

APPENDIX G

Jasper Post Office Incomplete PM_{2.5} Monitoring Data Analysis

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Data Analysis for Missing PM_{2.5} Data at the Jasper Post Office Monitor in Dubois County, Indiana

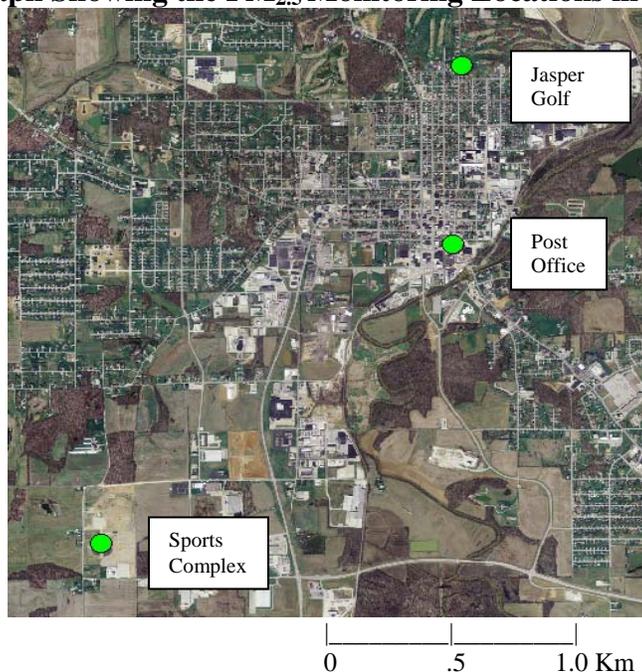
Introduction

During the first, second, and third quarters of 2008 and during the second quarter of 2009 the Jasper Post Office monitor located in Dubois County, Indiana, Site ID 18-037-2001, recorded low Valid Data Return (VDR) for PM_{2.5}. The U.S. EPA required VDR in a quarter is 75%. According to U.S. EPA guidance, the monitoring data for 2007 through 2009 at the Jasper Post Office monitor is incomplete. Therefore, an analysis of missing data during the first, second, and third quarters of 2008 and the second quarter of 2009 was conducted and the following details the scenarios for filling in the missing data and determining an accurate design value.

Monitoring Network

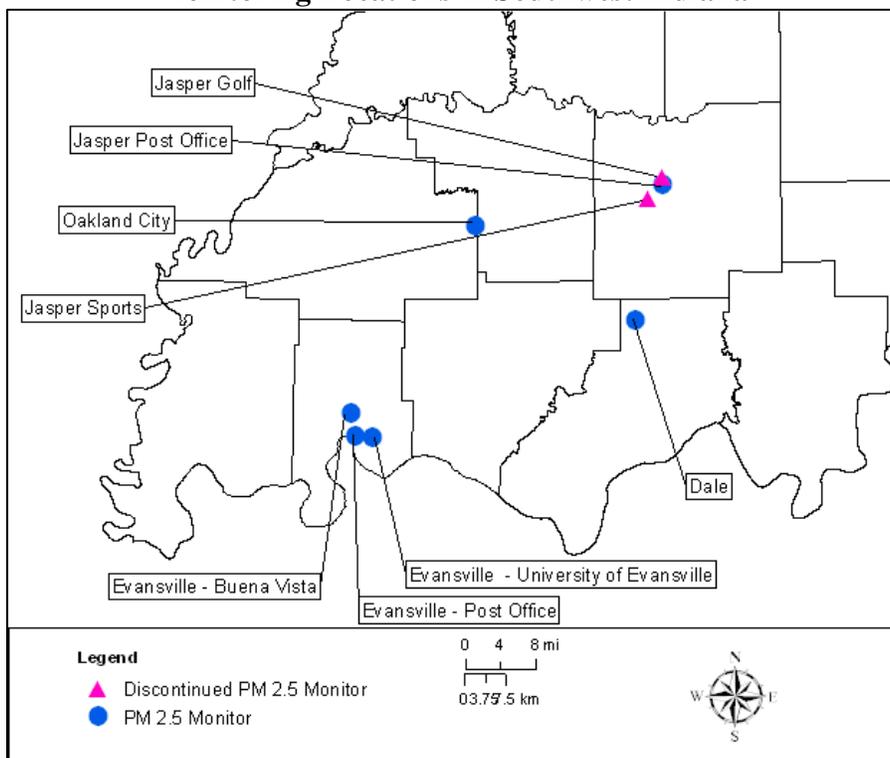
Currently there is only one monitor located in Dubois County, Indiana on top of the Post Office located at 200 E. 6th Street in Jasper, which is near the town square. In February 2006 two additional PM_{2.5} monitors were installed, one upwind and one downwind of the Jasper Post Office monitor. The additional monitors in Jasper were installed to determine the level of fine particulate matter coming in and going out of Jasper. The upwind monitor was located at the Jasper Sports Complex, 1401 12th Ave, and the downwind monitor was located at the Jasper Golf Center at 1729 Jackson St. The locations of the monitors in Dubois County are shown in the aerial photograph below in Figure 1. The Jasper Sports Complex and Jasper Golf Center monitors were discontinued in December 2008. Indiana operates an extensive network of PM_{2.5} monitors stretching throughout the state, including a monitor in nearby Spencer (Dale) and Gibson (Oakland City) counties in southwestern Indiana. A map showing the locations of the monitors in Southwest Indiana is below in Figure 2.

Figure 1
Aerial Photograph Showing the PM_{2.5} Monitoring Locations in Jasper, Indiana



Upon establishment of the Jasper Post Office monitoring site, data values from this location were higher than other monitors in southwest Indiana and among the highest in the state. The two additional monitors at the Jasper Sports Complex and Jasper Golf Center were installed to determine if there was a local source impacting the Post Office monitor. Indiana Department of Environmental Management (IDEM) performed a detailed analysis using data from the three sites and determined that there was no major impact from local sources to account for the high values. During the three year study, a very high level of correlation was displayed between the sites and also with the monitor in Dale, and the conclusion was that the high values were due to regional contributions.

Figure 2
Monitoring Locations in Southwest Indiana



Calculation of the PM_{2.5} Annual Standard

The U.S. EPA developed a “Guideline for Data Handling Conventions for the PM National Ambient Air Quality Standard (NAAQS)”, released in April 1999 (Guidance), to assess compliance with the standard. The annual PM_{2.5} standard is set at 15.0 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The annual standard is met when the 3-year average of the annual mean concentrations across a designated area is less than or equal to 15.0 $\mu\text{g}/\text{m}^3$. Any design value above this is a violation of the standard.

Missing Data Review

Examining the first, second and third quarters of 2008 and the second quarter of 2009 for the Jasper Post Office monitor, the missing data was a result of power failures and machine malfunction errors at the monitor. Many of the repair and maintenance trips were made to the Jasper Post Office monitoring site to address the problems as they arose. Repairs were made to the monitor and samplers were also exchanged in February, March, and April. The majority of the invalid samples can be attributed to three

mechanical situations. First, a sensor in the sampler resulted in the filter cassettes not allowing the supply magazine to rise or to be pushed down into the receiver magazine. Second, a new version of the Federal Reference Method (FRM) samplers was being distributed from the vendor. Indiana had purchased several of these new units and the new samplers were originally shipped without the required shims in the filter exchange area. This problem was identified after some time and the shims were later installed. Third, new filter cassettes were purchased in late 2007. These cassettes were milled slightly different than the ones being used prior to this. An extra amount of torque had to be applied to them to get the m seated and clamped together as tightly as needed. If the cassettes were not applied correctly then problems occurred with the filter exchanges in the samplers, resulting in invalid samples. This problem was especially prevalent with the new version of the FRM samplers. Table 1 below lists the types of errors that occurred at the Jasper Post Office monitor in the year 2008.

**Table 1
Jasper Post Office Monitor Errors**

	Exchange Error	Monitor Error	Collection Error	Operator Error	Other Error	Total Errors
1st Q 2008	13	18	5	6	7	49
2nd Q 2008	19	0	2	1	3	25
3rd Q 2008	15	0	0	10	1	26
4th Q 2008	1	0	7	8	0	16

These problems with the monitors were occurring at other sites throughout the state and the PM_{2.5} specialists from IDEM’s Office of Air Quality had a difficult time responding to all of the errors as quickly as they were occurring in the year 2008. Once the mechanical problems were identified during the year, the VDR improved and the errors which were being encountered were more collection issues than problems with the filters.

These errors caused the Jasper Post Office monitor to record low VDR in the first, second and third quarters of 2008 and the second quarter of 2009 making the three year average from 2007 through 2009 incomplete. The U.S. EPA required VDR in a quarter is 75%. For the remaining quarters of 2008 and 2009 the Jasper Post Office monitor had a VDR over 75%. Table 2 shows the VDR percentages in each quarter for 2007 through 2009 monitoring data at the Jasper Post Office monitor.

Page 15 of the Guidance contains the following information. **“9. What if I want to show I meet the standards but I don’t have complete data?** Appendix N says you may have compelling reasons to use less complete data, but the Regional Administrator must approve it. The Regional Administrator may want to consider filling in for missing scheduled sampling days using the procedures...if you • Have at least 50% of the scheduled number of samples for each quarter for all three years. • Show that the emissions and meteorology for the substitute quarters compare to the emissions and meteorology for the quarters in question. • Meet the standards based on the incomplete data.”

Table 2
VDR at the Jasper Post Office Monitor for 2007 through 2009

Quarter	Valid Data Return (VDR)
1Q 2007	77%
2Q 2007	89%
3Q 2007	88%
4Q 2007	95%
1Q 2008	46%
2Q 2008	73%
3Q 2008	72%
4Q 2008	83%
1Q 2009	100%
2Q 2009	68%
3Q 2009	90%
4Q 2009	87%

Yellow highlight indicates a low VDR

According to the Guidance, the 2007 through 2009 design value for the Jasper Post Office monitor is incomplete. Table 3 lists the quarterly and annual averages for the three monitors located in Jasper for the years 2007 and 2008. Table 4 below lists the annual means and three-year design value for all the monitors located in southwestern Indiana. All of the monitors in southwestern Indiana are below the PM_{2.5} standard.

Table 3
Quarterly and Annual Averages at the Jasper Monitors for 2007 through 2008

	Jasper Post Office		Jasper Sports		Jasper Golf	
	VDR	Value	VDR	Value	VDR	Value
1 Q 2007	77%	11.87	87%	12.34	90%	12.48
2 Q 2007	89%	15.44	83%	16.32	93%	16.83
3 Q 2007	88%	17.34	74%	18.00	94%	18.04
4 Q 2007	95%	12.39	73%	11.77	93%	12.34
Year 2007		14.3		14.6		14.9
1 Q 2008	46%	13.77	74%	11.00	77%	12.65
2 Q 2008	73%	12.23	73%	11.75	83%	11.74
3 Q 2008	72%	15.52	87%	15.62	94%	15.06
4 Q 2008	83%	10.18	90%	10.04	100%	10.67
Year 2008		12.9		12.1		12.5

Yellow highlight indicates a low VDR

Table 4
Annual Means and Design Values for 2007 through 2009

County	Monitor Location	Annual Mean 2007	Annual Mean 2008	Annual Mean 2009	Design Value 2007-2009
Dubois	Jasper Sport	14.61	12.10		
Dubois	Jasper Golf	14.92	12.53		
Dubois	Jasper Post Office	14.26	12.93	12.49	13.2*
Gibson	Oakland City		11.33	11.00	11.2 ²
Spencer	Dale	14.13	12.03	11.77	12.6
Vanderburgh	Evansville Civic Center/Post Office	13.91	12.58	12.32	12.9
Vanderburgh	Mill Road/Buena Vista	14.23	12.70	12.28	13.1
Vanderburgh	University of Evansville	14.21	12.53	12.49	13.1

The Jasper Sport and Jasper Golf monitors began operation February 1, 2006 and were discontinued on December 31, 2008.

The Oakland City monitor began operation on January 18, 2008.

The Evansville Civic Center monitor was replaced by the Evansville Post Office monitor and data for 2009 as well as the 2007 and 2009 design value have been combined.

The Evansville Mill Road monitor was replaced by the Evansville Buena Vista monitor and data for 2009 as well as the 2007-2009 design value have been combined.

*The Jasper Post Office monitor data is incomplete; it is missing the required amount of data in the first, second, and third quarters of 2008, as well as the second quarter of 2009.

² Indicates design value is based on two years of data.

IDEM conducted an analysis of the missing data at the Jasper Post Office monitor. As per 40CFR part 58.12 if the daily design value of an area is plus or minus 5% of the NAAQS (between 33.25 $\mu\text{g}/\text{m}^3$ and 36.75 $\mu\text{g}/\text{m}^3$ for PM) then the sampling at the design site must be daily. The Jasper Post Office monitor's design value for the 2004-2006 period was 34.267 $\mu\text{g}/\text{m}^3$ which prompted daily sampling in 2007. The Jasper Post Office monitor's design value for the 2005-2007 period was 34.993 $\mu\text{g}/\text{m}^3$, causing the daily sampling to continue through 2008. The Jasper Post Office monitor's design value from 2006-2008 dropped to 30.267 $\mu\text{g}/\text{m}^3$ and the sampling frequency was switched to every third day in 2009. According to the Guidance, creditable samples are samples that are given credit for data completeness which determines the VDR for each quarter. Creditable samples include those collected on required sampling days and valid make-up samples taken for missed or invalidated scheduled samples. For monitoring sites that sample every day, such as the Jasper Post Office monitor in 2008, the creditable number of samples will always be the same as the total number of samples. Sites that sample every day cannot have make-up days or data substituted since every day is a scheduled sample day. A combination of situations beginning in 2008 resulted in problems with the Jasper Post Office monitor and a high percentage of invalid samples in 2008. Table 5 below lists the number of creditable samples for the year 2008.

Table 5
2008 Creditable Samples

Quarter	Scheduled Samples	Credible Samples	% Valid
1 st	91	42	46%
2 nd	91	66	73%
3 rd	92	66	72%
4 th	92	76	83%

The Jasper Post Office monitor is the only monitor still in operation in Dubois County. The design value for 2007 through 2009 for the Jasper Sport and Jasper Golf monitor cannot be calculated since the two monitors were shut down at the end of 2008. Even though the Jasper Post Office monitor cannot have make-up days or data substituted, IDEM conducted an analysis on the missing data for 2008 and 2009 and evaluated alternative methods for filling in the missing data. While the alternative methods do not follow the Guidance, they do provide a conservative estimate for what data at the Jasper Post Office monitor would have looked like had the monitor collected data on the missing days. The annual mean and design value along with alternative methods for the design value are listed in Table 4 below.

An analysis was also conducted comparing the concentrations from the PM_{2.5} monitors at the Jasper Post Office, the Jasper Sports, and the Jasper Golf sites. Monitoring data are available from all three PM_{2.5} monitors during 2008 comparing the upwind (Jasper Golf) and downwind site (Jasper Sports) with the Jasper Post Office PM_{2.5} monitor. The PM_{2.5} monitors are closely located and the concentrations at all three monitors tracked closely throughout 2008. The three monitors are essentially monitoring the same air mass and IDEM calculated an alternative method (Alternative Methods C and D) listed in Table 6 that include data substituted from the Jasper Golf and Jasper Sports monitors for missing days at the Jasper Post Office monitor. If the Jasper Post Office monitor had recorded a sample on the missing day, the value would be similar to that recorded at the Jasper Golf and Jasper Sports monitors.

**Table 6
Summary of Jasper Post Office Data and Alternative Methods for Data Substitution**

	% VALID	Jasper Post Office Data	Alternative Method A	Alternative Method B	Alternative Method C	Alternative Method D	Alternative Method E
1Q 2007	77%	11.87	11.87	11.87	11.87	11.87	11.87
2Q 2007	89%	15.44	15.44	15.44	15.44	15.44	15.44
3Q 2007	88%	17.34	17.34	17.34	17.34	17.34	17.34
4Q 2007	95%	12.39	12.39	12.39	12.39	12.39	12.39
Year 2007 Average		14.26	14.26	14.26	14.26	14.26	14.26
1Q 2008	46%	13.77	25.04	12.90	13.36	13.57	13.31
2Q 2008	73%	12.23	20.27	12.90	11.95	11.94	11.98
3Q 2008	72%	15.52	22.44	15.78	15.65	15.59	15.59
4Q 2008	83%	10.18	10.18	10.18	10.18	10.18	10.18
Year 2008 Average		12.93	19.48	12.94	12.79	12.82	12.77
1Q 2009	100%	12.77	12.77	12.77	12.77	12.77	12.77
2Q 2009	68%	11.70	21.31	12.44	11.70	11.70	11.70
3Q 2009	90%	13.77	13.77	13.77	13.77	13.77	13.77
4Q 2009	87%	11.74	11.74	11.74	11.74	11.74	11.74
Year 2009 Average		12.49	14.90	12.68	12.49	12.49	12.49
3 Year Average (2007-2009)		13.2	16.2	13.3	13.2	13.2	13.2

Yellow highlighted data indicates incomplete valid data return for the quarter.

Gray highlighted data indicates data based on a substitution is over the Annual PM_{2.5} Standard.

Red text indicates incomplete data

Blue text indicates a value calculated from an alternative substitution method

Green text indicates incomplete data calculated from an alternative substitution method

Alternative Method A is the average based on substituting highest quarterly max from 2007-2009.

Alternative Method B is the average based on substituting the average from two quarters.

Alternative Method C is the average based on substituting fine particulate matter values from nearby Jasper Sports and Jasper Golf monitors.

Alternative Method D is the average based on substituting fine particulate matter values from nearby Jasper Golf monitor only.

Alternative Method E is the average based on substituting the historical difference between the Jasper Post Office monitor and other SW Indiana monitors.

Jasper Post Office Data:

Average based on no substitution, calculated according to U.S. EPA guidance.

Using this average makes the data incomplete since the required VDR is 75%. The 1st Quarter 2008 VDR is only 46%, the 2nd Quarter 2008 VDR is 73%, the 3rd Quarter 2008 VDR is 72%, and the 2nd Quarter 2009 VDR is 68%. The Guidance states that the incomplete design value of $13.2 \mu\text{g}/\text{m}^3$ is still identified as the monitor's true design value.

The alternative method substitution procedures listed below for data below the required 75% VDR are conservative mechanisms to ascertain the likelihood that a site would meet or not meet the standards if the site had met the 75% criteria. The incomplete design value identified as the Jasper Post Office Data ($13.2 \mu\text{g}/\text{m}^3$) is indicative of the area's air quality and the recalculated design values explained below provide additional weight of evidence to support this conclusion.

Data Substitutions—Alternative Methods A through E

Alternative Method A:

Average based on substituting highest quarterly max value at the Jasper Post Office monitor from 2007 through 2009 for a particular year. According to the Guidance, this is the suggested method for substitution to replace missing data. The highest value that occurred in the 1st Quarter of 2007 through 2009 ($34.7 \mu\text{g}/\text{m}^3$ on February 21, 2007) was substituted for any day that had missing data in the 1st Quarter of 2008. The highest value in the 2nd Quarter of 2007 through 2009 ($41.5 \mu\text{g}/\text{m}^3$ on May 26, 2007) was substituted for any day that had missing data in the 2nd Quarter of 2008. The highest value in the 3rd Quarter of 2007 through 2009 ($40.0 \mu\text{g}/\text{m}^3$ on July 26, 2007) was substituted for any day that had missing data in the 3rd Quarter of 2008. The highest value in the 2nd Quarter of 2007 through 2009 ($41.5 \mu\text{g}/\text{m}^3$ on May 26, 2007) was also substituted for any day that had missing data in the 2nd Quarter of 2009. With the large amount of data substituted in the years 2008 and 2009, using the highest quarterly max values produces a very high three-year average, over the Annual $\text{PM}_{2.5}$ standard.

Alternative Method B:

Average based on substituting the average from two quarters at the Jasper Post Office monitor for any day that had missing data in a quarter. This data substitution method is not covered in the Guidance. However, the data provides weight of evidence that the Jasper Post Office monitoring values are similar to the quarterly and annual averages listed in Table 2 for the Jasper Golf and Jasper Sports monitors. The data values derived from this substitution are very similar to the quarterly and annual averages at the Jasper Golf and Jasper Sports monitors.

Given the large number of substitutions, there are enough values to provide a robust average for assessing air quality. 1st Quarter values from the Jasper Post Office monitor for 2007 and 2009 were averaged ($12.15 \mu\text{g}/\text{m}^3$) and substituted for any day that had missing data in the 1st Quarter of 2008. 2nd Quarter values from the Jasper Post Office monitor for 2007 and 2009 were averaged ($14.65 \mu\text{g}/\text{m}^3$) and substituted for any day that had missing data in the 2nd Quarter of 2008. 3rd Quarter values from the Jasper Post Office monitor for 2007 and 2009 were averaged ($16.44 \mu\text{g}/\text{m}^3$) and substituted for any day that had missing data in the 3rd Quarter of 2008. 2nd Quarter values from the Jasper Post Office monitor for 2007 and 2008 were averaged ($13.98 \mu\text{g}/\text{m}^3$) and substituted for any day that had missing data in the 2nd Quarter of 2009. This method produces a design value under the NAAQS and very similar to the first scenario, "Jasper Post Office Data."

Alternative Method C:

Average based on substituting fine particulate matter values from nearby monitors (Jasper Golf and Jasper Sports monitors). The higher of the two values at the Jasper Golf monitor or the Jasper Sports monitor was substituted for each day that had missing data at the Jasper Post Office monitor. This was only done for the first three quarters of the year 2008 because the Jasper Golf and Jasper sports monitors were discontinued at the end of 2008. VDR for the 4th Quarter of 2008 for the Jasper Post Office is acceptable and no data was substituted for this quarter. Although the VDRs for the 1st Quarter (63% after substitution), 2nd Quarter (73% after substitution), and 3rd Quarter (72% after substitution) for 2008 are still below 75%, using this average provides a value that is exactly the same as the true design value identified by the “Jasper Post Office Data” scenario. Table 7 below lists the daily values for each of the three Jasper monitors in 2008. The highlighted values for the Jasper Golf and Jasper Sports monitors show which value for that day was used as substitution for the missing data at the Jasper Post Office monitor.

**Table 7
Daily Values for Jasper Monitors in 2008**

Note: AQ is Collection Error, AN is Machine Malfunction, AJ is Filter Damage, and AV is Power Failure.

Date	Jasper Post Office	Jasper Golf	Jasper Sports	Date	Jasper Post Office	Jasper Golf	Jasper Sports
1/1/2008	14.8	19.0	14.1	2/1/2008	AN		
1/2/2008	AQ			2/2/2008	AN		
1/3/2008	14.6			2/3/2008	AN	16.1	AN
1/4/2008	AN	11.5	11.1	2/4/2008	AN		
1/5/2008	AN			2/5/2008	6.6		
1/6/2008	AN			2/6/2008	4.1	4.5	3.2
1/7/2008	AN	6.4	6.5	2/7/2008	8.9		
1/8/2008	AV			2/8/2008	16.2		
1/9/2008	AJ			2/9/2008	6.1	6.9	6.1
1/10/2008	8.9	10.4	9.2	2/10/2008	AN		
1/11/2008	15.4			2/11/2008	AN		
1/12/2008	18.3			2/12/2008	AN	13.9	11.7
1/13/2008	AJ	AN	20.2	2/13/2008	AN		
1/14/2008	11.1			2/14/2008	AN		
1/15/2008	11.8			2/15/2008	AN	AN	19.2
1/16/2008	11.2	13.7	11.4	2/16/2008	AN		
1/17/2008	15.8			2/17/2008	AN		
1/18/2008	7.8			2/18/2008	AN	AN	7.0
1/19/2008	6.4	8.7	6.0	2/19/2008	AN		
1/20/2008	8.4			2/20/2008	10.8		
1/21/2008	10.7			2/21/2008	19.6	17.6	16.3
1/22/2008	15.0	14.6	14.0	2/22/2008	21.5		
1/23/2008	26.1			2/23/2008	31.7		
1/24/2008	AV			2/24/2008	27.2	28.3	26.3
1/25/2008	AV	12.9	AN	2/25/2008	23.2		
1/26/2008	AV			2/26/2008	13.8		
1/27/2008	AV			2/27/2008	9.9	11.3	10.5
1/28/2008	AV	16.0	AN	2/28/2008	14.2		
1/29/2008	AQ			2/29/2008	AN		
1/30/2008	9			3/1/2008	AN	AN	3.8
1/31/2008	AQ	10.1	10.3	3/2/2008	AN		

Note: AQ is Collection Error, AN is Machine Malfunction, AJ is Filter Damage, and AV is Power Failure.

Date	Jasper Post Office	Jasper Golf	Jasper Sports	Date	Jasper Post Office	Jasper Golf	Jasper Sports
3/3/2008	AN			4/20/2008	14.2		
3/4/2008	AN	AN	4.0	4/21/2008	17.3	AN	15.7
3/5/2008	AN			4/22/2008	AQ	17.1	
3/6/2008	AN			4/23/2008	18.2		
3/7/2008	AN	13.9	15.2	4/24/2008	19.0	19.3	19.4
3/8/2008	AN			4/25/2008	17.3		
3/9/2008	AN			4/26/2008	5.7		
3/10/2008	AN	AN	AN	4/27/2008	7.9	7.4	7.9
3/11/2008	22.6			4/28/2008	AN		
3/12/2008	18.5			4/29/2008	12.1		
3/13/2008	6.2	7.6	7.2	4/30/2008	11.4	11.2	11.5
3/14/2008	12.4			5/1/2008	15.2		
3/15/2008	13.5	11.3		5/2/2008	13.0		
3/16/2008	12.5	11.9	12.4	5/3/2008	7.2	7.6	AN
3/17/2008	12.2	13.9		5/4/2008	6.5		
3/18/2008	16.4	14.2		5/5/2008	11.7		
3/19/2008	7.6	7.4	7.2	5/6/2008	15.7	16.0	AN
3/20/2008	AN			5/7/2008	15.3		
3/21/2008	8.6			5/8/2008	13.8		
3/22/2008	AN	AQ	AN	5/9/2008	18.2	17.3	17.8
3/23/2008	AN			5/10/2008	10.2		
3/24/2008	AN			5/11/2008	AN		
3/25/2008	AN	AQ	AN	5/12/2008	AN	6.0	7.0
3/26/2008	AN			5/13/2008	AN		
3/27/2008	14.2			5/14/2008	18.6		
3/28/2008	AJ	7.7	AN	5/15/2008	15.3	11.9	14.3
3/29/2008	AJ			5/16/2008	6.1		
3/30/2008	14.4			5/17/2008	9.1		
3/31/2008	AQ	19.1	AN	5/18/2008	7.5	7.2	7.8
4/1/2008	AQ			5/19/2008	6.1		
4/2/2008	6.5			5/20/2008	9.2		
4/3/2008	11.0	AN	10.3	5/21/2008	8.6	7.9	7.3
4/4/2008	9.8			5/22/2008	10.5		
4/5/2008	AJ			5/23/2008	9.0		
4/6/2008	15.8	AN	14.6	5/24/2008	10.2	9.5	11.2
4/7/2008	15.1			5/25/2008	10.6		
4/8/2008	19.2			5/26/2008	9.9		
4/9/2008	7.7	AN	8.6	5/27/2008	18.5	18.2	AN
4/10/2008	13.8			5/28/2008	AN		
4/11/2008	5.5			5/29/2008	11.6		
4/12/2008	AN	3.9	3.4	5/30/2008	20.3	21.6	22.9
4/13/2008	AN			5/31/2008	11.1		
4/14/2008	AN			6/1/2008	12.2		
4/15/2008	7.4	7.8	7.6	6/2/2008	17.3	17.7	AM
4/16/2008	10.7			6/3/2008	15.0		
4/17/2008	16.4			6/4/2008	10.9		
4/18/2008	13.9	AN	13.2	6/5/2008	10.3	10.2	AM
4/19/2008	4.9			6/6/2008	9.9		

Note: AQ is Collection Error, AN is Machine Malfunction, AJ is Filter Damage, and AV is Power Failure.

Date	Jasper Post Office	Jasper Golf	Jasper Sports	Date	Jasper Post Office	Jasper Golf	Jasper Sports
6/7/2008	AN			7/25/2008	15.1		
6/8/2008	AN	AV	AN	7/26/2008	19.2	19.0	19.9
6/9/2008	AN			7/27/2008	23.4		23.4
6/10/2008	AN			7/28/2008	19.5		21.1
6/11/2008	6.9	6.9	6.7	7/29/2008	20.1	21.2	19.9
6/12/2008	AN			7/30/2008	8.7		
6/13/2008	15.1			7/31/2008	16.1		
6/14/2008	14.4	13.9	12.3	8/1/2008	20.6	19.6	18.6
6/15/2008	17.5			8/2/2008	13.2		
6/16/2008	8.4			8/3/2008	AN		
6/17/2008	7.8	7.5	7.8	8/4/2008	AN	21.8	21.2
6/18/2008	AN			8/5/2008	AN		
6/19/2008	12.3			8/6/2008	14.1		
6/20/2008	15.0	17.2	13.7	8/7/2008	10.8	10.3	10.3
6/21/2008	AN			8/8/2008	6.2		
6/22/2008	AN			8/9/2008	11.6		
6/23/2008	AN	7.1	AM	8/10/2008	13.0	12.7	12.9
6/24/2008	AN			8/11/2008	5.3		
6/25/2008	17.8			8/12/2008	13.3		
6/26/2008	16.8	16.9	17.5	8/13/2008	17.7	16.4	17.8
6/27/2008	AN			8/14/2008	18.7		
6/28/2008	AN			8/15/2008	12.4		
6/29/2008	AN	6.1	AN	8/16/2008	8.2	6.9	8.2
6/30/2008	AN			8/17/2008	11.1		
7/1/2008	10.9			8/18/2008	21.7		
7/2/2008	14.7	14.5	15.1	8/19/2008	AN	21.4	AN
7/3/2008	11.7			8/20/2008	AN		
7/4/2008	17.1			8/21/2008	26.7		
7/5/2008	18.1	17.3	16.0	8/22/2008	AN	23.4	AN
7/6/2008	21.5			8/23/2008	AN		
7/7/2008	21.9			8/24/2008	AN		
7/8/2008	17.1	15.7	16.6	8/25/2008	AN	12.1	12.7
7/9/2008	AQ			8/26/2008	14.4		
7/10/2008	9.2			8/27/2008	10.8		
7/11/2008	13.2	13.2	11.9	8/28/2008	20.6	AM	20.1
7/12/2008	13.1			8/29/2008	29.5		
7/13/2008	5.2			8/30/2008	14.5		
7/14/2008	7.7	7.5	6.8	8/31/2008	24.3	AM	24.3
7/15/2008	13.3			9/1/2008	19.7		
7/16/2008	21.4			9/2/2008	22.3		
7/17/2008	22.2	21.2	AN	9/3/2008	26.5	24.4	26
7/18/2008	26.8			9/4/2008	AN		
7/19/2008	30.5			9/5/2008	AN		
7/20/2008	24.7	25.0	AN	9/6/2008	AN	9.6	11.0
7/21/2008	19.8			9/7/2008	AN		
7/22/2008	8.7			9/8/2008	AN		
7/23/2008	9.9	9.3	10.2	9/9/2008	AN	7.5	8.7
7/24/2008	11.4			9/10/2008	AN		

Note: AQ is Collection Error, AN is Machine Malfunction, AJ is Filter Damage, and AV is Power Failure.

Date	Jasper Post Office	Jasper Golf	Jasper Sports	Date	Jasper Post Office	Jasper Golf	Jasper Sports
9/11/2008	20.2			9/21/2008	AN	20.1	22.1
9/12/2008	12.4	12.3	12.6	9/22/2008	AN		
9/13/2008	10.7			9/23/2008	AN		
9/14/2008	7.6			9/24/2008	AQ	20.1	20.6
9/15/2008	7.8	8.0	AN	9/25/2008	15.9		
9/16/2008	7.8			9/26/2008	AN		
9/17/2008	8.2			9/27/2008	AN	8.5	9.2
9/18/2008	10.0	8.0	9.7	9/28/2008	AN		
9/19/2008	14.8			9/29/2008	AN		
9/20/2008	AN			9/30/2008	9.8	9.6	10.4

Alternative Method D:

Average based on substituting fine particulate matter values from the nearby Jasper Golf monitor. This method uses the one-in-three day sampling schedule – only the days from this schedule are used from the data collected by the Jasper Post Office monitor. Method C differs from this because it retains the daily sampling schedule. Data from the Jasper Golf monitor was substituted for each day that had missing data at the Jasper Post Office. This was only done for the first three quarters of 2008 because the Jasper Golf monitor was discontinued at the end of 2008. The 4th Quarter of 2008 for the Jasper Post Office monitor met the required VDR and no data was substituted for this quarter. The Jasper Golf monitor is the only one of the three Jasper monitors that had greater than 75% VDR for each quarter in 2008. The 1st and 2nd Quarters in 2008 for the Jasper Sports monitor are incomplete. Substituting the data from the Jasper Golf monitor is the cleanest and most accurate method to assess actual air quality since the Jasper Golf monitor had acceptable VDR in each quarter of 2008. Although the VDR for the 1st Quarter (57% after substitution) for 2008 is still too low, using this average provides a value that is exactly the same as the true design value identified by the “Jasper Post Office Data” scenario. Table 7 above lists the daily values for each of the three Jasper monitors in the year 2008.

Alternative Method E:

Average based on substituting the historical difference between the Jasper Post Office monitor and other nearby southwest Indiana monitors including Dale (Spencer County), Evansville Civic Center (Vanderburgh County), Evansville Mill Road (Vanderburgh County) and University of Evansville (Vanderburgh County). The year 2008 was the first year that the Jasper Post Office monitor had an incomplete VDR in a quarter. IDEM looked at the 2005 through 2007 data to compare the historical difference between the Jasper Post Office monitor and other nearby southwest Indiana monitors. The nearby Oakland City (Gibson County) monitor was not used in this comparison because it did not start until January 18, 2008.

The substitutions were made for the first three quarters of 2008 because the Jasper Sports and Jasper Golf monitors were discontinued at the end of 2008. The 4th Quarter of 2008 for the Jasper Post Office monitor had the required VDR and no data was substituted for this quarter. The 1st Quarter average for the years 2005 through 2007 at the Jasper Post Office monitor was compared to the 1st Quarter average at the Dale, Evansville Civic Center, Evansville Mill Road, and University of Evansville monitors. This was also done for the 2nd and 3rd Quarters for each of the monitors. The percent difference between the Jasper Post Office monitor and the Dale, Evansville Civic Center, Evansville Mill Road, and University

of Evansville monitors was calculated. Data from the monitor with the highest percent difference was then used as a substitute for the 2008 data missing at the Jasper Post Office monitor.

Table 8 below lists the percent differences between the Jasper Post Office monitor and the nearby Dale, Evansville Civic Center, Evansville Mill Road, and University of Evansville monitors and Table 9 lists the data used for substitution. The 2008 data from the Evansville Civic Center monitor was used for substitution for any missing data at the Jasper Post Office monitor in the 1st Quarter 2008. The 2008 data from the University of Evansville monitor was used for substitution for any missing data at the Jasper Post Office monitor in the 2nd Quarter of 2008. The 2008 data from the Dale monitor was used for substitution for any missing data at the Jasper Post Office monitor in the 3rd Quarter of 2008. Although the VDR for the 1st Quarter (65% after substitution) for 2008 is still too low, using this average provides a value that is exactly the same as the true design value identified by the scenario “Jasper Post Office Data.” Reviewing the data used in this substitution also shows that the particulate matter in southwest Indiana is of a regional nature.

Table 8
Percent Differences for 2005 through 2007 at the Southwest Indiana Monitors

2005-2007 Average	Jasper Post Office	Dale	Evansville Civic Center	Evansville Mill Road	University of Evansville
1Q	13.16	12.58 (Difference of 0.58 or 4.4%)	12.40 (Difference of 0.76 or 5.7%)	12.80 (Difference of 0.36 or 2.7%)	12.79 (Difference of 0.37 or 2.8%)
2Q	15.25	14.53 (Difference of 0.72 or 4.7%)	14.92 (Difference of 0.33 or 2.1%)	15.61 (Difference of 0.36 or 2.3%)	16.44 (Difference of 1.19 or 7.8%)
3Q	18.84	19.27 (Difference of 0.43 or 2.2%)	18.99 (Difference of 0.15 or 0.7%)	18.51 (Difference of 0.33 or 1.7%)	19.01 (Difference of 0.17 or 0.9%)

Table 9
Data From Southwest Indiana Monitors Used for Substitution in Alternative Method E

1 st Quarter							
Date	Jasper Post Office	Evansville Civic Center	Evansville Civic Center Value Plus Historical Difference (0.76)	Date	Jasper Post Office	Evansville Civic Center	Evansville Civic Center Value Plus Historical Difference (0.76)
1/1/2008	14.8	10.8		2/16/2008	AN		
1/2/2008	AQ			2/17/2008	AN		
1/3/2008	14.6			2/18/2008	AN	4.1	4.86
1/4/2008	AN	8.8		2/19/2008	AN		
1/5/2008	AN			2/20/2008	10.8		
1/6/2008	AN	5.7	6.46	2/21/2008	19.6	16.3	
1/7/2008	AN			2/22/2008	21.5		
1/8/2008	AV			2/23/2008	31.7		
1/9/2008	AJ			2/24/2008	27.2	21.9	
1/10/2008	8.9	10.1		2/25/2008	23.2		
1/11/2008	15.4			2/26/2008	13.8		
1/12/2008	18.3			2/27/2008	9.9	8.7	
1/13/2008	AJ	17.9	18.66	2/28/2008	14.2		
1/14/2008	11.1			2/29/2008	AN		
1/15/2008	11.8			3/1/2008	AN	4.1	4.86
1/16/2008	11.2	14.6		3/2/2008	AN		
1/17/2008	15.8			3/3/2008	AN		
1/18/2008	7.8			3/4/2008	AN	3.0	3.76
1/19/2008	6.4	6.2		3/5/2008	AN		
1/20/2008	8.4			3/6/2008	AN		
1/21/2008	10.7			3/7/2008	AN	14.5	15.26
1/22/2008	15.0	14.4		3/8/2008	AN		
1/23/2008	26.1			3/9/2008	AN		
1/24/2008	AV			3/10/2008	AN	17.1	17.86
1/25/2008	AV	13.0	13.76	3/11/2008	22.6		
1/26/2008	AV			3/12/2008	18.5		
1/27/2008	AV			3/13/2008	6.2	8.8	
1/28/2008	AV	11.7	12.46	3/14/2008	12.4		
1/29/2008	AQ			3/15/2008	13.5		
1/30/2008	9.0			3/16/2008	12.5	13.9	
1/31/2008	AQ	10.2	10.96	3/17/2008	12.2		
2/1/2008	AN			3/18/2008	16.4		
2/2/2008	AN			3/19/2008	7.6	6.9	
2/3/2008	AN	16.9	17.66	3/20/2008	AN		
2/4/2008	AN			3/21/2008	8.6		
2/5/2008	6.6			3/22/2008	AN	9.6	10.36
2/6/2008	4.1	3.7		3/23/2008	AN		
2/7/2008	8.9			3/24/2008	AN		
2/8/2008	16.2			3/25/2008	AN	9.0	9.76
2/9/2008	6.1	AL		3/26/2008	AN		
2/10/2008	AN			3/27/2008	14.2		
2/11/2008	AN			3/28/2008	AJ	9.4	10.16
2/12/2008	AN	12.5	13.26	3/29/2008	AJ		
2/13/2008	AN			3/30/2008	14.4		
2/14/2008	AN			3/31/2008	AQ	16.7	17.46
2/15/2008	AN	18.8	19.56				

2 nd Quarter							
Date	Jasper Post Office	University of Evansville	University of Evansville Value Plus Historical Difference (1.19)	Date	Jasper Post Office	University of Evansville	University of Evansville Value Plus Historical Difference (1.19)
4/1/2008	AQ			5/17/2008	9.1		
4/2/2008	6.5			5/18/2008	7.5	6.6	
4/3/2008	11	10.0		5/19/2008	6.1		
4/4/2008	9.8			5/20/2008	9.2		
4/5/2008	AJ			5/21/2008	8.6	7.7	
4/6/2008	15.8	AN		5/22/2008	10.5		
4/7/2008	15.1			5/23/2008	9		
4/8/2008	19.2			5/24/2008	10.2	11.9	
4/9/2008	7.7	11.5		5/25/2008	10.6		
4/10/2008	13.8			5/26/2008	9.9		
4/11/2008	5.5			5/27/2008	18.5	14.9	
4/12/2008	AN	3.1	4.29	5/28/2008	AN		
4/13/2008	AN			5/29/2008	11.6		
4/14/2008	AN			5/30/2008	20.3	17.7	
4/15/2008	7.4	9.4		5/31/2008	11.1		
4/16/2008	10.7			6/1/2008	12.2		
4/17/2008	16.4			6/2/2008	17.3	13.1	
4/18/2008	13.9	12.9		6/3/2008	15		
4/19/2008	4.9			6/4/2008	10.9		
4/20/2008	14.2			6/5/2008	10.3	8.3	
4/21/2008	17.3	21.8		6/6/2008	9.9		
4/22/2008	AQ			6/7/2008	AN		
4/23/2008	18.2			6/8/2008	AN	9.0	10.19
4/24/2008	19	21.8		6/9/2008	AN		
4/25/2008	17.3			6/10/2008	AN		
4/26/2008	5.7			6/11/2008	6.9	11.9	
4/27/2008	7.9	9.1		6/12/2008	AN		
4/28/2008	AN			6/13/2008	15.1		
4/29/2008	12.1			6/14/2008	14.4	11.2	
4/30/2008	11.4	13.5		6/15/2008	17.5		
5/1/2008	15.2			6/16/2008	8.4		
5/2/2008	13			6/17/2008	7.8	6.7	
5/3/2008	7.2	AN		6/18/2008	AN		
5/4/2008	6.5			6/19/2008	12.3		
5/5/2008	11.7			6/20/2008	15	AN	
5/6/2008	15.7	AN		6/21/2008	AN		
5/7/2008	15.3			6/22/2008	AN		
5/8/2008	13.8			6/23/2008	AN	8.6	9.79
5/9/2008	18.2	AN		6/24/2008	AN		
5/10/2008	10.2			6/25/2008	17.8		
5/11/2008	AN			6/26/2008	16.8	15.9	
5/12/2008	AN	AN		6/27/2008	AN		
5/13/2008	AN			6/28/2008	AN		
5/14/2008	18.6			6/29/2008	AN	5.8	6.99
5/15/2008	15.3	13.8		6/30/2008	AN		
5/16/2008	6.1						

3 rd Quarter							
Date	Jasper Post Office	Dale	Dale Value Plus Historical Difference (0.43)	Date	Jasper Post Office	Dale	Dale Value Plus Historical Difference (0.43)
7/1/2008	10.9			8/16/2008	8.2	AN	
7/2/2008	14.7	13.9		8/17/2008	11.1		
7/3/2008	11.7			8/18/2008	21.7		
7/4/2008	17.1			8/19/2008	AN	AN	
7/5/2008	18.1	17.4		8/20/2008	AN		
7/6/2008	21.5			8/21/2008	26.7		
7/7/2008	21.9			8/22/2008	AN	AN	
7/8/2008	17.1	16.4		8/23/2008	AN		
7/9/2008	AQ			8/24/2008	AN		
7/10/2008	9.2			8/25/2008	AN	AN	
7/11/2008	13.2	13.7		8/26/2008	14.4		
7/12/2008	13.1			8/27/2008	10.8		
7/13/2008	5.2			8/28/2008	20.6	20.2	
7/14/2008	7.7	AN		8/29/2008	29.5		
7/15/2008	13.3			8/30/2008	14.5		
7/16/2008	21.4			8/31/2008	24.3	27.2	
7/17/2008	22.2	22.2		9/1/2008	19.7		
7/18/2008	26.8			9/2/2008	22.3		
7/19/2008	30.5			9/3/2008	26.5	AM	
7/20/2008	24.7	24.8		9/4/2008	AN		
7/21/2008	19.8			9/5/2008	AN		
7/22/2008	8.7			9/6/2008	AN	10.9	11.33
7/23/2008	9.9	11.2		9/7/2008	AN		
7/24/2008	11.4			9/8/2008	AN		
7/25/2008	15.1			9/9/2008	AN	9.2	9.63
7/26/2008	19.2	19.8		9/10/2008	AN		
7/27/2008	23.4			9/11/2008	20.2		
7/28/2008	19.5			9/12/2008	12.4	13.4	
7/29/2008	20.1	20.7		9/13/2008	10.7		
7/30/2008	8.7			9/14/2008	7.6		
7/31/2008	16.1			9/15/2008	7.8	8.0	
8/1/2008	20.6	22.9		9/16/2008	7.8		
8/2/2008	13.2			9/17/2008	8.2		
8/3/2008	AN			9/18/2008	10	9.2	
8/4/2008	AN	22.5	22.93	9/19/2008	14.8		
8/5/2008	AN			9/20/2008	AN		
8/6/2008	14.1			9/21/2008	AN	22.2	23.63
8/7/2008	10.8	11.1		9/22/2008	AN		
8/8/2008	6.2			9/23/2008	AN		
8/9/2008	11.6			9/24/2008	AQ	19.5	19.93
8/10/2008	13	14.0		9/25/2008	15.9		
8/11/2008	5.3			9/26/2008	AN		
8/12/2008	13.3			9/27/2008	AN	10.0	10.43
8/13/2008	17.7	19.8		9/28/2008	AN		
8/14/2008	18.7			9/29/2008	AN		
8/15/2008	12.4			9/30/2008	9.8	AJ	

Regional Nature of Fine Particle Matter in Southwest Indiana

Jasper is located in an area of Indiana that is surrounded and impacted by large coal-combustion emissions which contribute to higher fine particle concentrations. Jasper also has a substantial number of small industrial sources and has a busy highway which passes through the middle of town. The three Jasper monitors tracked closely together and the annual averages from 2006 through 2008 were within $0.8 \mu\text{g}/\text{m}^3$ of each other. On certain days, it appeared that local sources could have an impact, but this impact was generally below $1.5 \mu\text{g}/\text{m}^3$. Impacts such as these would be expected in a city with multiple industrial sources. The upwind monitor (Jasper Sports) had a higher annual fine particle concentration than the Jasper Post Office monitor, which indicates that local impacts were not the driving force behind the higher values, and impacts in Dubois County were more regional in nature. Nitrogen oxides (NO_x)

and sulfur dioxide (SO₂) emissions are significant precursors for the formation of fine particle. Emission totals from Dubois, Spencer, and Vanderburgh counties show that Spencer County has the highest NO_x and SO₂ emissions in the area. Dubois County has the lowest NO_x emissions and second lowest SO₂ emissions of these counties; yet the measured fine particle concentrations in Dubois County remain high. This points to the transport of fine particle matter into Dubois County from nearby sources. Sources in Dubois County are small emitters and scattered throughout the county. Nearly 90% of the SO₂ emissions in Dubois County are from the Jasper Municipal Electric Utility.

Correlation Between Jasper Monitors

Correlation is a measure of the statistical relationship between two comparable time series. In this case, the Jasper Post Office monitor was compared to the Jasper Golf monitor and to the Jasper Sports monitor. The relationship stated as the correlation coefficient reflects the simultaneous change in value of the pairs of numerical values over time. The correlation coefficient, which lies between the range of -1.00 to +1.00, is a positive or negative probability that the members of a pair relate to each other. A negative reading suggests that one member of the pair consistently moves up while the other moves down. Conversely, a positive reading suggests there is a tendency for the pair to move together in the same direction. The correlation coefficient was calculated between the three Jasper monitors for the years 2006-2008. The correlation coefficient between the Jasper Post Office monitor and the Jasper Golf monitor is 0.98629. The correlation coefficient between the Jasper Post Office monitor and the Jasper Sports monitor is 0.98385. Both of the correlation coefficients are positive numbers very close to 1.00 showing that the Jasper monitors track very close together.

The Guidance states the requirements for data used for comparison with the PM_{2.5} NAAQS must be calculated on a site-level basis except for calculations of spatially averaged annual means and spatially averaged annual standard design values calculated in Community Monitoring Zones (CMZs). CMZs allow the installation of multiple sites in an area, as long as it can be shown that they are sampling the same air mass, to use for comparison to the PM_{2.5} NAAQS. CMZs have to be approved by U.S. EPA as part of the annual monitoring network plan and Indiana does not have any CMZs in the state. The extra monitors in Jasper (Jasper Sports and Jasper Golf) were established for a special three year study and not intended to be permanent monitors or used as part of a CMZ. However, since there is a high correlation between all three of the Jasper monitors, using the data from the Jasper Sports and Jasper Golf monitoring sites as substitution for the missing data at the Jasper Post Office monitor is as good as using co-located or CMZ site data (if it were available for the Jasper Post Office site). Essentially, all three Jasper monitors are sampling the same air mass and the data are interchangeable. Table 10 below shows the percentage difference on a quarterly basis for the Jasper monitors. IDEM thinks that using the data from the nearby Jasper Sports and Jasper Golf monitoring sites to substitute for the missing Jasper Post Office data provides an accurate assessment of actual air quality in the Jasper area versus using the conservative approach used by U.S. EPA, explained in Alternative Method A, using the highest quarterly max values. Table 11 below shows the 2008 values substituted from the Jasper Sports and Jasper Golf monitoring sites compared to the highest quarterly max values required by the U.S. EPA method. Table 11 shows that for an accurate assessment of the air quality in Jasper, the U.S. EPA method is not a proper substitute when data is available to quantify that inaccuracy.

Table 10
Percentage Difference for Jasper Monitors

	Jasper Post Office	Jasper Sports	Jasper Golf
1Q 2006	12.24	13.23* (Difference of 0.99 or 8.0%)	13.57* (Difference of 1.33 or 10.8%)
2Q 2006	13.06	12.74 (Difference of 0.32 or 2.4%)	12.60 (Difference of 0.46 or 3.5%)
3Q 2006	17.94	18.05 (Difference of 0.11 or 0.6%)	17.74 (Difference of 0.20 or 1.1%)
4Q 2006	10.83	10.28 (Difference of 0.55 or 5.0%)	10.84 (Difference of 0.01 or 0.09%)
1Q 2007	11.83	12.11 (Difference of 0.28 or 2.3%)	12.41 (Difference of 0.58 or 4.9%)
2Q 2007	15.75	16.19 (Difference of 0.44 or 2.7%)	16.42 (Difference of 0.67 or 4.2%)
3Q 2007	17.31	16.88 (Difference of 0.43 or 2.4%)	17.81 (Difference of 0.5 or 2.8%)
4Q 2007	12.39	11.94 (Difference of 0.45 or 3.6%)	12.23 (Difference of 0.16 or 1.2%)
1Q 2008	13.75	10.75 (Difference of 3.0 or 21.8%)	12.77 (Difference of 0.98 or 7.1%)
2Q 2008	12.33	11.81 (Difference of 0.52 or 4.2%)	11.65 (Difference of 0.68 or 5.5%)
3Q 2008	15.22	15.60 (Difference of 0.38 or 2.4%)	15.09 (Difference of 0.13 or 0.8%)
4Q 2008	10.32	9.71 (Difference of 0.61 or 5.9%)	10.67 (Difference of 0.35 or 3.3%)

*Based on data from February and March only since the monitor did not begin until February 1, 2006

Table 11
Jasper Monitoring Data compared to Highest Quarterly Max Values

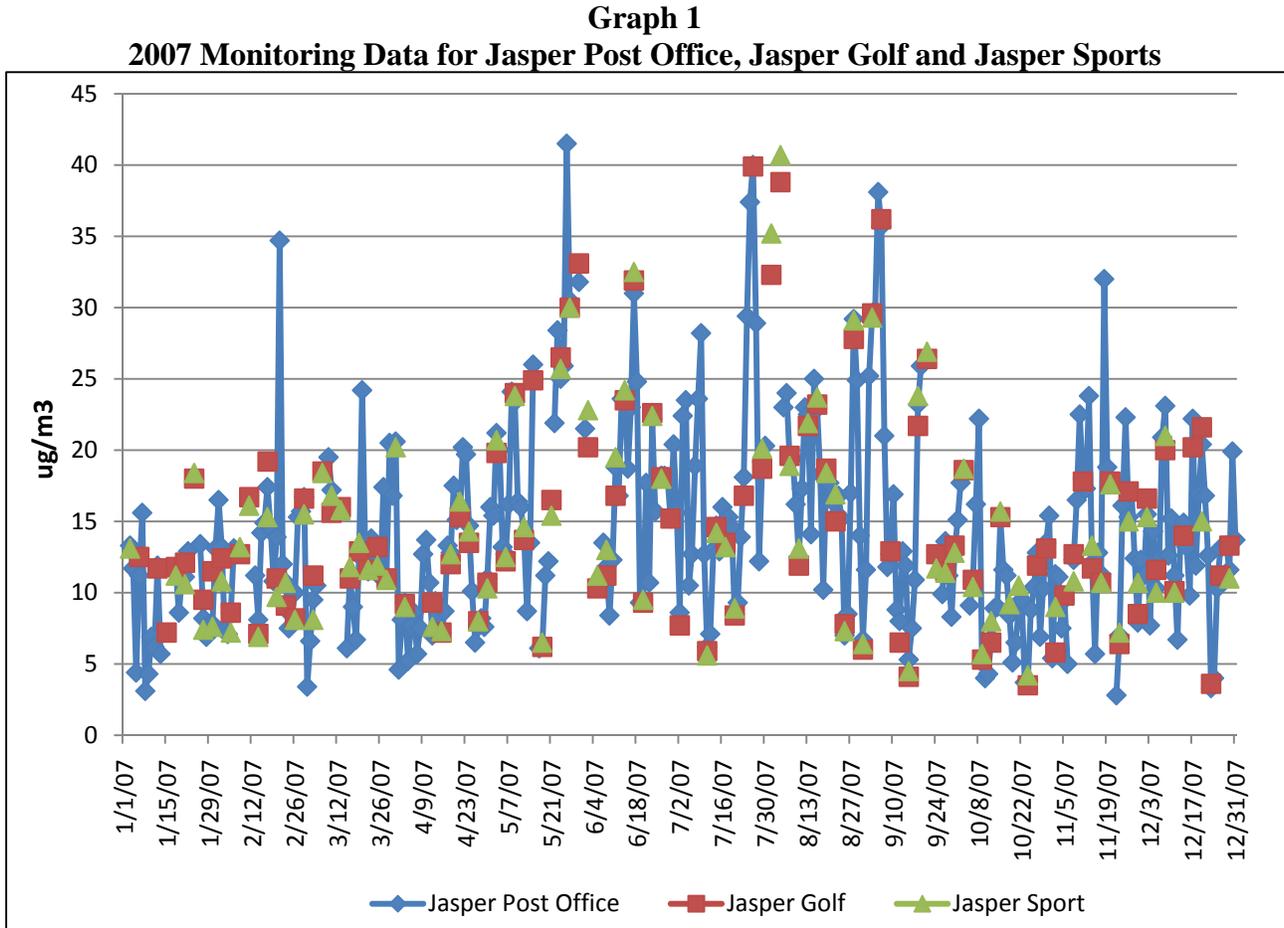
Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 1st Quarter Max	Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 1st Quarter Max
1/6/2008	AN				2/18/2008	AN	AN	7.0	34.7
1/7/2008	AN	6.4	6.5	34.7	2/19/2008	AN			
1/8/2008	AV				2/20/2008	10.8			
1/9/2008	AJ				2/21/2008	19.6	17.6	16.3	34.7
1/10/2008	8.9	10.4	9.2	34.7	2/22/2008	21.5			
1/11/2008	15.4				2/23/2008	31.7			
1/12/2008	18.3				2/24/2008	27.2	28.3	26.3	34.7
1/13/2008	AJ	AN	20.2	34.7	2/25/2008	23.2			
1/14/2008	11.1				2/26/2008	13.8			
1/15/2008	11.8				2/27/2008	9.9	11.3	10.5	34.7
1/16/2008	11.2	13.7	11.4	34.7	2/28/2008	14.2			
1/17/2008	15.8				2/29/2008	AN			
1/18/2008	7.8				3/1/2008	AN	AN	3.8	34.7
1/19/2008	6.4	8.7	6.0	34.7	3/2/2008	AN			
1/20/2008	8.4				3/3/2008	AN			
1/21/2008	10.7				3/4/2008	AN	AN	4.0	34.7
1/22/2008	15.0	14.6	14.0	34.7	3/5/2008	AN			
1/23/2008	26.1				3/6/2008	AN			
1/24/2008	AV				3/7/2008	AN	13.9	15.2	34.7
1/25/2008	AV	12.9	AN	34.7	3/8/2008	AN			
1/26/2008	AV				3/9/2008	AN			
1/27/2008	AV				3/10/2008	AN	AN	AN	34.7
1/28/2008	AV	16.0	AN	34.7	3/11/2008	22.6			
1/29/2008	AQ				3/12/2008	18.5			
1/30/2008	9				3/13/2008	6.2	7.6	7.2	34.7
1/31/2008	AQ	10.1	10.3	34.7	3/14/2008	12.4			
2/1/2008	AN				3/15/2008	13.5	11.3		
2/2/2008	AN				3/16/2008	12.5	11.9	12.4	34.7
2/3/2008	AN	16.1	AN	34.7	3/17/2008	12.2	13.9		
2/4/2008	AN				3/18/2008	16.4	14.2		
2/5/2008	6.6				3/19/2008	7.6	7.4	7.2	34.7
2/6/2008	4.1	4.5	3.2	34.7	3/20/2008	AN			
2/7/2008	8.9				3/21/2008	8.6			
2/8/2008	16.2				3/22/2008	AN	AQ	AN	34.7
2/9/2008	6.1	6.9	6.1	34.7	3/23/2008	AN			
2/10/2008	AN				3/24/2008	AN			
2/11/2008	AN				3/25/2008	AN	AQ	AN	34.7
2/12/2008	AN	13.9	11.7	34.7	3/26/2008	AN			
2/13/2008	AN				3/27/2008	14.2			
2/14/2008	AN				3/28/2008	AJ	7.7	AN	34.7
2/15/2008	AN	AN	19.2	34.7	3/29/2008	AJ			
2/16/2008	AN				3/30/2008	14.4			
2/17/2008	AN				3/31/2008	AQ	19.1	AN	34.7

Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 2 nd Quarter Max	Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 2 nd Quarter Max
4/1/2008	AQ				5/17/2008	9.1			
4/2/2008	6.5				5/18/2008	7.5	7.2	7.8	41.5
4/3/2008	11.0	AN	10.3	41.5	5/19/2008	6.1			
4/4/2008	9.8				5/20/2008	9.2			
4/5/2008	AJ				5/21/2008	8.6	7.9	7.3	41.5
4/6/2008	15.8	AN	14.6	41.5	5/22/2008	10.5			
4/7/2008	15.1				5/23/2008	9.0			
4/8/2008	19.2				5/24/2008	10.2	9.5	11.2	41.5
4/9/2008	7.7	AN	8.6	41.5	5/25/2008	10.6			
4/10/2008	13.8				5/26/2008	9.9			
4/11/2008	5.5				5/27/2008	18.5	18.2	AN	41.5
4/12/2008	AN	3.9	3.4	41.5	5/28/2008	AN			
4/13/2008	AN				5/29/2008	11.6			
4/14/2008	AN				5/30/2008	20.3	21.6	22.9	41.5
4/15/2008	7.4	7.8	7.6	41.5	5/31/2008	11.1			
4/16/2008	10.7				6/1/2008	12.2			
4/17/2008	16.4				6/2/2008	17.3	17.7	AM	41.5
4/18/2008	13.9	AN	13.2	41.5	6/3/2008	15.0			
4/19/2008	4.9				6/4/2008	10.9			
4/20/2008	14.2				6/5/2008	10.3	10.2	AM	41.5
4/21/2008	17.3	AN	15.7	41.5	6/6/2008	9.9			
4/22/2008	AQ	17.1			6/7/2008	AN			
4/23/2008	18.2				6/8/2008	AN	AV	AN	41.5
4/24/2008	19.0	19.3	19.4	41.5	6/9/2008	AN			
4/25/2008	17.3				6/10/2008	AN			
4/26/2008	5.7				6/11/2008	6.9	6.9	6.7	41.5
4/27/2008	7.9	7.4	7.9	41.5	6/12/2008	AN			
4/28/2008	AN				6/13/2008	15.1			
4/29/2008	12.1				6/14/2008	14.4	13.9	12.3	41.5
4/30/2008	11.4	11.2	11.5	41.5	6/15/2008	17.5			
5/1/2008	15.2				6/16/2008	8.4			
5/2/2008	13.0				6/17/2008	7.8	7.5	7.8	41.5
5/3/2008	7.2	7.6	AN	41.5	6/18/2008	AN			
5/4/2008	6.5				6/19/2008	12.3			
5/5/2008	11.7				6/20/2008	15.0	17.2	13.7	41.5
5/6/2008	15.7	16.0	AN	41.5	6/21/2008	AN			
5/7/2008	15.3				6/22/2008	AN			
5/8/2008	13.8				6/23/2008	AN	7.1	AM	41.5
5/9/2008	18.2	17.3	17.8	41.5	6/24/2008	AN			
5/10/2008	10.2				6/25/2008	17.8			
5/11/2008	AN				6/26/2008	16.8	16.9	17.5	41.5
5/12/2008	AN	6.0	7.0	41.5	6/27/2008	AN			
5/13/2008	AN				6/28/2008	AN			
5/14/2008	18.6				6/29/2008	AN	6.1	AN	41.5
5/15/2008	15.3	11.9	14.3	41.5	6/30/2008	AN			
5/16/2008	6.1								

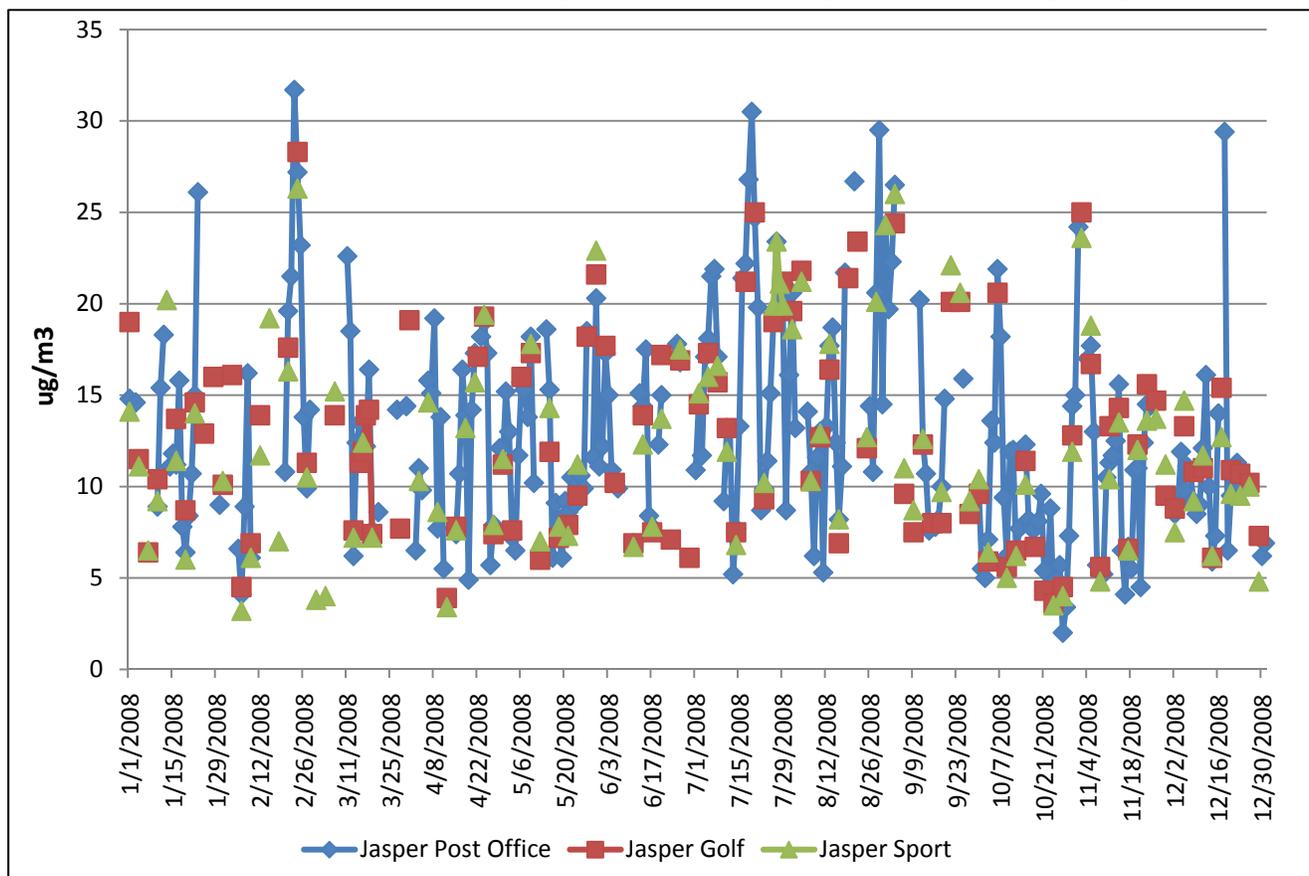
Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 3 rd Quarter Max	Date	Jasper Post Office	Jasper Golf	Jasper Sports	Highest 3 rd Quarter Max
7/1/2008	10.9				8/16/2008	8.2	6.9	8.2	40.0
7/2/2008	14.7	14.5	15.1	40.0	8/17/2008	11.1			
7/3/2008	11.7				8/18/2008	21.7			
7/4/2008	17.1				8/19/2008	AN	21.4	AN	40.0
7/5/2008	18.1	17.3	16.0	40.0	8/20/2008	AN			
7/6/2008	21.5				8/21/2008	26.7			
7/7/2008	21.9				8/22/2008	AN	23.4	AN	40.0
7/8/2008	17.1	15.7	16.6	40.0	8/23/2008	AN			
7/9/2008	AQ				8/24/2008	AN			
7/10/2008	9.2				8/25/2008	AN	12.1	12.7	40.0
7/11/2008	13.2	13.2	11.9	40.0	8/26/2008	14.4			
7/12/2008	13.1				8/27/2008	10.8			
7/13/2008	5.2				8/28/2008	20.6	AM	20.1	40.0
7/14/2008	7.7	7.5	6.8	40.0	8/29/2008	29.5			
7/15/2008	13.3				8/30/2008	14.5			
7/16/2008	21.4				8/31/2008	24.3	AM	24.3	40.0
7/17/2008	22.2	21.2	AN	40.0	9/1/2008	19.7			
7/18/2008	26.8				9/2/2008	22.3			
7/19/2008	30.5				9/3/2008	26.5	24.4	26	40.0
7/20/2008	24.7	25.0	AN	40.0	9/4/2008	AN			
7/21/2008	19.8				9/5/2008	AN			
7/22/2008	8.7				9/6/2008	AN	9.6	11.0	40.0
7/23/2008	9.9	9.3	10.2	40.0	9/7/2008	AN			
7/24/2008	11.4				9/8/2008	AN			
7/25/2008	15.1				9/9/2008	AN	7.5	8.7	40.0
7/26/2008	19.2	19.0	19.9	40.0	9/10/2008	AN			
7/27/2008	23.4		23.4		9/11/2008	20.2			
7/28/2008	19.5		21.1		9/12/2008	12.4	12.3	12.6	40.0
7/29/2008	20.1	21.2	19.9	40.0	9/13/2008	10.7			
7/30/2008	8.7				9/14/2008	7.6			
7/31/2008	16.1				9/15/2008	7.8	8.0	AN	40.0
8/1/2008	20.6	19.6	18.6	40.0	9/16/2008	7.8			
8/2/2008	13.2				9/17/2008	8.2			
8/3/2008	AN				9/18/2008	10.0	8.0	9.7	40.0
8/4/2008	AN	21.8	21.2	40.0	9/19/2008	14.8			
8/5/2008	AN				9/20/2008	AN			
8/6/2008	14.1				9/21/2008	AN	20.1	22.1	40.0
8/7/2008	10.8	10.3	10.3	40.0	9/22/2008	AN			
8/8/2008	6.2				9/23/2008	AN			
8/9/2008	11.6				9/24/2008	AQ	20.1	20.6	40.0
8/10/2008	13.0	12.7	12.9	40.0	9/25/2008	15.9			
8/11/2008	5.3				9/26/2008	AN			
8/12/2008	13.3				9/27/2008	AN	8.5	9.2	40.0
8/13/2008	17.7	16.4	17.8	40.0	9/28/2008	AN			
8/14/2008	18.7				9/29/2008	AN			
8/15/2008	12.4				9/30/2008	9.8	9.6	10.4	40.0

Time Series

PM_{2.5} values for the years 2007-2008 at all three Jasper monitors were plotted to show comparison over time and to see how closely the monitors tracked together. Given the fact that the monitors are in close proximity to each other, the three monitors track together very well. As illustrated in Graphs 1 and 2 below, the PM_{2.5} values in 2007 and 2008 from monitor to monitor do not show much variation and the relative differences among the sites are similar. That is, when one monitor value is high, the other monitor values are high and vice versa.



Graph 2
2008 Monitoring Data for Jasper Post Office, Jasper Golf and Jasper Sports



Conclusions

The 2007-2009 PM_{2.5} three-year average of 13.2 µg/m³ for the Jasper Post Office monitor is incomplete; it is missing the required amount of data in the first, second and third quarters of 2008 and the second quarter of 2009. U.S. EPA guidance states that the incomplete design value of 13.2 µg/m³, is still identified as the monitor’s true design value.

U.S. EPA guidance recommends substituting the quarterly maximum value (Alternative Method A) which is the worst-case scenario and results in the design value being above the standard. However, IDEM does not believe that the substitutions in Alternative Methods A necessarily result in a value representative of the PM_{2.5} concentrations monitored at the Jasper Post Office site. Since the Jasper monitors have such a high correlation and track well together IDEM thinks Alternative Method C, using the day-specific substitution from nearby Jasper Sports and Jasper Golf monitors, best represents the true value for the Jasper Post Office monitor had it collected the required 75 % VDR. The other Alternatives provide additional weight of evidence to show that the Jasper Post Office value of 13.2 µg/m³ is reflective of air quality in the entire southwest Indiana region.