

Several observations can be made by an examination of annual averages of PM<sub>2.5</sub> obtained from monitoring sites in SW Indiana and northern Kentucky (Figure 1, Figure 2, Table 1):

- The background monitor at the Purdue Agricultural Center in Knox County (and outside of the Evansville-Henderson-Owensboro Air Quality Control Region) measures the lowest average compared to all other sites (exception in 2002 by the EVV collocated, and 2003 by the Bend Gate monitor in Henderson.)
- All monitors in the region with the notable exception of the monitor at the Purdue Agricultural Center display robust decreasing trends (Figure 3).
- The Knox County monitor at the Purdue site averages just under 14  $\mu\text{g}/\text{m}^3$ .
- The monitor in Jasper measures higher values (by at least 1  $\mu\text{g}/\text{m}^3$ ) than the monitors in Evansville, Henderson, or Owensboro.

Several conclusions can be drawn from these observations:

- ✓ The regional background value of PM<sub>2.5</sub> is relatively high (approximately 14  $\mu\text{g}/\text{m}^3$ .) This is consistent with other areas in the Midwest where urban/rural monitor pairs were compared.
- ✓ The Knox County monitor is not tracking the improving trends of the other monitors.
- ✓ That all other monitors display parallel trends is a good indicator that they are sited in the same airshed.
- ✓ In 2003, local emissions sources other than power plants within the air quality control region were responsible for less than 1  $\mu\text{g}/\text{m}^3$  of the PM<sub>2.5</sub> annual average.
- ✓ The Jasper monitor is registering a localized effect.

An evaluation of emissions inventories values (Figure 4) and trends (Table 2), and comparisons with speciation data (Figure 6) within the air quality control region provides insight on the cause of monitored PM<sub>2.5</sub> annual values near the NAAQS.

- Emissions of primary PM<sub>2.5</sub> and the precursors of NO<sub>x</sub>, and SO<sub>2</sub> overwhelmingly originate from electric generating units in the region. (Compare the location of power plants in the region Figure 5, with the counties with large SO<sub>2</sub> emissions in Figure 4c.)

- Emissions of VOCs are highest in the most populated counties.
- Dubois County has anomalously high emissions of NH<sub>3</sub> due to a large number of animal feeding operations located in that county.
- Utilities have reduced their emissions of NO<sub>x</sub>, and SO<sub>2</sub> dramatically.
- PM<sub>2.5</sub> is dominated by nitrates in the winter and sulfates in the summer.

Conclusions that can be reached:

- ✓ Urban population and VOCs do not contribute significantly to monitored PM values, otherwise the highest monitored values would be seen Vanderburgh County IN, and Daviess County KY.
- ✓ Utility emissions are the dominant source of PM<sub>2.5</sub> in the airshed.
- ✓ As utility emissions have been declining, so have monitored PM<sub>2.5</sub> levels.

Three hypotheses are proposed to explain the localized elevated PM<sub>2.5</sub> readings in Jasper:

1. The monitor is improperly sited too close to heavy truck traffic.
2. The monitor is recording elevated PM<sub>2.5</sub> levels from the specialized industry (furniture manufacturing) concentrated in Jasper.
3. The monitor is feeling the effects of elevated NH<sub>3</sub> emissions in Dubois County.

Hypotheses 2 and 3 can be ruled out based on the following information: Figure 7 shows the difference between the monthly averages (for the years 2000-2003) from the Jasper and Dale monitors. With the exception of July, the Jasper monitor displays consistently higher values. Annually, several of the industrial emissions sources in Jasper have plant wide shut downs in July. Therefore, the negative difference in July could be explained by decreased emissions and/or decreased truck traffic. The lower PM in July is not likely to be related to lowered emissions. The emissions from the furniture industry account for slightly elevated VOC emissions in Dubois County, but, if VOC emissions were to be held accountable, Vanderburgh and Daviess counties should display higher PM values. NH<sub>3</sub> emissions can also be ruled out as the explanation for elevated PM levels in Jasper because animal feeding operations do not shut down in July.

At immediate issue is whether Vanderburgh County and other Indiana Counties in the airshed should be designated in nonattainment of the PM<sub>2.5</sub> NAAQS.

- ✓ 2004 Monitor data from Vanderburgh, Dubois, and Spencer Counties show the trend towards lower PM2.5 values continues (Table 3).
- ✓ This trend is not surprising, as utilities are continuing to reduce both their NOx and SO<sub>2</sub> emissions.
- ✓ In the years to come, emissions inventories of primary PM2.5 and PM2.5 precursors in the region will continue to get smaller as additional reductions from power plants are guaranteed.
- ✓ 2002-2004 design values calculated for all three monitors in Vanderburgh County show compliance with the NAAQS.

**THEREFORE, Vanderburgh County, and all others in SW Indiana that USEPA proposed be in nonattainment for the PM2.5 standard should be designated in ATTAINMENT. This includes Dubois County because the violation in Jasper is due to an improperly sited monitor that is measuring hotspot vehicular exhaust, rather than representative ambient PM2.5 values.**