

**Table 3.6**  
**Annual Design Values for Southern Indiana/Northern Kentucky from 2000 – 2006**

County	Site	2000	2001	2002	2003	2004	2005	2006
Clark	Pfau	18.6	16.9	16.0	15.8	15.1	18.5	15.0
Floyd	Green Valley School	16.3	15.7	14.6	14.4	13.7	16.8	13.3
Bullitt	Carpenter Street	16.4	15.6	14.7	14.4	13.6	16.3	14.1
Hardin	Elizabethtown	15.6	14.6	14.0	13.4	12.2	14.5	13.2
Jefferson	Southern Avenue	17.3	17.1	17.2	16.0	14.5	16.7	15.0
Jefferson	Wyandotte Park	16.7	17.7	17.5	15.4	14.1	16.5	15.2
Jefferson	Barret Ave.	16.7	16.9	16.4	15.5	13.7	16.8	14.0
Jefferson	Watson Elementary	16.8	16.3	15.7	14.9	12.6	16.5	13.7

U.S. EPA has developed the “Modeled Attainment Test Software” (MATS) to spatially interpret data, adjust spatial fields with modeled output gradients and multiply the fields by modeled RRFs. However, the PM<sub>2.5</sub> portion of MATS is not available at this time. U.S. EPA guidance recommends using nearby ambient data, as well as modeled output to determine the concentrations in unmonitored areas. In the case of the unmonitored areas of Jefferson County, Indiana, ambient monitored data in Clark and Floyd Counties, Indiana and the fine particle monitors in northern Kentucky show decreasing annual design values, and future year modeled results at all Southern Indiana and Northern Kentucky fine particle monitors fall below the annual fine particle standard.

LADCO Round 5 modeling results for all the fine particle monitoring sites located in Southern Indiana/Northern Kentucky are shown in Table 3.7. The 2009 modeled results show that the highest modeled concentrations will be 13.6 µg/m<sup>3</sup>, at least 1.4 µg/m<sup>3</sup> below the annual fine particle NAAQS of 15.0 µg/m<sup>3</sup>, with other modeled results in Southern Indiana/Northern Kentucky areas much lower. Modeling results for 2012 and 2018 indicate future year design values will continue to decrease at all Southern Indiana/Northern Kentucky fine particle monitors. These results confirm that the adjacent U.S. EPA designated nonattainment county of Jefferson County, Indiana, will be in attainment of the annual fine particle standard by 2009 and continue through 2018 as modeled fine particle concentrations are less than 14 µg/m<sup>3</sup> and continue to decrease in the future.

**Table 3.7**  
**Modeling Results for PM<sub>2.5</sub> Monitors located in or near the Louisville KY-IN Fine Particle Nonattainment Area for 2009, 2012 and 2018**

Monitor	Site	County	2005	2009	2012	2018
			Baseyear	Future Year	Future Year	Future Year
18-019-0006	Pfau	Clark	16.5	13.6	13.6	13.2
18-043-1004	Green Valley School	Floyd	14.9	12.1	12.0	11.5
21-029-0006	Carpenter Street	Bullitt	14.9	12.4	12.4	12.0
21-093-0006	Elizabethtown	Hardin	13.5	11.2	11.2	10.7
21-111-0043	Southern Avenue	Jefferson	15.7	12.8	12.7	12.1
21-111-0044	Wyandotte Park	Jefferson	15.4	12.8	12.8	12.4
21-111-0048	Barret Ave.	Jefferson	15.2	12.5	12.5	12.1
21-111-0051	Watson Elementary	Jefferson	14.7	12.1	12.1	11.7

All modeled future year concentrations are well below the annual fine particle standard and show that the Louisville KY-IN area will attain the current annual fine particle standard in the future.

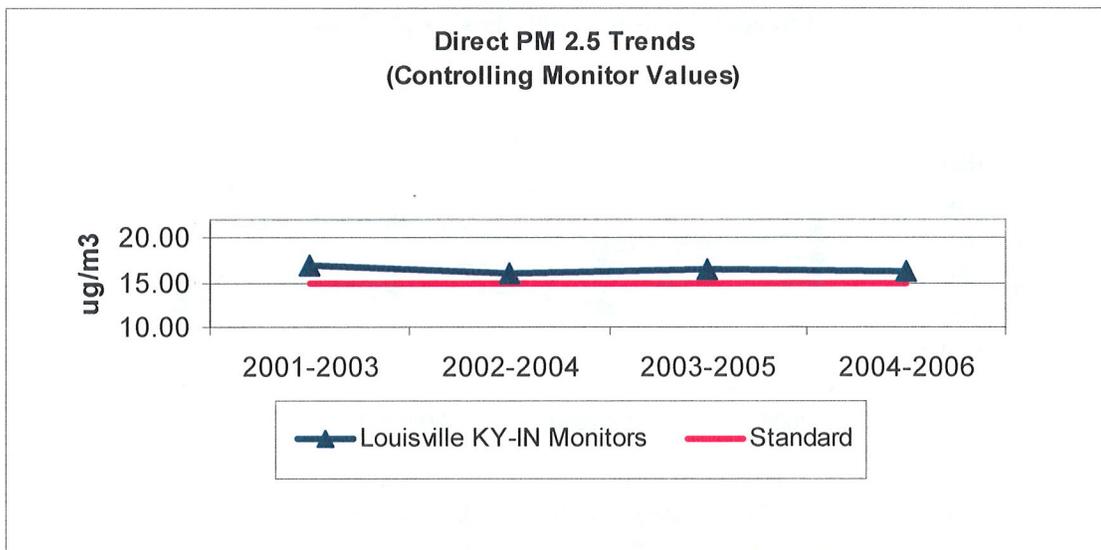
#### 4.0 AIR QUALITY TRENDS

One benchmark for attainment of the annual fine particle standard is the area's design value. Table 4.1 shows the yearly trend in the design value for the area since 2003. This value is determined by the average of each monitor's PM<sub>2.5</sub> values over a three-year period.

**Table 4.1**  
**Louisville KY-IN Nonattainment Area's Annual Fine Particle Design Values**

Year	Design Value [ $\mu\text{g}/\text{m}^3$ ] (Monitor Location)	3-Year Period
2006	16.2 (Spring St./Pfau)	2004-2006
2005	16.5 (Spring St./Pfau)	2003-2005
2004	15.9 (Southern Avenue)	2002-2004
2003	16.9 (Wyandotte Park)	2001-2003

**Figure 4.1**  
**Controlling Monitor Design Values**



As shown in Figure 4.1, the data shows a relative decline since the implementation of federal control programs such as the NO<sub>x</sub> SIP Call and the new engine and fuel standards.

To give a more complete picture of the air quality improvement in the nonattainment area, Chart 4.1 lists the design values for each of the ambient fine particle monitors in the nonattainment area.

**Chart 4.1**  
**Historical Design Values for the Louisville KY-IN Nonattainment Area from 2001-2006**

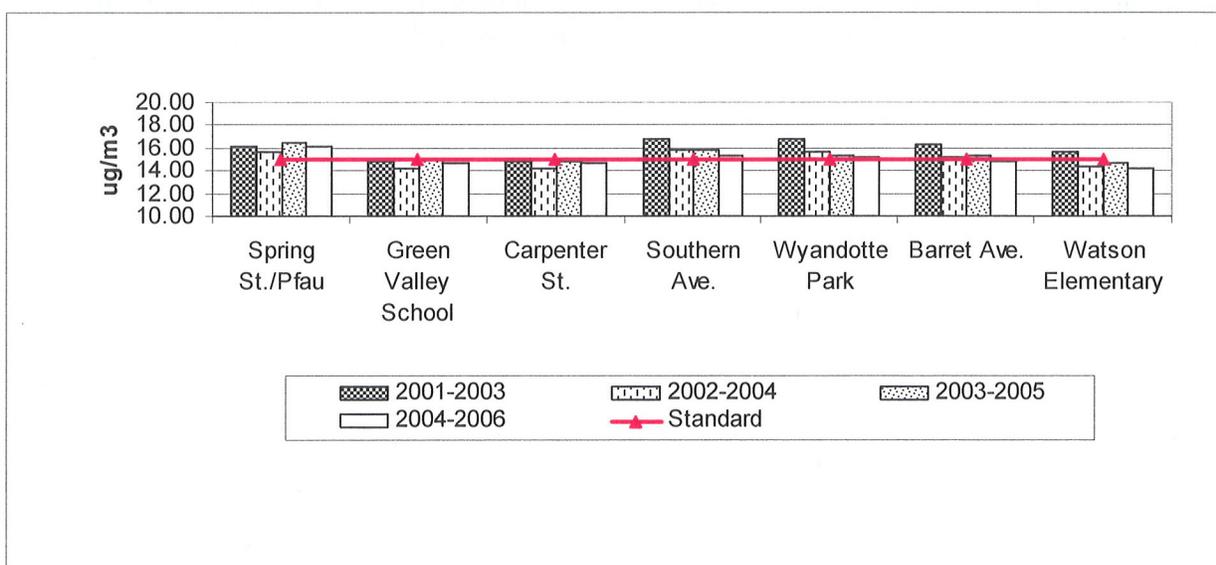
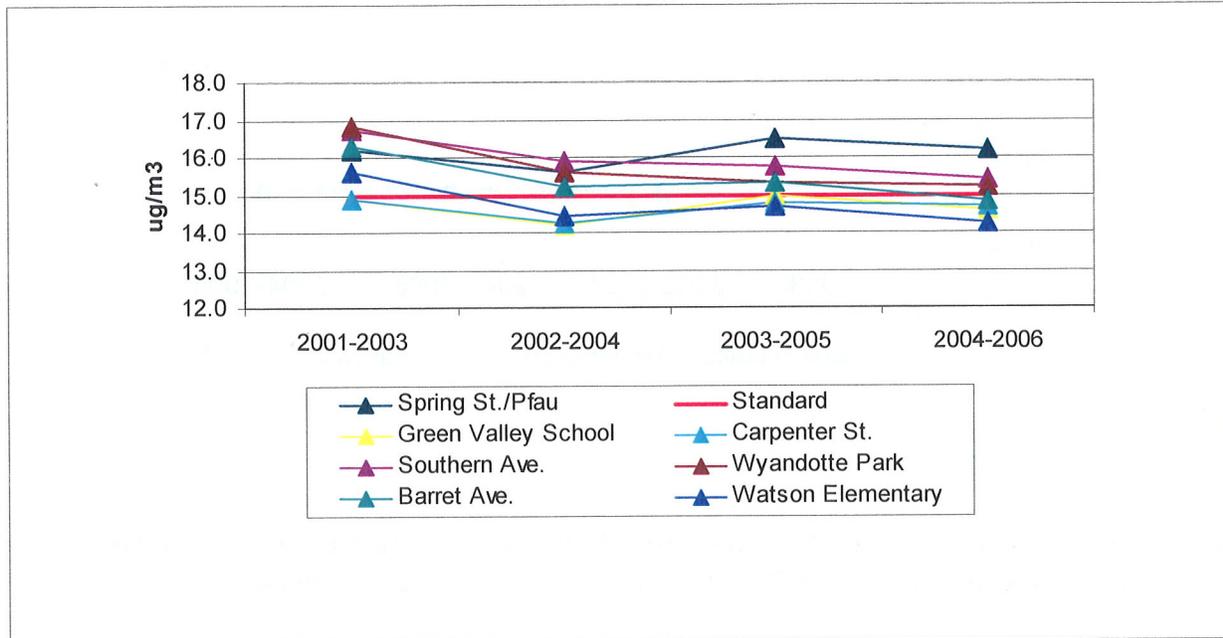


Figure 4.2 shows the design values for the Louisville KY-IN fine particle nonattainment area from 2001 through 2006.

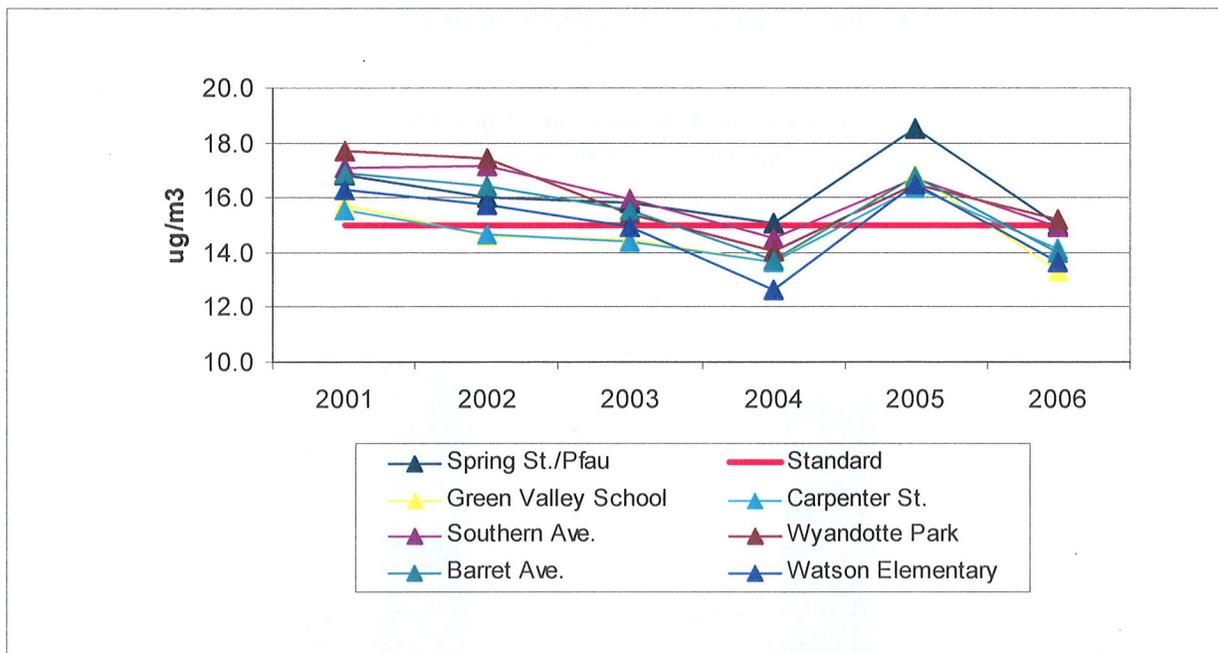
**Figure 4.2**  
**Three-Year Fine Particle Design Values**



In looking at the design value for each year between 2001 and 2006, as shown in Chart 4.1 and Figure 4.2, the annual design values for the Louisville KY-IN fine particle monitors generally show a downward trend. In the figure, the NAAQS value for annual  $PM_{2.5}$  of  $15.0 \mu\text{g}/\text{m}^3$  is identified by the red line. A general downward trend can be noticed with the exception of 2005. 2005 experienced meteorological events that led to several  $PM_{2.5}$  episodes in which daily  $PM_{2.5}$  concentrations in the Louisville KY-IN area were extremely high. This in turn, weighed the annual  $PM_{2.5}$  concentrations upward, as well as the latest 3-year design value for the area.

Figure 4.3 shows the monitored values from 2001-2006 for each of the monitors in the Louisville KY-IN area.

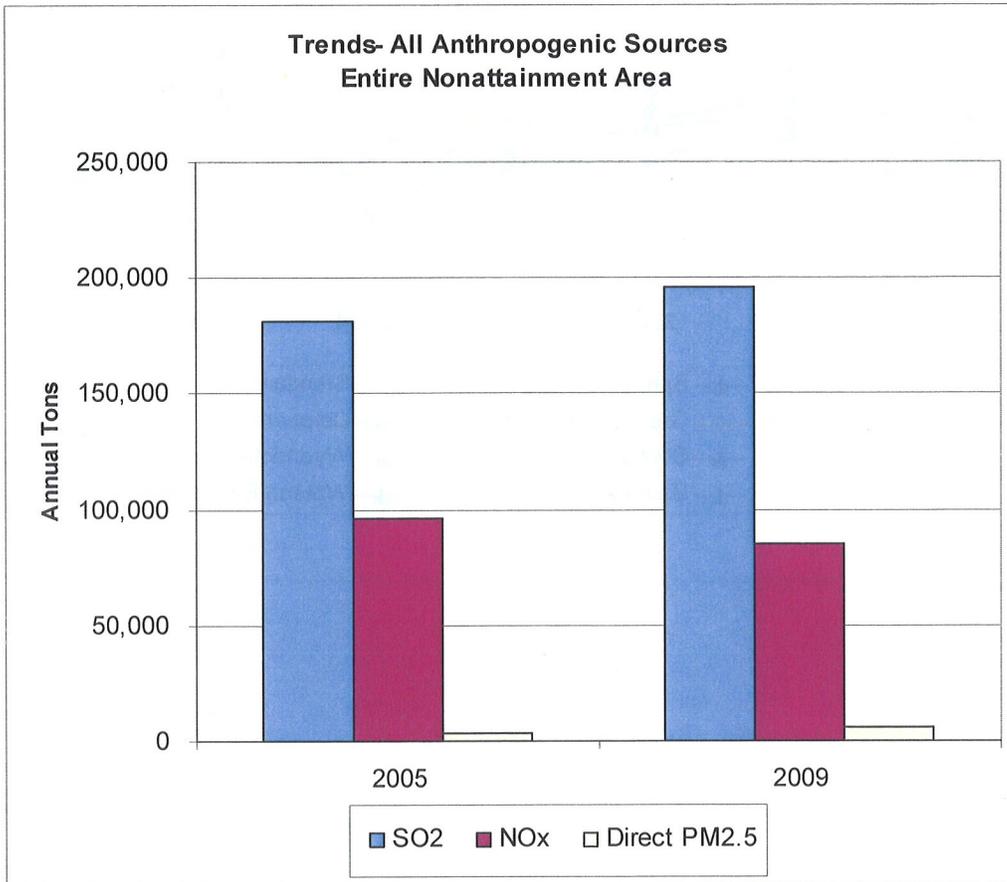
**Figure 4.3**  
**Annual PM<sub>2.5</sub> Values for the Louisville KY-IN Area**



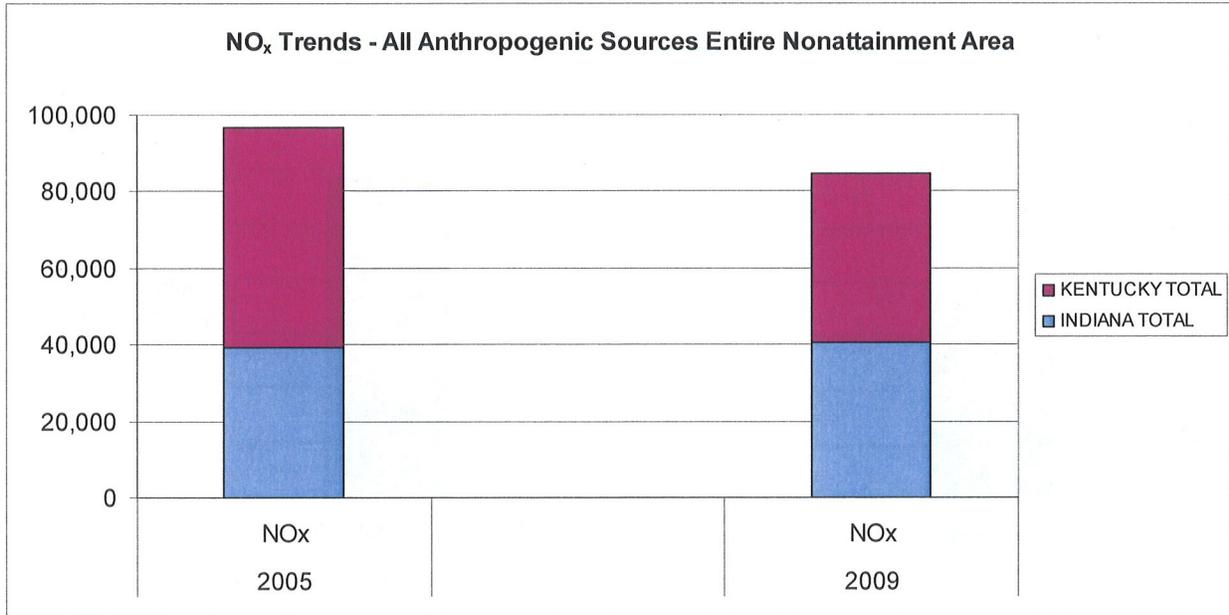
## 5.0 EMISSIONS TRENDS ANALYSIS

Charts 5.1, 5.2, 5.3 and 5.4 compare 2005 actual SO<sub>2</sub>, NO<sub>x</sub> and direct PM<sub>2.5</sub> emissions, which were used in the modeling demonstration, to the projected 2009 emissions.

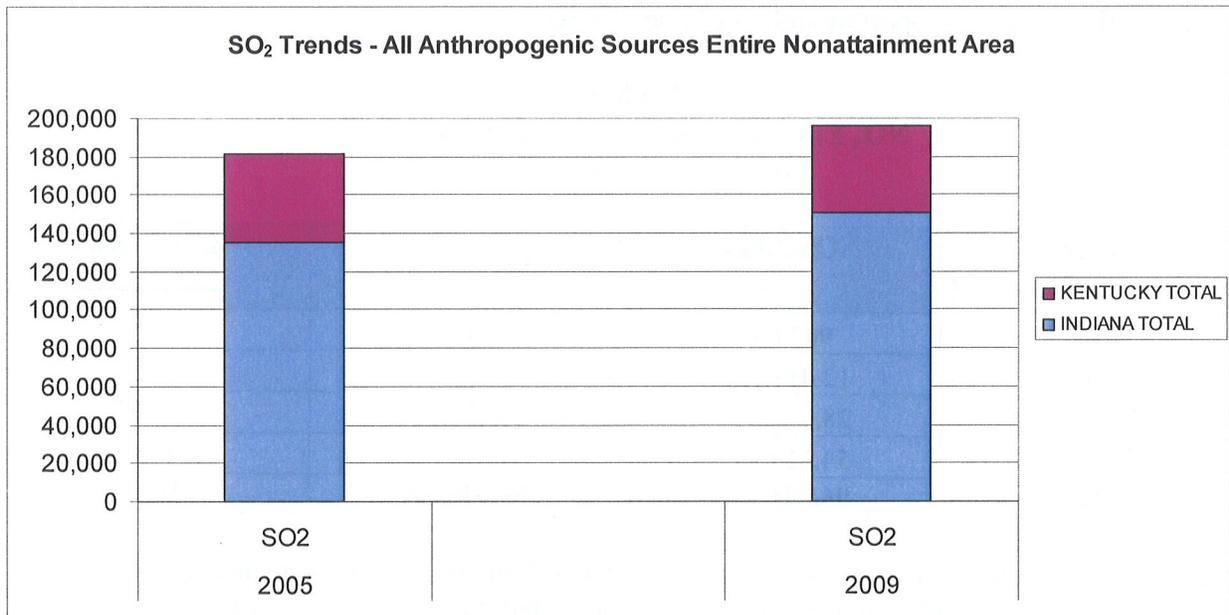
**Chart 5.1**  
**Emissions Trends – All Anthropogenic Sources**



**Chart 5.2**  
**NOx Emissions Trends**



**Chart 5.3**  
**SO<sub>2</sub> Emissions Trends**



**Chart 5.4**  
**Direct PM<sub>2.5</sub> Emissions Trends**

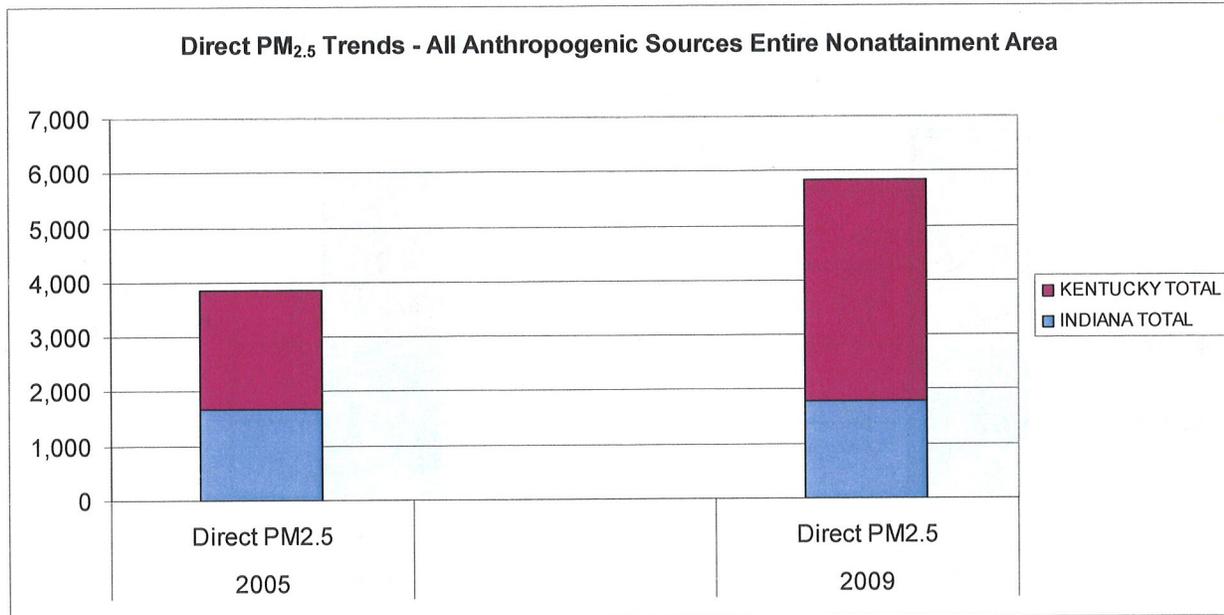


Table 5.1 shows the NO<sub>x</sub> emissions that were modeled, broken down by state and by source sectors (point, area, mobile, and non-road). The 2005 estimated emissions from each of the nonattainment counties in Indiana and Kentucky were pulled from the LADCO emissions inventory files used to support modeling (Appendix B).

**Table 5.1**  
**NO<sub>x</sub> Emissions Inventories (tons per year)**  
**Entire Nonattainment Area**

Sector	NO <sub>x</sub> 2005	NO <sub>x</sub> 2009	%Reduction 2005-2009
Area	902.69	886.77	1.76
Non-road	12,411.73	9,318.47	24.92
On-road	28,997.23	20,405.80	29.63
Point	54,310.33	54,037.26	0.50
<b>Total</b>	<b>96,621.98</b>	<b>84,648.30</b>	<b>12.39</b>

Table 5.2 shows the SO<sub>2</sub> emissions that were modeled, broken down by state and by source sectors (point, area, mobile, and non-road). The projected 2009 emissions from each of the nonattainment counties in Indiana and Kentucky were pulled from the LADCO emissions inventory files used to support modeling (Appendix B). Though the 2009 emissions data for the nonattainment area reflects conservative assumptions, the Louisville area will benefit greatly from regional emissions reductions as reflected in Figure 5.1 and 5.2. Furthermore, point source

SO<sub>2</sub> emissions will decrease substantially within the nonattainment area beginning in 2010 as a result of SO<sub>2</sub> scrubbers going on-line on Indiana Kentucky Electric Company - Clifty Creek Station's six electric generating units located in Madison Township, Jefferson County, Indiana.

**Table 5.2**  
**SO<sub>2</sub> Emissions Inventories (tons per year)**  
**Entire Nonattainment Area**

<b>Sector</b>	<b>SO<sub>2</sub> 2005</b>	<b>SO<sub>2</sub> 2009</b>	<b>%Reduction 2005-2009</b>
Area	462.84	409.46	11.53
Non-road	1,389.08	672.03	51.62
On-road	577.84	145.62	74.80
Point	179,161.06	194,594.23	-8.61
<b>Total</b>	<b>181,590.82</b>	<b>195,821.34</b>	<b>-7.84</b>

Table 5.3 shows the PM<sub>2.5</sub> emissions that were modeled, broken down by state and by source sectors (point, area, mobile, and non-road). The 2005 estimated emissions from each of the nonattainment counties in Indiana and Kentucky were pulled from the LADCO emissions inventory files used to support modeling (Appendix B).

**Table 5.3**  
**PM<sub>2.5</sub> Emissions Inventories (tons per year)**  
**Entire Nonattainment Area**

<b>Sector</b>	<b>Direct PM<sub>2.5</sub> 2005</b>	<b>Direct PM<sub>2.5</sub> 2009</b>	<b>%Reduction 2005-2009</b>
Area	754.01	688.20	8.73%
Non-road	842.19	660.22	21.61%
On-road	442.27	337.04	23.79%
Point	1,812.46	4,159.21	-129.48%
<b>Total</b>	<b>3,850.93</b>	<b>5,844.67</b>	<b>-51.77%</b>

The CAIR rule provides annual state caps for NO<sub>x</sub> and SO<sub>2</sub> in two phases, with the Phase I caps for NO<sub>x</sub> and SO<sub>2</sub> starting in 2009 and 2010, respectively. In response to U.S. EPA's rulemaking, IDEM adopted its state rule in 2006 based on the federal rule. IDEM's rule includes an annual and seasonal NO<sub>x</sub> trading program and an annual SO<sub>2</sub> trading program. Indiana's NO<sub>x</sub> and SO<sub>2</sub> EGU budgets are shown in Table 5.4. EGU reductions occurring outside of the Louisville KY-IN fine particle nonattainment area will have a positive affect on the area.