricultural Roadway Harvest ADT Increase on 10/29/2013

This document outlines the assumptions and calculations used for determining an average ADT for harvesting operations on Agricultural Roadways.

During a meeting with the Agricultural community on 10/21/2013, the following information was provided to ADEQ describing Ag road travel during the harvesting period of 10/29/2008.

- For 100 acres of cotton harvesting, the number of trips for harvesting equipment vehicles is 69 with a weighted average vehicle speed of 26.4mph.
- For 100 acres of alfalfa harvesting, the number of trips for harvesting equipment vehicles is 21 with a weighted average vehicle speed of 18.9mph.
- Harvesting 100 acres of alfalfa would take 4 days and alfalfa is harvested once per month.

ADEQ performed a survey of 20 crop fields in the Stanfield modeling domain to determine the average mileage of agricultural roads per 100 acres of cropland. This survey revealed that per 100 acres of cropland, there was an average of 2.43 miles of bordering roads, of which 1.54 miles were agricultural roads.

ADEQ has used this information to calculate an average Ag road ADT formula based on cotton and alfalfa harvesting for the 10/29/2008 design day.

Cotton Harvesting

An average farm size of 1,334 acres was assumed in the Pinal County PM_{10} Emission Inventory document. It was determined from this information that on average 100 acres or 7.5% of a farm could be harvested for cotton on any one day of the cotton harvesting season. ADEQ assumed that 25% of the roadway immediately surrounding a crop field will be accessed on average for a harvesting trip[1]. On average 69 trips are taken for 100 acres of cotton harvesting. The total mileage of Ag roadway bordering a 100 acre harvesting operation is 1.54 miles[2]. This only accounts for the mileage driven on those ag roads immediately bordering the crop field; however, the vehicles must travel to and from equipment areas and/or public roadways to access these fields. In these transport periods, ADEQ observed an average distance between public access roadways of ~1 mile. Therefore, ADEQ assumed an average access distance

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[1] This assumption is based on a rectangular crop field of 100 acres where, at most, an individual would need to drive 50% of the perimeter of the field to access the furthest point, and on average a driver would only need to drive halfway to the furthest point.

[2] This was determined by surveying the GIS land use layer in the Stanfield area for 20 crop fields and calculating the bordering roadway mileage to the surveyed fields. This roadway mileage was then adjusted to remove public roads and only account for agricultural roadways.

traveled of 0.25 miles per trip. This means that the average total distance traveled per harvesting trip is 1.79 miles (i.e. 1.54 miles + 0.25 miles). The total estimated mileage of Ag roadways in a 1,334 farm was calculated to be 8.7 miles. Therefore, on an average trip, 20.6% of the ag roadways are accessed (i.e. 1.79 miles / 8.7 miles).

Since ADEQ does not know which fields are harvesting on which days, an average cotton harvest ADT across ag roadways must be calculated. Therefore, ADEQ assumed that cotton harvesting would result in an increase in ADT of 14.2 (or 20.6% of 69 trips).

Alfalfa Harvesting

An average farm size of 1,334 acres was assumed in the Pinal County PM_{10} Emission Inventory document. The agricultural community informed ADEQ that harvesting of 100 acres of alfalfa would take approximately 4 days and would be performed once per month. ADEQ assumed that 25% of the roadway immediately surrounding a crop field will be accessed on average for a harvesting trip[3]. On average 21 trips are taken for 100 acres of alfalfa harvesting. The total mileage of Ag roadway bordering a 100 acre harvesting operation is 1.54 miles. This only accounts for the mileage driven on those ag roads immediately bordering the crop field; however, the vehicles must travel to and from equipment areas and/or public roadways to access these fields. In these transport periods, ADEQ observed an average distance between public access roadways of ~1 mile. Therefore, ADEQ estimated an average access distance traveled of 0.25 miles per trip. This means that the average total distance traveled per harvesting trip is 1.79 miles (i.e. 1.54 miles + 0.25 miles). The total calculated mileage of Ag roadways in a 1,334 farm is estimated to be 8.7 miles. Therefore, on an average trip, 20.6% of the ag roadways are accessed (i.e. 1.79 miles / 8.7 miles).

Since ADEQ does not know which fields are harvesting on which days, an average alfalfa harvest ADT across ag roadways must be calculated. While 20.6% of the ag roadways are accessed per harvesting trip, the frequency of harvesting and the number of days over which a 100 acre alfalfa field are harvested must be accounted for. Therefore, ADEQ assumed that alfalfa harvesting would result in an increase in ADT of 2.43.

$$ADT = \frac{(\%\ of\ Ag\ Roadways\ accessed) * (\#of\ trips/harvest) * (30\ day\ farm\ rotations)}{(4\ days\ per\ harvest) * (13.34\ rotations\ for\ a\ farm)}$$

Where farm rotations and rotations for a farm are dependent on the days between harvests and the average number of 100 acre plots each farm must harvest respectively.

[3] This assumption is based on a rectangular crop field of 100 acres where, at most, an individual would need to drive 50% of the perimeter of the field to access the furthest point, and on average a driver would only need to drive halfway to the furthest point.

Harvest ADT application

Above, ADEQ has estimated that Cotton Harvest increases base ADT by 14.2 and Alfalfa harvesting increases base ADT by 2.43; however, these numbers should be proportional increases based on the percentage of cotton and alfalfa cropland within a given modeling domain. For instance, if no cotton is grown within a given modeling domain, it would stand to reason that no additional cotton harvesting ADT should be applied. Therefore, ADEQ proposes to use these ADT increases on a modeling domain basis based on the weighted average of cotton and alfalfa harvested in the given modeling domain. Below, an example of the application of this is shown for some modeling domain "X".

EXAMPLE: Assuming the crop distribution in modeling domain X is:

- 30% Cotton
- 15% Alfalfa
- 55% Other Crops

We can calculate the proportional ADT harvest increase as:

$$harvest\ ADT\ increase = (0.3 * 14.2) + (0.15 * 2.43) = 4.62$$

Assuming a base, non-harvest average ADT for Ag roads of 11.33 (calculated in "Notes from Pinal County Agricultural meeting on 10-21-2013.docx"), total average ADT is equal to:

$$total\ ADT = base\ ADT + harvest\ ADT\ increase = 11.33 + 4.62 = 15.95$$

Cowtown

Crop	Acreage	% of modeling domain Ag land
Alfalfa	2413.07	35.37%
Cotton	653.19	9.57%
Other Crops	3755.76	55.05%
TOTAL	6822.01	100.00%

Please note that for these calculations I am only focusing on identified ag lands

Using the values calculated in "Average Agricultural Roadway Harvest ADT Increase.docx", Base ADT is 11.33, Cotton harvest ADT is 14.2, and Alfalfa harvest ADT is 2.43.

Operation	Fractional ADT	Speed (mph)
Cotton Harvest	1.36	26.4
Alfalfa Harvest	0.86	18.9
Base Operations	11.33	28.23919

Average Ag Road ADT for Modeling Domain	**13.55**	27.46217

Pinal County Housing (PCH)

Crop	Acreage	% of modeling domain Ag land
Alfalfa	931.88	21.95%
Cotton	1522.31	35.86%
Other Crops	1791.02	42.19%
TOTAL	4245.20	100.00%

Please note that for these calculations I am only focusing on identified ag lands

Using the values calculated in "Average Agricultural Roadway Harvest ADT Increase.docx", Base ADT is 11.33, Cotton harvest ADT is 14.2, and Alfalfa harvest ADT is 2.43.

Operation	Fractional ADT	Speed (mph)
Cotton Harvest	5.09	26.4
Alfalfa Harvest	0.53	18.9
Base Operations	11.33	28.23919

Average Ag Road ADT for Modeling Domain	**16.96**	27.39303

Stanfield

Crop	Acreage	% of modeling domain Ag land
Alfalfa	6647.86	49.15%
Cotton	2554.54	18.89%
Other Crops	4324.31	31.97%
TOTAL	13526.71	100.00%

Please note that for these calculations I am only focusing on identified ag lands

Using the values calculated in "Average Agricultural Roadway Harvest ADT Increase.docx", Base ADT is 11.33, Cotton harvest ADT is 14.2, and Alfalfa harvest ADT is 2.43.

Operation	Fractional ADT	Speed (mph)
Cotton Harvest	2.68	26.4
Alfalfa Harvest	1.19	18.9
Base Operations	11.33	28.23919

Average Ag Road ADT for Modeling Domain	**15.21**	27.18135

Appendix 10

Listing of Diurnal Profiles for Windblown, Activity-Based,
and Total Emissions on High Wind Days

Table 4-4A Emissions Inventory (lbs/hour) for the High Wind Day at PCH on 1/1/2008																
												Unpaved Road				
Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Paved Road	Permitted Point Sources	Dairies	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Agri-culture	AG Road	Public Dirt	Private Dirt	Trail	Total
1	1.6	303.8	28.2	0.5	33.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	12.8	2.0	0.0	48.5
2	1.5	318.0	21.0	0.5	33.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	10.4	9.8	0.0	53.8
3	2.0	335.4	22.2	0.4	33.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	12.3	4.9	0.0	51.1
4	2.5	333.7	24.5	0.5	33.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	45.8
5	5.9	352.2	16.4	1.0	33.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8	5.9	0.0	68.7
6	3.2	299.6	19.1	3.4	33.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	60.8	20.6	0.0	119.8
7	3.9	339.3	16.2	5.5	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	119.4	41.3	2.8	474.8
8	5.7	5.0	22.7	4.9	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	177.7	25.5	2.8	516.8
9	4.8	53.9	34.7	4.1	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	162.1	34.4	2.8	509.2
10	16.3	41.2	871.2	0.0	0.0	2.0	119.0	297.2	42.6	11.0	2521.4	352.2	230.0	107.5	15.6	3698.5
11	21.4	46.3	919.3	0.0	0.0	1.6	355.2	823.7	118.2	37.3	8165.9	755.1	315.6	187.1	45.9	10805.6
12	25.1	49.6	1136.1	0.0	0.0	1.6	641.0	1486.2	213.3	67.3	14663.9	1215.6	463.7	326.4	80.5	19159.6
13	23.6	48.5	790.7	0.0	0.0	1.2	275.3	638.4	91.6	28.9	6348.8	626.3	284.8	159.6	36.2	8491.2
14	22.9	48.3	946.1	0.0	0.0	1.2	135.1	313.3	45.0	14.2	3160.4	400.3	245.5	131.3	19.2	4465.5
15	19.2	47.6	320.0	0.0	0.0	1.2	65.5	163.5	23.5	6.1	1427.0	275.9	229.5	84.4	9.9	2286.4
16	22.3	53.6	397.9	0.0	0.0	1.6	87.6	203.2	29.2	9.2	2081.0	323.8	245.1	100.3	13.5	3094.4
17	19.9	53.6	281.9	0.0	0.0	2.0	80.0	199.8	28.7	7.4	1724.6	296.7	219.5	75.8	11.4	2645.9
18	15.0	50.6	65.8	0.0	0.0	2.8	20.5	53.3	7.7	1.8	480.7	209.6	172.7	46.1	4.9	1000.0
19	15.5	54.6	50.9	0.0	0.0	3.6	14.6	38.1	5.5	1.3	280.3	19.3	95.4	46.1	1.5	505.7
20	19.4	58.1	61.5	0.0	0.0	3.6	18.2	45.4	6.5	1.7	371.9	25.9	55.8	37.9	1.9	568.8
21	19.3	56.7	70.6	0.0	0.0	2.8	21.8	54.5	7.8	2.0	446.3	31.1	58.8	43.2	2.3	670.6
22	19.2	57.4	67.6	0.0	0.0	2.0	21.8	54.5	7.8	2.0	446.3	31.1	49.5	17.6	2.3	635.0
23	17.2	55.7	32.7	0.0	0.0	0.6	6.6	16.6	2.4	0.6	135.5	9.4	31.4	11.2	0.7	215.0
24	14.9	54.6	139.3	0.0	0.0	0.6	13.0	33.9	4.9	1.1	249.3	17.2	27.0	7.3	1.3	355.6
Average			264.9	0.9	12.4	1.6	78.1	184.2	26.4	8.0	1782.0	214.1	138.3	63.6	10.7	2520.3
Percentage Contribution				0.0%	0.5%	0.1%	3.1%	7.3%	1.0%	0.3%	70.7%	8.5%	5.5%	2.5%	0.4%	100.0%

Shaded Area = High Wind Hours

Table 4-4B Emissions Inventory (lbs/hour) for the High Wind Day (High Wind Hour) at PCH on 1/1/2008																
												Unpaved Road				
Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Paved Road	Permitted Point Sources	Dairies	Cleared Area	Desert Shrubland	Developed Rural Lands	Developed Urban Lands	Agri-culture	AG Road	Public Dirt	Private Dirt	Trail	Total
1	1.6	303.8	28.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.5	318.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2.0	335.4	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.5	333.7	24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	5.9	352.2	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	3.2	299.6	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	3.9	339.3	16.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	5.7	5.0	22.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	4.8	53.9	34.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	16.3	41.2	871.2	0.0	0.0	0.0	119.0	297.2	42.6	11.0	2433.3	169.6	43.9	42.6	12.8	3172.0
11	21.4	46.3	919.3	0.0	0.0	0.0	355.2	823.7	118.2	37.3	8077.8	572.5	148.1	143.9	43.0	10319.7
12	25.1	49.6	1136.1	0.0	0.0	0.0	641.0	1486.2	213.3	67.3	14575.7	1033.0	267.2	259.6	77.7	18621.1
13	23.6	48.5	790.7	0.0	0.0	0.0	275.3	638.4	91.6	28.9	6260.7	443.7	114.8	111.5	33.4	7998.2
14	22.9	48.3	946.1	0.0	0.0	0.0	135.1	313.3	45.0	14.2	3072.2	217.7	56.3	54.7	16.4	3924.9
15	19.2	47.6	320.0	0.0	0.0	0.0	65.5	163.5	23.5	6.1	1338.9	93.3	24.1	23.5	7.0	1745.3
16	22.3	53.6	397.9	0.0	0.0	0.0	87.6	203.2	29.2	9.2	1992.8	141.2	36.5	35.5	10.6	2545.9
17	19.9	53.6	281.9	0.0	0.0	0.0	80.0	199.8	28.7	7.4	1636.4	114.1	29.5	28.7	8.6	2133.2
18	15.0	50.6	65.8	0.0	0.0	0.0	20.5	53.3	7.7	1.8	392.5	27.0	7.0	6.8	2.0	518.6
19	15.5	54.6	50.9	0.0	0.0	0.0	14.6	38.1	5.5	1.3	280.3	19.3	5.0	4.9	1.5	370.4
20	19.4	58.1	61.5	0.0	0.0	0.0	18.2	45.4	6.5	1.7	371.9	25.9	6.7	6.5	1.9	484.8
21	19.3	56.7	70.6	0.0	0.0	0.0	21.8	54.5	7.8	2.0	446.3	31.1	8.0	7.8	2.3	581.8
22	19.2	57.4	67.6	0.0	0.0	0.0	21.8	54.5	7.8	2.0	446.3	31.1	8.0	7.8	2.3	581.8
23	17.2	55.7	32.7	0.0	0.0	0.0	6.6	16.6	2.4	0.6	135.5	9.4	2.4	2.4	0.7	176.7
24	14.9	54.6	139.3	0.0	0.0	0.0	13.0	33.9	4.9	1.1	249.3	17.2	4.4	4.3	1.3	329.5
Average			264.9	0.0	0.0	0.0	78.1	184.2	26.4	8.0	1737.9	122.8	31.8	30.9	9.2	2229.3
Percentage Contribution				0.0%	0.0%	0.0%	3.5%	8.3%	1.2%	0.4%	78.0%	5.5%	1.4%	1.4%	0.4%	100.0%

Table 4-4C Emissions Inventory (lbs/hour) for the High Wind Day (Low Wind Hours) at PCH on 1/1/2008																
												Unpaved Road				
Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Paved Road	Permitted Point Sources	Dairies	Cleared Area	Desert Shrubland	Developed Rural Lands	Developed Urban Lands	Agri-culture	AG Road	Public Dirt	Private Dirt	Trail	Total
1	1.6	303.8	28.2	0.5	33.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	12.8	2.0	0.0	48.5
2	1.5	318.0	21.0	0.5	33.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	10.4	9.8	0.0	53.8
3	2.0	335.4	22.2	0.4	33.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	12.3	4.9	0.0	51.1
4	2.5	333.7	24.5	0.5	33.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	45.8
5	5.9	352.2	16.4	1.0	33.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8	5.9	0.0	68.7
6	3.2	299.6	19.1	3.4	33.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	60.8	20.6	0.0	119.8
7	3.9	339.3	16.2	5.5	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	119.4	41.3	2.8	474.8
8	5.7	5.0	22.7	4.9	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	177.7	25.5	2.8	516.8
9	4.8	53.9	34.7	4.1	33.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	162.1	34.4	2.8	509.2
10	16.3	41.2	871.2	0.0	0.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	186.1	64.8	2.8	526.6
11	21.4	46.3	919.3	0.0	0.0	1.6	0.0	0.0	0.0	0.0	88.2	182.6	167.5	43.2	2.8	485.9
12	25.1	49.6	1136.1	0.0	0.0	1.6	0.0	0.0	0.0	0.0	88.2	182.6	196.6	66.8	2.8	538.5
13	23.6	48.5	790.7	0.0	0.0	1.2	0.0	0.0	0.0	0.0	88.2	182.6	170.0	48.1	2.8	493.0
14	22.9	48.3	946.1	0.0	0.0	1.2	0.0	0.0	0.0	0.0	88.2	182.6	189.2	76.6	2.8	540.6
15	19.2	47.6	320.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	88.2	182.6	205.3	60.9	2.8	541.0
16	22.3	53.6	397.9	0.0	0.0	1.6	0.0	0.0	0.0	0.0	88.2	182.6	208.6	64.8	2.8	548.6
17	19.9	53.6	281.9	0.0	0.0	2.0	0.0	0.0	0.0	0.0	88.2	182.6	190.0	47.1	2.8	512.7
18	15.0	50.6	65.8	0.0	0.0	2.8	0.0	0.0	0.0	0.0	88.2	182.6	165.7	39.3	2.8	481.3
19	15.5	54.6	50.9	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	90.4	41.3	0.0	135.3
20	19.4	58.1	61.5	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	49.0	31.4	0.0	84.0
21	19.3	56.7	70.6	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	50.7	35.4	0.0	88.9
22	19.2	57.4	67.6	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	41.5	9.8	0.0	53.3
23	17.2	55.7	32.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	28.9	8.8	0.0	38.4
24	14.9	54.6	139.3	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	22.5	2.9	0.0	26.1
Average			264.9	0.9	12.4	1.6	0.0	0.0	0.0	0.0	44.1	91.3	106.5	32.7	1.4	290.9
Percentage Contribution				0.3%	4.3%	0.6%	0.0%	0.0%	0.0%	0.0%	15.2%	31.4%	36.6%	11.3%	0.5%	100.0%

Table 4-5A
Emissions Inventory (lbs/hour) for the High Wind Day Modeling Domain at Cowtown on 04/27/2008

Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Permitt-ed Point Sources	Paved Road	Con-struction	Cleared Area	Desert Shrubland		Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	CAFOs	Agriculture		Unpaved Road					Total
									County	Tribal					County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	
1	6.1	332.4	68.3	1.2	10.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	3.5	1.5	0.0	19.6	3.0	0.0	2.3	79.0
2	0.7	320.5	73.0	1.2	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	3.5	1.5	0.0	22.2	14.8	0.0	4.8	96.0
3	5.9	314.7	88.1	1.2	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.2	3.5	1.5	0.0	18.1	7.4	0.0	2.8	119.5
4	3.9	84.4	59.7	1.2	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	148.4	3.5	1.5	0.0	18.3	0.0	0.0	1.5	185.3
5	2.2	25.7	92.3	1.2	10.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	39.7	8.9	0.0	5.1	442.8
6	2.4	156.6	492.9	1.2	10.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	84.1	31.2	0.0	13.7	522.5
7	1.6	229.1	326.4	1.2	10.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	185.9	62.3	2.2	39.8	1045.0
8	2.1	11.6	222.0	1.2	10.0	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	268.9	38.6	2.2	42.0	1105.3
9	10.9	33.2	372.4	1.2	10.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	249.1	51.9	2.2	43.2	1098.5
10	20.0	52.9	886.8	0.0	0.0	0.0	621.2	59.8	1156.3	451.0	101.0	3.5	0.2	370.9	2022.3	52.1	415.5	301.2	385.2	6.3	53.3	5999.8
11	17.6	44.4	107.7	0.0	0.0	0.0	164.7	15.8	306.5	119.5	26.8	0.9	0.1	296.7	582.7	52.1	291.4	256.7	141.5	3.3	45.8	2304.5
12	15.7	43.0	122.3	0.0	0.0	0.0	75.2	7.2	140.0	54.6	12.2	0.4	0.0	296.7	300.6	52.1	267.1	291.8	135.7	2.7	55.9	1692.4
13	17.7	37.0	72.0	0.0	0.0	0.0	153.7	14.8	286.0	111.5	25.0	0.9	0.1	222.5	548.0	52.1	288.5	261.6	143.8	3.3	49.4	2161.1
14	14.7	44.0	38.4	0.0	0.0	0.0	51.6	5.2	105.1	41.0	9.2	0.3	0.0	222.5	230.8	52.1	260.3	285.7	139.0	2.6	59.1	1464.5
15	16.1	49.6	36.4	0.0	0.0	0.0	76.2	7.3	141.8	55.3	12.4	0.4	0.0	222.5	303.7	52.1	267.4	315.6	127.3	2.7	56.1	1640.8
16	15.1	50.7	23.1	0.0	0.0	0.0	60.9	6.2	124.1	48.4	10.8	0.3	0.0	296.7	261.1	52.1	262.8	330.5	125.4	2.6	58.2	1640.1
17	12.1	59.4	69.7	0.0	0.0	0.0	11.6	1.2	23.7	9.2	2.1	0.1	0.0	370.9	101.2	52.1	249.8	314.0	76.5	2.3	50.9	1265.6
18	9.2	68.9	101.2	1.2	10.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	519.2	63.5	52.1	246.7	272.8	59.4	2.2	45.4	1279.8
19	5.2	40.9	230.1	1.2	10.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	667.6	3.5	1.5	0.0	152.8	62.3	0.0	24.8	927.8
20	4.0	8.0	72.9	1.2	10.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	667.6	3.5	1.5	0.0	88.7	47.5	0.0	16.3	839.6
21	2.9	37.2	79.7	1.2	10.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	519.2	3.5	1.5	0.0	94.2	53.4	0.0	17.8	703.6
22	3.0	35.3	42.6	1.2	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	76.2	14.8	0.0	9.0	489.2
23	3.8	111.6	232.5	1.2	10.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	111.3	3.5	1.5	0.0	50.7	13.4	0.0	6.5	199.5
24	4.7	9.3	127.5	1.2	10.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	111.3	3.5	1.5	0.0	36.6	4.5	0.0	3.6	173.3
Average			168.3	0.8	6.7	2.5	50.6	4.9	95.1	37.1	8.3	0.3	0.0	309.1	193.6	26.8	137.1	168.1	72.8	1.5	29.5	1144.8
Percentage Contribution				0.1%	0.6%	0.2%	4.4%	0.4%	8.3%	3.2%	0.7%	0.0%	0.0%	27.0%	16.9%	2.3%	12.0%	14.7%	6.4%	0.1%	2.6%	100.0%

Shaded Area = High Wind Hours

Table 4-5B
Emissions Inventory (lbs/hour) for the High Wind Day Modeling Domain (high wind hours) at Cowtown on 04/27/2008

Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Permitt-ed Point Sources	Paved Road	Cons-truction	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	CAFOs	Agriculture		Unpaved Road					Total
														County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	
1	6.1	332.4	68.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.7	320.5	73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	5.9	314.7	88.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	3.9	84.4	59.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.2	25.7	92.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	2.4	156.6	492.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	1.6	229.1	326.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	2.1	11.6	222.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	10.9	33.2	372.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	20.0	52.9	886.8	0.0	0.0	0.0	621.2	59.8	1607.3	101.0	3.5	0.2	0.0	1958.9	0.0	168.8	29.6	287.3	4.1	0.0	4841.6
11	17.6	44.4	107.7	0.0	0.0	0.0	164.7	15.8	426.0	26.8	0.9	0.1	0.0	519.2	0.0	44.7	7.9	76.1	1.1	0.0	1283.3
12	15.7	43.0	122.3	0.0	0.0	0.0	75.2	7.2	194.6	12.2	0.4	0.0	0.0	237.2	0.0	20.4	3.6	34.8	0.5	0.0	586.2
13	17.7	37.0	72.0	0.0	0.0	0.0	153.7	14.8	397.6	25.0	0.9	0.1	0.0	484.5	0.0	41.8	7.3	71.1	1.0	0.0	1197.6
14	14.7	44.0	38.4	0.0	0.0	0.0	51.6	5.2	146.1	9.2	0.3	0.0	0.0	167.3	0.0	13.6	2.4	23.2	0.3	0.0	419.3
15	16.1	49.6	36.4	0.0	0.0	0.0	76.2	7.3	197.1	12.4	0.4	0.0	0.0	240.2	0.0	20.7	3.6	35.2	0.5	0.0	593.7
16	15.1	50.7	23.1	0.0	0.0	0.0	60.9	6.2	172.5	10.8	0.3	0.0	0.0	197.6	0.0	16.1	2.9	27.4	0.4	0.0	495.1
17	12.1	59.4	69.7	0.0	0.0	0.0	11.6	1.2	33.0	2.1	0.1	0.0	0.0	37.7	0.0	3.1	0.5	5.2	0.1	0.0	94.6
18	9.2	68.9	101.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	5.2	40.9	230.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	4.0	8.0	72.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	2.9	37.2	79.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	3.0	35.3	42.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	3.8	111.6	232.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	4.7	9.3	127.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average			168.3	0.0	0.0	0.0	50.6	4.9	132.3	8.3	0.3	0.0	0.0	160.1	0.0	13.7	2.4	23.3	0.3	0.0	396.3
Percentage Contribution				0.0%	0.0%	0.0%	12.8%	1.2%	33.4%	2.1%	0.1%	0.0%	0.0%	40.4%	0.0%	3.5%	0.6%	5.9%	0.1%	0.0%	100.0%

Shaded Area = High Wind Hours

Table 4-5C
Emissions Inventory (lbs/hour) for the High Wind Day Modeling (Low Wind Hours) Domain at Cowtown on 04/27/2008

														Agriculture		Unpaved Road					
Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Permitt-ed Point Sources	Paved Road	Con-struction	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	CAFOs	County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	Total
1	6.1	332.4	68.3	1.2	10.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	37.1	3.5	1.5	0.0	19.6	3.0	0.0	2.3	79.0
2	0.7	320.5	73.0	1.2	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	37.1	3.5	1.5	0.0	22.2	14.8	0.0	4.8	96.0
3	5.9	314.7	88.1	1.2	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	74.2	3.5	1.5	0.0	18.1	7.4	0.0	2.8	119.5
4	3.9	84.4	59.7	1.2	10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	148.4	3.5	1.5	0.0	18.3	0.0	0.0	1.5	185.3
5	2.2	25.7	92.3	1.2	10.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	39.7	8.9	0.0	5.1	442.8
6	2.4	156.6	492.9	1.2	10.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	84.1	31.2	0.0	13.7	522.5
7	1.6	229.1	326.4	1.2	10.0	10.4	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	185.9	62.3	2.2	39.8	1045.0
8	2.1	11.6	222.0	1.2	10.0	9.2	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	268.9	38.6	2.2	42.0	1105.3
9	10.9	33.2	372.4	1.2	10.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	249.1	51.9	2.2	43.2	1098.5
10	20.0	52.9	886.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	271.6	98.0	2.2	53.3	1158.2
11	17.6	44.4	107.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	296.7	63.5	52.1	246.7	248.8	65.3	2.2	45.8	1021.2
12	15.7	43.0	122.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	296.7	63.5	52.1	246.7	288.2	100.9	2.2	55.9	1106.2
13	17.7	37.0	72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	222.5	63.5	52.1	246.7	254.3	72.7	2.2	49.4	963.5
14	14.7	44.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	222.5	63.5	52.1	246.7	283.3	115.8	2.2	59.1	1045.2
15	16.1	49.6	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	222.5	63.5	52.1	246.7	311.9	92.0	2.2	56.1	1047.1
16	15.1	50.7	23.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	296.7	63.5	52.1	246.7	327.6	98.0	2.2	58.2	1145.0
17	12.1	59.4	69.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	63.5	52.1	246.7	313.4	71.2	2.2	50.9	1171.0
18	9.2	68.9	101.2	1.2	10.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	519.2	63.5	52.1	246.7	272.8	59.4	2.2	45.4	1279.8
19	5.2	40.9	230.1	1.2	10.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	667.6	3.5	1.5	0.0	152.8	62.3	0.0	24.8	927.8
20	4.0	8.0	72.9	1.2	10.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	667.6	3.5	1.5	0.0	88.7	47.5	0.0	16.3	839.6
21	2.9	37.2	79.7	1.2	10.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	519.2	3.5	1.5	0.0	94.2	53.4	0.0	17.8	703.6
22	3.0	35.3	42.6	1.2	10.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	370.9	3.5	1.5	0.0	76.2	14.8	0.0	9.0	489.2
23	3.8	111.6	232.5	1.2	10.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	111.3	3.5	1.5	0.0	50.7	13.4	0.0	6.5	199.5
24	4.7	9.3	127.5	1.2	10.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	111.3	3.5	1.5	0.0	36.6	4.5	0.0	3.6	173.3
Average			168.3	0.8	6.7	2.5	0.0	0.0	0.0	0.0	0.0	0.0	309.1	33.5	26.8	123.4	165.7	49.5	1.1	29.5	748.5
Percentage Contribution				0.1%	0.9%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	41.3%	4.5%	3.6%	16.5%	22.1%	6.6%	0.1%	3.9%	100.0%

Shaded Area = High Wind Hours

Table 4-6A
Emissions Inventory (lbs/hour) for the High Wind Day Modeling Domain at Maricopa on 10/27/2008

Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Paved Road	Construc-tion	CAFOs	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	Agriculture		Unpaved Road					Total
													County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	
1	3.8	160.0	239.9	1.0	3.0	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	1.8	0.0	1.0	18.9
2	2.0	106.0	143.5	1.0	2.8	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	8.9	0.0	2.2	25.2
3	1.3	6.0	70.3	1.0	2.8	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	4.4	0.0	1.3	30.6
4	1.3	348.0	73.8	1.0	3.4	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.7	43.4
5	2.5	290.0	98.7	1.0	6.5	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8	5.3	0.0	2.3	111.1
6	2.0	241.0	91.8	1.0	21.3	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.8	18.7	0.0	6.3	153.3
7	1.3	215.0	129.8	1.0	32.5	0.0	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	28.9	37.4	1.0	18.2	384.9
8	5.6	82.0	160.4	1.0	28.8	256.5	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	43.9	23.1	1.0	19.2	639.5
9	13.0	84.0	326.2	0.0	0.0	631.0	89.2	108.5	52.4	59.9	30.2	8.8	247.3	7.2	175.9	41.6	36.4	1.6	19.7	1509.8
10	16.1	85.0	852.9	0.0	0.0	2657.9	89.2	663.4	305.9	349.2	200.6	53.0	1428.2	7.2	270.5	63.4	94.0	5.0	24.3	6211.9
11	18.3	81.0	496.5	0.0	0.0	2401.5	71.3	592.5	273.3	311.9	179.2	47.3	1276.8	7.2	258.6	55.7	70.7	4.6	20.9	5571.4
12	16.3	82.0	293.2	0.0	0.0	1193.1	71.3	425.3	119.3	136.2	78.3	20.7	563.3	7.2	202.6	56.8	74.2	2.6	25.5	2976.4
13	17.0	79.0	176.0	0.0	0.0	1055.9	53.5	220.8	101.8	116.3	66.8	17.6	482.4	7.2	196.2	47.9	55.3	2.3	22.6	2446.6
14	16.8	74.0	141.9	0.0	0.0	878.3	53.5	171.8	79.2	90.4	51.9	13.7	377.5	7.2	188.0	52.1	78.5	2.0	27.0	2071.0
15	15.4	72.0	84.8	0.0	0.0	514.8	53.5	71.5	36.2	41.3	20.8	6.1	173.8	7.2	170.7	52.6	58.8	1.4	25.6	1234.4
16	13.6	71.0	76.6	0.0	0.0	350.1	71.3	27.1	13.1	15.0	7.6	2.2	69.6	7.2	163.3	50.3	60.0	1.2	26.6	864.7
17	13.0	72.0	68.6	0.0	0.0	318.9	89.2	18.1	8.7	10.0	5.0	1.5	49.9	7.2	161.9	42.3	43.6	1.1	23.3	780.6
18	8.7	62.0	60.4	1.0	23.1	0.0	124.8	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	36.7	35.6	1.0	20.7	419.7
19	7.2	61.0	56.2	1.0	13.5	0.0	160.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6	37.4	0.0	11.3	243.3
20	7.4	68.0	45.1	1.0	10.7	0.0	160.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	28.5	0.0	7.5	217.7
21	9.6	70.0	36.1	1.0	9.2	0.0	124.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	32.0	0.0	8.1	184.6
22	9.8	80.0	30.8	1.0	6.8	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	8.9	0.0	4.1	117.5
23	9.2	82.0	33.2	1.0	5.0	0.0	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	8.0	0.0	3.0	49.6
24	8.9	78.0	38.7	1.0	3.8	0.0	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	2.7	0.0	1.7	40.9
Average			159.4	0.6	7.2	427.4	74.3	95.8	41.2	47.1	26.7	7.1	195.8	3.6	94.4	27.6	34.3	1.0	13.5	1097.8
Percentage Contribution				0.1%	0.7%	38.9%	6.8%	8.7%	3.8%	4.3%	2.4%	0.6%	17.8%	0.3%	8.6%	2.5%	3.1%	0.1%	1.2%	100.0%

Shaded Area = High Wind Hours

Table 4-6B
Emissions Inventory (lbs/hour) for the High Wind Day (High Wind Hour) Modeling Domain at Maricopa on 10/27/2008

Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Paved Road	Con-struction	CAFOs	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	Agriculture		Unpaved Road					Total
													County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	
1	3.8	160.0	239.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.0	106.0	143.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1.3	6.0	70.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1.3	348.0	73.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.5	290.0	98.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	2.0	241.0	91.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	1.3	215.0	129.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	5.6	82.0	160.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	13.0	84.0	326.2	0.0	0.0	374.5	0.0	108.5	52.4	59.9	30.2	8.8	236.9	0.0	16.8	2.2	5.3	0.6	0.0	896.2
10	16.1	85.0	852.9	0.0	0.0	2401.4	0.0	663.4	305.9	349.2	200.6	53.0	1417.8	0.0	111.3	14.8	35.3	4.0	0.0	5556.8
11	18.3	81.0	496.5	0.0	0.0	2145.0	0.0	592.5	273.3	311.9	179.2	47.3	1266.4	0.0	99.4	13.2	31.5	3.5	0.0	4963.3
12	16.3	82.0	293.2	0.0	0.0	936.6	0.0	425.3	119.3	136.2	78.3	20.7	552.9	0.0	43.4	5.8	13.8	1.5	0.0	2333.8
13	17.0	79.0	176.0	0.0	0.0	799.4	0.0	220.8	101.8	116.3	66.8	17.6	472.0	0.0	37.1	4.9	11.7	1.3	0.0	1849.8
14	16.8	74.0	141.9	0.0	0.0	621.8	0.0	171.8	79.2	90.4	51.9	13.7	367.1	0.0	28.8	3.8	9.1	1.0	0.0	1438.7
15	15.4	72.0	84.8	0.0	0.0	258.3	0.0	71.5	36.2	41.3	20.8	6.1	163.4	0.0	11.6	1.5	3.7	0.4	0.0	614.9
16	13.6	71.0	76.6	0.0	0.0	93.6	0.0	27.1	13.1	15.0	7.6	2.2	59.2	0.0	4.2	0.6	1.3	0.1	0.0	224.0
17	13.0	72.0	68.6	0.0	0.0	62.4	0.0	18.1	8.7	10.0	5.0	1.5	39.5	0.0	2.8	0.4	0.9	0.1	0.0	149.4
18	8.7	62.0	60.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	7.2	61.0	56.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	7.4	68.0	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	9.6	70.0	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	9.8	80.0	30.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	9.2	82.0	33.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	8.9	78.0	38.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average			159.4	0.0	0.0	320.5	0.0	95.8	41.2	47.1	26.7	7.1	190.6	0.0	14.8	2.0	4.7	0.5	0.0	751.1
Percentage Contribution				0.0%	0.0%	42.7%	0.0%	12.8%	5.5%	6.3%	3.6%	0.9%	25.4%	0.0%	2.0%	0.3%	0.6%	0.1%	0.0%	100.0 %

Shaded Area = High Wind Hours

Table 4-6C
Emissions Inventory (lbs/hour) for the High Wind Day (Low Wind Hour) Modeling Domain at Maricopa on 10/27/2008

													Agriculture		Unpaved Road					
Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Rail Road	Paved Road	Con-struction	CAFOs	Cleared Area	Desert Shrub-land	Develop-ed Rural Lands	Develop-ed Urban Lands	Un-known	County	Tribal Land	AG Road	Public Dirt	Private Dirt	Trail	Tribal road	Total
1	3.8	160.0	239.9	1.0	3.0	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	1.8	0.0	1.0	18.9
2	2.0	106.0	143.5	1.0	2.8	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	8.9	0.0	2.2	25.2
3	1.3	6.0	70.3	1.0	2.8	0.0	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	4.4	0.0	1.3	30.6
4	1.3	348.0	73.8	1.0	3.4	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.7	43.4
5	2.5	290.0	98.7	1.0	6.5	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8	5.3	0.0	2.3	111.1
6	2.0	241.0	91.8	1.0	21.3	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.8	18.7	0.0	6.3	153.3
7	1.3	215.0	129.8	1.0	32.5	0.0	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	28.9	37.4	1.0	18.2	384.9
8	5.6	82.0	160.4	1.0	28.8	256.5	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	43.9	23.1	1.0	19.2	639.5
9	13.0	84.0	326.2	0.0	0.0	256.5	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	39.3	31.1	1.0	19.7	613.6
10	16.1	85.0	852.9	0.0	0.0	256.5	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	48.7	58.7	1.0	24.3	655.1
11	18.3	81.0	496.5	0.0	0.0	256.5	71.3	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	42.5	39.1	1.0	20.9	608.2
12	16.3	82.0	293.2	0.0	0.0	256.5	71.3	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	51.1	60.5	1.0	25.5	642.6
13	17.0	79.0	176.0	0.0	0.0	256.5	53.5	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	43.0	43.6	1.0	22.6	596.9
14	16.8	74.0	141.9	0.0	0.0	256.5	53.5	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	48.2	69.4	1.0	27.0	632.3
15	15.4	72.0	84.8	0.0	0.0	256.5	53.5	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	51.1	55.1	1.0	25.6	619.6
16	13.6	71.0	76.6	0.0	0.0	256.5	71.3	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	49.8	58.7	1.0	26.6	640.6
17	13.0	72.0	68.6	0.0	0.0	256.5	89.2	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	41.9	42.7	1.0	23.3	631.3
18	8.7	62.0	60.4	1.0	23.1	0.0	124.8	0.0	0.0	0.0	0.0	0.0	10.4	7.2	159.1	36.7	35.6	1.0	20.7	419.7
19	7.2	61.0	56.2	1.0	13.5	0.0	160.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6	37.4	0.0	11.3	243.3
20	7.4	68.0	45.1	1.0	10.7	0.0	160.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	28.5	0.0	7.5	217.7
21	9.6	70.0	36.1	1.0	9.2	0.0	124.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	32.0	0.0	8.1	184.6
22	9.8	80.0	30.8	1.0	6.8	0.0	89.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	8.9	0.0	4.1	117.5
23	9.2	82.0	33.2	1.0	5.0	0.0	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	8.0	0.0	3.0	49.6
24	8.9	78.0	38.7	1.0	3.8	0.0	26.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	2.7	0.0	1.7	40.9
Average			159.4	0.6	7.2	106.9	74.3	0.0	0.0	0.0	0.0	0.0	5.2	3.6	79.6	25.7	29.6	0.5	13.5	346.7
Percentage Contribution				0.1%	0.7%	30.8%	21.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	1.0%	23.0%	7.4%	8.6%	0.1%	3.9%	100.0 %

Shaded Area = High Wind Hours

Table 4-7A
Emissions Inventory (lbs/hour) for the High Wind Day Modeling Domain at STF on 11/21/2008

Hour	WSPD (mph)	WD (degree)	PM10 Observation (µg/m3)	Paved Road	Construc-tion	CAFOs	Cleared Area	Desert Shrubland	Developed Rural Lands	Developed Urban Lands	Agri-culture	Unpaved Road AG Road	Unpaved Road Public Dirt	Unpaved Road Private Dirt	Trail	Total
1	4.1	119.2	112.4	0.2	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	18.0	2.2	0.0	33.9
2	3.5	161.6	59.4	0.2	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	22.4	10.9	0.0	47.0
3	3.9	117.3	157.4	0.2	0.0	26.9	0.0	0.0	0.0	0.0	0.0	0.0	16.7	5.5	0.0	49.3
4	4.3	125.4	158.4	0.3	0.0	53.8	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	70.8
5	3.7	274.2	102.3	0.5	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	33.6	6.6	0.0	175.2
6	4.0	240.9	234.2	1.7	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	72.2	23.0	0.0	231.5
7	15.9	85.5	357.4	0.0	0.0	215.9	2.1	112.8	9.5	0.1	697.8	668.3	181.7	49.3	2.5	1939.9
8	18.3	81.9	326.6	0.0	1.3	267.8	3.4	185.0	15.5	0.2	1112.4	692.6	261.2	33.9	2.9	2576.2
9	20.4	82.2	584.6	0.0	1.3	720.1	14.8	812.6	68.2	0.8	4719.2	904.2	304.6	62.4	5.7	7613.9
10	19.9	81.1	429.2	0.0	1.3	351.8	5.5	301.5	25.3	0.3	1782.0	731.9	269.3	81.1	3.4	3553.4
11	20.0	80.2	334.3	0.0	1.3	255.4	3.7	205.0	17.2	0.2	1227.5	699.3	238.5	54.2	3.0	2705.4
12	18.2	80.4	186.1	0.0	1.3	175.8	1.7	94.5	7.9	0.1	592.7	662.1	262.9	77.2	2.5	1878.7
13	14.7	79.2	93.9	0.0	1.3	104.3	0.6	36.0	3.0	0.0	239.1	641.0	228.7	54.5	2.2	1310.8
14	13.4	78.5	65.1	0.0	1.3	90.7	0.3	15.2	1.3	0.0	129.7	634.8	254.4	85.7	2.1	1215.5
15	12.3	75.3	64.8	0.0	1.3	84.8	0.1	6.2	0.5	0.0	90.3	632.1	282.0	68.0	2.1	1167.4
16	9.9	77.2	65.2	3.9	1.3	107.6	0.0	0.0	0.0	0.0	49.4	630.2	302.0	72.2	2.0	1168.7
17	7.1	74.7	87.1	3.7	1.3	134.5	0.0	0.0	0.0	0.0	49.4	630.2	289.0	52.5	2.0	1162.7
18	4.7	73.8	104.6	2.0	0.0	188.4	0.0	0.0	0.0	0.0	49.4	630.2	254.2	43.8	2.0	1170.0
19	6.3	75.1	88.3	1.1	0.0	242.2	0.0	0.0	0.0	0.0	0.0	0.0	143.5	45.9	0.0	432.7
20	5.6	86.2	56.1	0.9	0.0	242.2	0.0	0.0	0.0	0.0	0.0	0.0	85.0	35.0	0.0	363.0
21	2.6	158.4	98.3	0.7	0.0	188.4	0.0	0.0	0.0	0.0	0.0	0.0	90.5	39.4	0.0	319.0
22	2.2	230.2	249.6	0.5	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	74.5	10.9	0.0	220.5
23	2.9	270.1	171.6	0.4	0.0	40.4	0.0	0.0	0.0	0.0	0.0	0.0	49.1	9.8	0.0	99.8
24	2.4	291.4	99.5	0.3	0.0	40.4	0.0	0.0	0.0	0.0	0.0	0.0	33.4	3.3	0.0	77.4
Average			178.6	0.7	0.5	165.1	1.3	73.7	6.2	0.1	447.5	339.9	157.7	38.6	1.4	1232.6
Percentage Contribution				0.1%	0.0%	13.4%	0.1%	6.0%	0.5%	0.0%	36.3%	27.6%	12.8%	3.1%	0.1%	100.0%

Shaded Area = High Wind Hours

Table 4-7B Emissions Inventory (lbs/hour) for the High Wind Day (High Wind Hour) Modeling Domain at STF on 11/21/2008																
												Unpaved Road				
Hour	WSPD (mph)	WD (degree)	PM10 Observation (µg/m3)	Paved Road	Construc-tion	CAFOs	Cleared Area	Desert Shrubland	Develop-ed Rural Lands	Develop-ed Urban Lands	Agri-culture	AG Road	Public Dirt	Private Dirt	Trail	Total
1	4.1	119.2	112.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.5	161.6	59.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3.9	117.3	157.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4.3	125.4	158.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	3.7	274.2	102.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	4.0	240.9	234.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	15.9	85.5	357.4	0.0	0.0	81.3	2.1	112.8	9.5	0.1	648.4	38.0	11.6	3.3	0.5	907.6
8	18.3	81.9	326.6	0.0	0.0	133.3	3.4	185.0	15.5	0.2	1063.0	62.4	19.0	5.5	0.8	1488.1
9	20.4	82.2	584.6	0.0	0.0	585.6	14.8	812.6	68.2	0.8	4669.8	273.9	83.6	24.1	3.7	6537.0
10	19.9	81.1	429.2	0.0	0.0	217.3	5.5	301.5	25.3	0.3	1732.6	101.6	31.0	8.9	1.4	2425.4
11	20.0	80.2	334.3	0.0	0.0	147.7	3.7	205.0	17.2	0.2	1178.1	69.1	21.1	6.1	0.9	1649.2
12	18.2	80.4	186.1	0.0	0.0	68.1	1.7	94.5	7.9	0.1	543.3	31.9	9.7	2.8	0.4	760.6
13	14.7	79.2	93.9	0.0	0.0	23.6	0.6	36.0	3.0	0.0	189.7	10.8	3.3	0.9	0.1	268.1
14	13.4	78.5	65.1	0.0	0.0	10.0	0.3	15.2	1.3	0.0	80.3	4.6	1.4	0.4	0.1	113.4
15	12.3	75.3	64.8	0.0	0.0	4.1	0.1	6.2	0.5	0.0	40.9	1.9	0.6	0.2	0.0	54.4
16	9.9	77.2	65.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	7.1	74.7	87.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	4.7	73.8	104.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	6.3	75.1	88.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	5.6	86.2	56.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	2.6	158.4	98.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	2.2	230.2	249.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	2.9	270.1	171.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	2.4	291.4	99.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average			178.6	0.0	0.0	53.0	1.3	73.7	6.2	0.1	422.8	24.8	7.6	2.2	0.3	591.8
Percentage Contribution				0.0%	0.0%	8.9%	0.2%	12.5%	1.0%	0.0%	71.4%	4.2%	1.3%	0.4%	0.1%	100.0%

Shaded Area = High Wind Hours

Table 4-7C
Emissions Inventory (lbs/hour) for the High Wind Day (Low Wind Hour) Modeling Domain at STF on 11/21/2008

Hour	WSPD (mph)	WD (degree)	PM10 Obser-vation (µg/m3)	Paved Road	Con-struction	CAFOs	Cleared Area	Desert Shrub-land	Developed Rural Lands	Developed Urban Lands	Agri-culture	Unpaved Road				Total
												AG Road	Public Dirt	Private Dirt	Trail	
1	4.1	119.2	112.4	0.2	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	18.0	2.2	0.0	33.9
2	3.5	161.6	59.4	0.2	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0	22.4	10.9	0.0	47.0
3	3.9	117.3	157.4	0.2	0.0	26.9	0.0	0.0	0.0	0.0	0.0	0.0	16.7	5.5	0.0	49.3
4	4.3	125.4	158.4	0.3	0.0	53.8	0.0	0.0	0.0	0.0	0.0	0.0	16.7	0.0	0.0	70.8
5	3.7	274.2	102.3	0.5	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	33.6	6.6	0.0	175.2
6	4.0	240.9	234.2	1.7	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	72.2	23.0	0.0	231.5
7	15.9	85.5	357.4	0.0	0.0	134.5	0.0	0.0	0.0	0.0	49.4	630.2	170.1	45.9	2.0	1032.3
8	18.3	81.9	326.6	0.0	1.3	134.5	0.0	0.0	0.0	0.0	49.4	630.2	242.2	28.4	2.0	1088.1
9	20.4	82.2	584.6	0.0	1.3	134.5	0.0	0.0	0.0	0.0	49.4	630.2	221.0	38.3	2.0	1076.8
10	19.9	81.1	429.2	0.0	1.3	134.5	0.0	0.0	0.0	0.0	49.4	630.2	238.3	72.2	2.0	1128.0
11	20.0	80.2	334.3	0.0	1.3	107.6	0.0	0.0	0.0	0.0	49.4	630.2	217.4	48.1	2.0	1056.1
12	18.2	80.4	186.1	0.0	1.3	107.6	0.0	0.0	0.0	0.0	49.4	630.2	253.2	74.4	2.0	1118.1
13	14.7	79.2	93.9	0.0	1.3	80.7	0.0	0.0	0.0	0.0	49.4	630.2	225.4	53.6	2.0	1042.7
14	13.4	78.5	65.1	0.0	1.3	80.7	0.0	0.0	0.0	0.0	49.4	630.2	253.0	85.3	2.0	1102.0
15	12.3	75.3	64.8	0.0	1.3	80.7	0.0	0.0	0.0	0.0	49.4	630.2	281.4	67.8	2.0	1113.0
16	9.9	77.2	65.2	3.9	1.3	107.6	0.0	0.0	0.0	0.0	49.4	630.2	302.0	72.2	2.0	1168.7
17	7.1	74.7	87.1	3.7	1.3	134.5	0.0	0.0	0.0	0.0	49.4	630.2	289.0	52.5	2.0	1162.7
18	4.7	73.8	104.6	2.0	0.0	188.4	0.0	0.0	0.0	0.0	49.4	630.2	254.2	43.8	2.0	1170.0
19	6.3	75.1	88.3	1.1	0.0	242.2	0.0	0.0	0.0	0.0	0.0	0.0	143.5	45.9	0.0	432.7
20	5.6	86.2	56.1	0.9	0.0	242.2	0.0	0.0	0.0	0.0	0.0	0.0	85.0	35.0	0.0	363.0
21	2.6	158.4	98.3	0.7	0.0	188.4	0.0	0.0	0.0	0.0	0.0	0.0	90.5	39.4	0.0	319.0
22	2.2	230.2	249.6	0.5	0.0	134.5	0.0	0.0	0.0	0.0	0.0	0.0	74.5	10.9	0.0	220.5
23	2.9	270.1	171.6	0.4	0.0	40.4	0.0	0.0	0.0	0.0	0.0	0.0	49.1	9.8	0.0	99.8
24	2.4	291.4	99.5	0.3	0.0	40.4	0.0	0.0	0.0	0.0	0.0	0.0	33.4	3.3	0.0	77.4
Average			178.6	0.7	0.5	112.1	0.0	0.0	0.0	0.0	24.7	315.1	150.1	36.5	1.0	640.8
Percentage Contribution				0.1%	0.1%	17.5%	0.0%	0.0%	0.0%	0.0%	3.9%	49.2%	23.4%	5.7%	0.2%	100.0%

Shaded Area = High Wind Hours