4.0 Analyses of Individual Nonattainment Area

4.7 Region 7 Nonattainment Areas

4.7.1 Iowa

Iowa Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standard

The table below identifies the counties in Iowa that EPA has designated as not attaining the 2006 24-hour fine particle ($PM_{2.5}$) standard.[1] A county (or part thereof) is designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard in a nearby area.

Area	Iowa Recommended Nonattainment Counties	EPA's Designated Nonattainment Counties
Davenport, IA	Scott County (partial) A portion of the City of Davenport described as follows: Northern Boundary = West Locust Street, to: Western Boundary = North Utah Avenue / South Utah Avenue Southern Boundary = U.S. Highway 61 (locally known as West River Drive), to: Eastern Boundary = Schmidt Road to: Rockingham Road, to: South Pine Street, to: North Pine Street, to: West 3rd Street, to: Waverly Road, ending at West Locus Street	Scott County (partial) Entire townships: Buffalo, Davenport, Pleasant Valley, Sheridan Partial townships: 1) Blue Grass a) portion contained within the city limits of Blue Grass b) portion contained within the city limits of Davenport 2) Hickory Grove a) portion contained within the city limits of Davenport 3) Lincoln a) portion contained within the city limits of Davenport

EPA has designated the remaining counties in the state as "unclassifiable/attainment."

[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour PM2.5 standard was revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for PM2.5 remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

EPA Technical Analysis for Davenport, Iowa

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to the violations. This technical analysis for Davenport, Iowa identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

EPA also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas. (See additional discussion of the CES under factor 1 below.)

Figure A is a map of the counties in the vicinity of the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

Davenport-Moline-Rock Island , IA-IL 2006 24-hr $PM_{2.5}$ Nonattainment Area

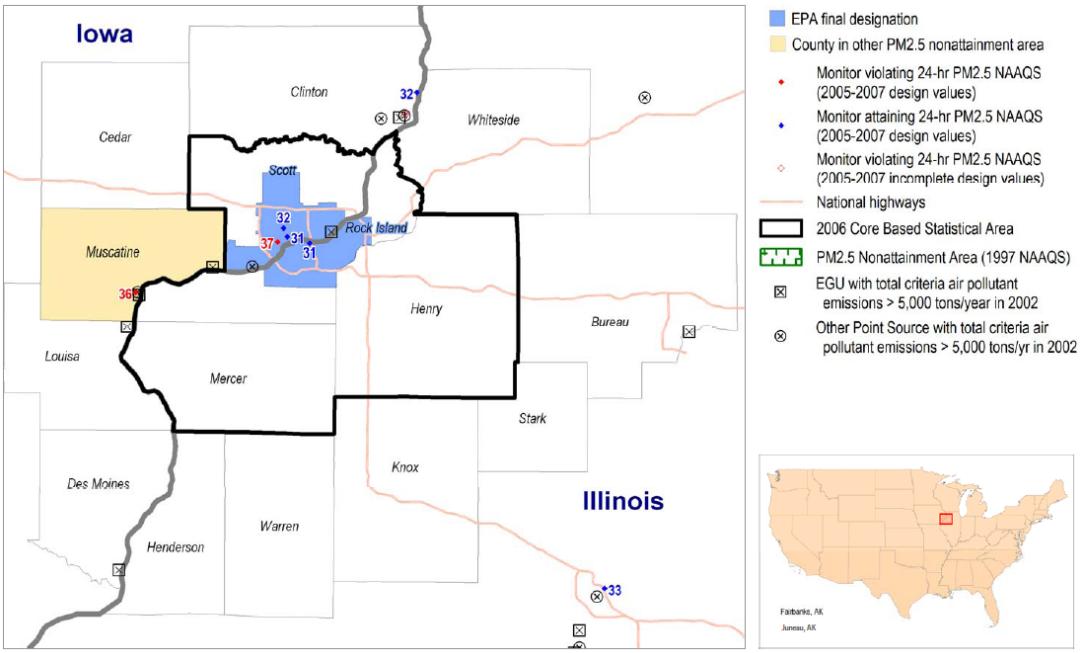

Figure A

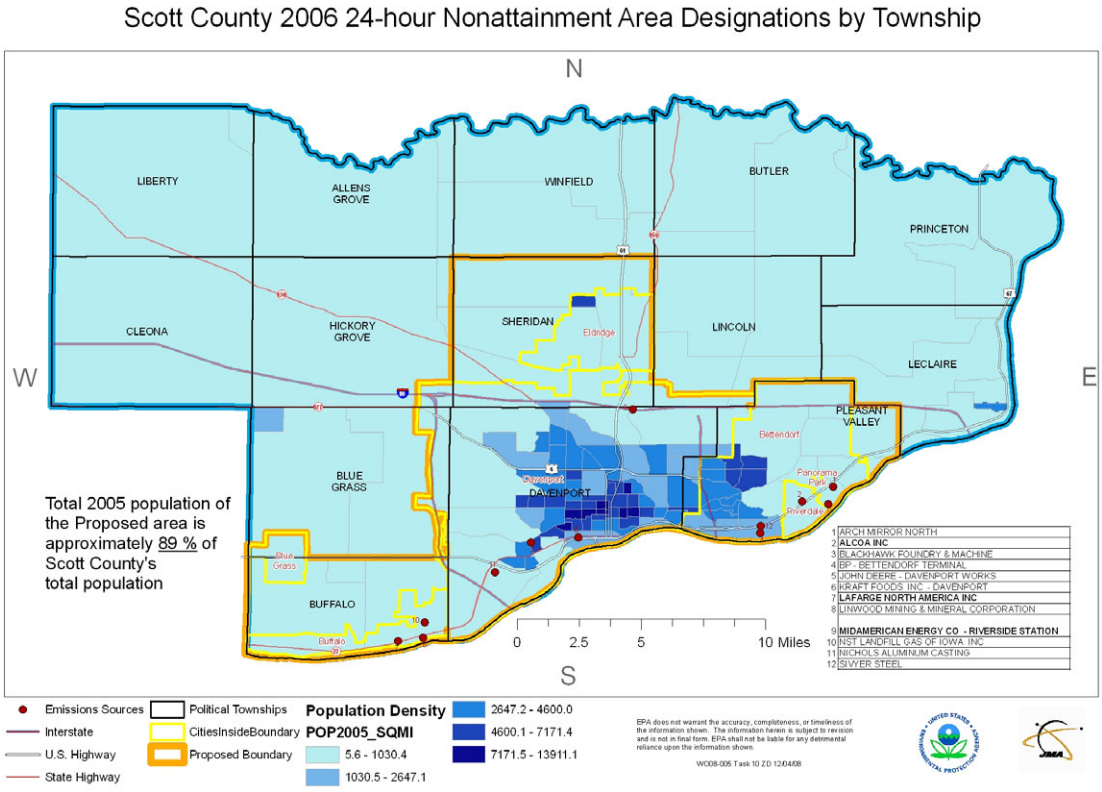

Figure B- Nonattainment Area Designation Boundary. Final boundary is noted in orange.

In a letter dated November 2007, Iowa recommended that all of the counties in Iowa be designated as attainment based on air quality data from 2004-2006. EPA determined that a monitor in Scott County, Iowa, had a violation of the 2006 24-hour $PM_{2.5}$ standards based on air quality data from 2005-2007. In response to EPA's notification of this new violation and the request for a designation recommendation, in a letter dated May 30, 2008, Iowa recommended that EPA delay promulgating any designation for Scott County for one year. In a subsequent letter, dated July 29, 2008, Iowa requested that, if EPA could not grant a one-year extension of the designation, that EPA designate only a portion of Scott County as nonattainment for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2005-2007. All air quality data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state.

EPA found that there was sufficient information to make a designation determination. (Extensions of the statutory deadline for initial designations are based on sufficiency of monitoring data, and sufficient monitoring data exists, as described in this TSD.) EPA took Iowa's recommendation to designate nonattainment a portion of the City of Davenport in Scott County under consideration, but finds that the information provided does not adequately support the designation as recommended by the State, but instead supports a larger partial county designation as shown in Figure B. Section 107 of the Clean Air Act defines a nonattainment area as an area that is violating the standard or an area that is contributing to the violation. The following is a technical analysis for the Iowa (EPA Region 7) portion of the Davenport area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration. Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area with a monitored violation. Note that this metric is not the exclusive analytical tool used for considering data for these factors. A summary of the CES is included in

attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutant components (given in tons per year) and the CES for violating and potentially contributing counties in the Davenport area. Counties are listed in descending order by CES.

County	**State Recommended Nonattainment?**	**CES**	**$PM_{2.5}$ emissions total (tpy)**	**$PM_{2.5}$ emissions carbon (tpy)**	**$PM_{2.5}$ emissions other (tpy)**	**SO_2 (tpy)**	**NOx (tpy)**	**NH_3 (tpy)**	**VOCs (tpy)**
Scott, IA	Yes, Partial	100	2,034	395	1,639	9,173	11,317	1,986	9,323
Muscatine, IA	Yes, Partial	80	1,702	283	1,419	27,020	10,717	1,083	4,910
Clinton, IA	No	52	2,711	354	2,357	11,506	13,217	4,870	11,503
Rock Island, IL	No	27	932	269	663	2,169	6,140	664	7,359
Henry, IL	No	7	1,273	252	1,021	268	6,648	2,805	3,431
Mercer, IL	No	4	793	149	644	133	1,120	1,026	1,469

Table 1- $PM_{2.5}$ Related Emissions and Contributing Emissions Score

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants' components (given in tons per year (tpy)) and the CES for violating and potentially contributing counties in the Davenport area. A review of this data shows that Iowa counties contribute 68% of the total $PM_{2.5}$ emissions, 97% of the total SO_2 emissions, 71% of the total NO_x emissions and 68% of the total VOC emissions in the areas EPA evaluated for this designation. Although emissions from Clinton County, IA (especially for SO_2 and NOx) are greater than those of Scott County, IA, the EPA eliminated Clinton County, IA from consideration for inclusion into the Davenport nonattainment area boundary based on a more detailed assessment of meteorology data, which is explained in greater detail under Factor 6, and information about significant reductions in emissions from sources in that areas, which is described under Factor 9 of this document.

In an August 2008 letter (the "120-day letter") EPA notified the State of its intent to designate separate nonattainment areas for Scott County, IA and Muscatine County, IA. EPA determined that these two counties are in separate Core Based Statistical Areas (CBSA) and should be separate nonattainment areas. A portion of Muscatine County, IA is being designated as a separate nonattainment area.

In addition to reviewing emissions data from a county-level, an evaluation of the emissions from local point and area sources near the violating monitor were also conducted. Because of the form of the standard (24-hour average) and the rural nature of the area surrounding Davenport, local sources are critical in terms of contributions to ambient $PM_{2.5}$ concentrations on exceedance days.

A) Point Source Emissions

Direct $PM_{2.5}$ emissions from the major sources located in Scott County and nearby areas are categorized in Table 1.1. The emissions from Iowa sources plotted in Table 1.1 was obtained from the 2002 NEI. Table 1.1 provides Scott County total emissions of direct $PM_{2.5}$ from major point sources, with emission totals in tons per year. Table 1.1 shows a value of 978.6 tpy of $PM_{2.5}$ emissions for all of Scott County. Figure 1 shows that all major point sources of direct $PM_{2.5}$ in Scott County are located within the nonattainment boundary identified above. The nonattainment area accounts for 100% of the total point sources of direct $PM_{2.5}$ emissions in Scott county compared to just 6% of the total direct $PM_{2.5}$ emissions for this area that would have been contained in the State's recommended boundary (point sources included in the State's recommended boundary are noted by an asterisk(*)).

Scott County Point Sources NEI 2002 (tons per year)				
FACILITY NAME	CITY	NOx	$PM_{2.5}$	SO_2
ARCH MIRROR NORTH	BETTENDORF	0	0.14	
LAFARGE NORTH AMERICA INC	BUFFALO	1766	76	4963
JOHN DEERE - DAVENPORT WORKS	DAVENPORT	6.206	9.29	0.175
ALCOA INC	BETTENDORF	240.5	346	1.78
NICHOLS ALUMINUM CASTING	DAVENPORT	54.08	53.8	0.26
KRAFT FOODS INC - DAVENPORT	DAVENPORT	117.6	54.1	336.2
MIDAMERICAN ENERGY CO - RIVERSIDE STATION	BETTENDORF	2102	230	2329
LINWOOD MINING & MINERAL CORPORATION	DAVENPORT	280.6	31.9	
SCOTT AREA SANITARY LANDFILL	DAVENPORT	0.005	22.9	
SIVYER STEEL	BETTENDORF	23.2	87.8	3.458
BLACKHAWK FOUNDRY & MACHINE (*)	DAVENPORT	3.064	65.9	
QUAD CITY DRUM RECYCLING COMPANY	DAVENPORT	0	0.13	
NICHOLS ALUMINUM - DAVENPORT	DAVENPORT	12.67	0.76	0.06
	TOTAL	**4606**	**979**	**7634**

Table 1.1- Emissions from Major Point Sources in Scott County.

The State asserted that several Scott County point sources could be eliminated from further study by examining their contribution of direct $PM_{2.5}$ to the 300 Wellman monitor (the violating monitor located near the Blackhawk Foundry) based on a commonly used screening method that divides distance by total emissions (Q/d). This method was used by the State to support its conclusion that a single point source nearest the violating monitor, Blackhawk Foundry, is the primary contributor to violations at this monitor. The State also conducted air dispersion modeling using AERMOD to demonstrate the potential of local point sources to contribute direct $PM_{2.5}$ emissions to the violating monitor which will be described in detail below. Generally, the State asserted that the contribution from point sources other then the Blackhawk Foundry is insignificant. The EPA can not support this position. The violating monitor location did not have speciated data available for study; therefore the State could not provide conclusive data from a filter analysis to demonstrate overwhelming contribution from the Foundry, or to confirm

insignificant contributions from other nearby sources. Even if it is correct that the Blackhawk Foundry is a "primary" contributor to ambient PM2.5 levels at the violating monitor, it is not the exclusive source of contribution to the total mass of ambient PM2.5 at that monitor. EPA concludes that additional sources in this area are also contributing to the aggregate amount of ambient PM2.5 at the violating area, as section 107(d) contemplates that term.

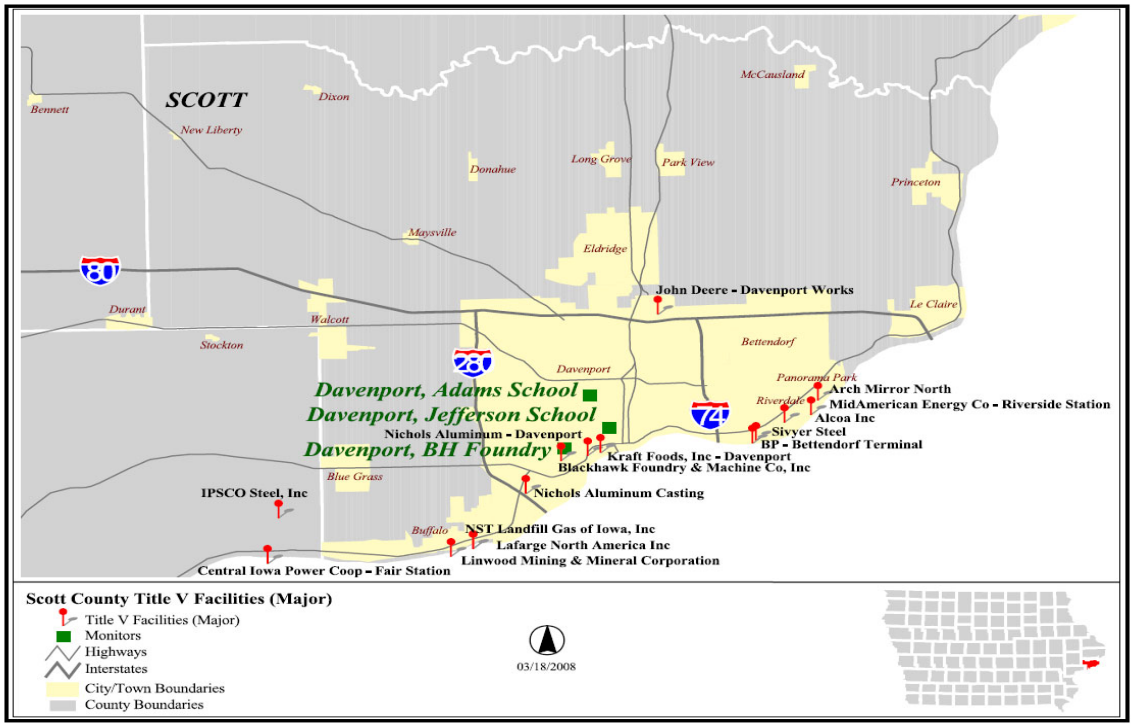

Figure 1- Point sources in Scott County, IA.

B) Other Source Emissions

EPA also examined other sources of emissions utilizing 2002 NEI. The other emissions are grouped into three source categories: onroad, offroad, nonpoint sources (also known as area sources). In the charts and discussion below, these three categories are compared to the point source emissions already discussed. The onroad source generally characterizes the tailpipe emissions associated with typical interstate, highway, and secondary roadway traffic. Typical offroad sources include construction, mining, and agricultural vehicular emissions. The nonpoint source category is largely derived using population density to determine emissions, but also includes dust from paved and unpaved roads, agricultural tilling, and construction projects (roads, buildings sites etc.).

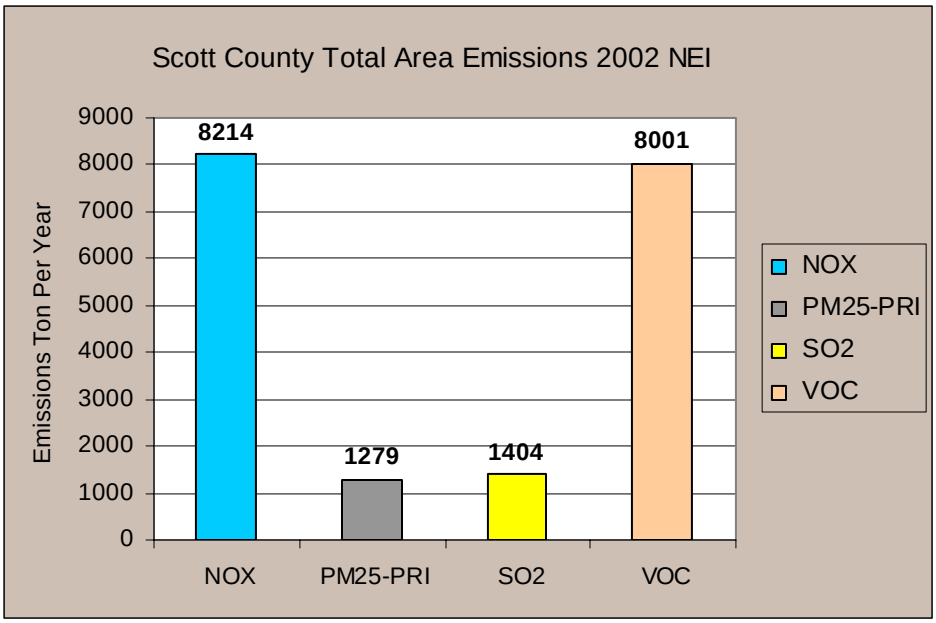

Figure 1.1-Area Source (also known as Nonpoint Source) Emissions, Scott County

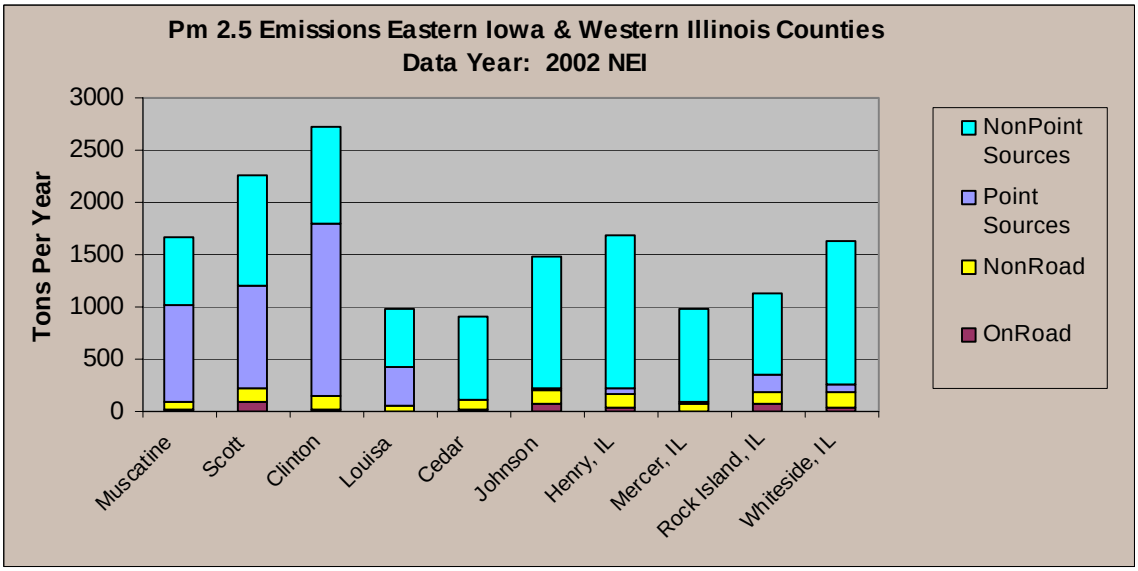

Figure 1.2-Total $PM_{2.5}$ Emissions, Scott County.

In Scott County, nonpoint source direct $PM_{2.5}$ emissions are almost half of the total county emissions, as shown in Figure 1.2, and are roughly equivalent to point source emissions. Outside of rural-based agricultural activities, such as tilling and road dust, much of this direct $PM_{2.5}$ is attributed to area sources that are based on population activities. EPA's promulgated nonattainment area boundary captures 89% of the population in Scott County, so a majority of the population-based area sources are captured in the nonattainment area boundary.

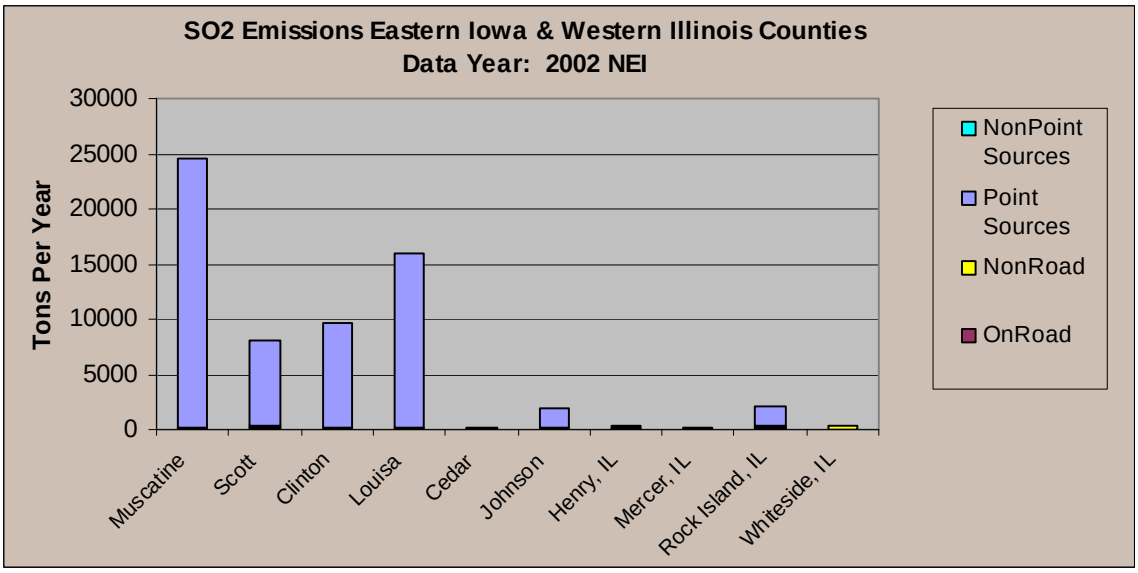

Figure 1.3-SO_2 Emissions from Various Source Categories, Compiled from EPA's 2002 NEI.

A review of the emission inventories reveals that SO_2 emissions are predominantly produced by electrical generating units and other industrial (major point source) coal-fired boilers (see Figure 1.3). All of the large Scott County point sources are contained within the boundary designated as nonattainment by the EPA, in order to encompass the sources that may be contributing to violations in the area to ensure an adequate boundary for evaluation of potential control strategies for the area.

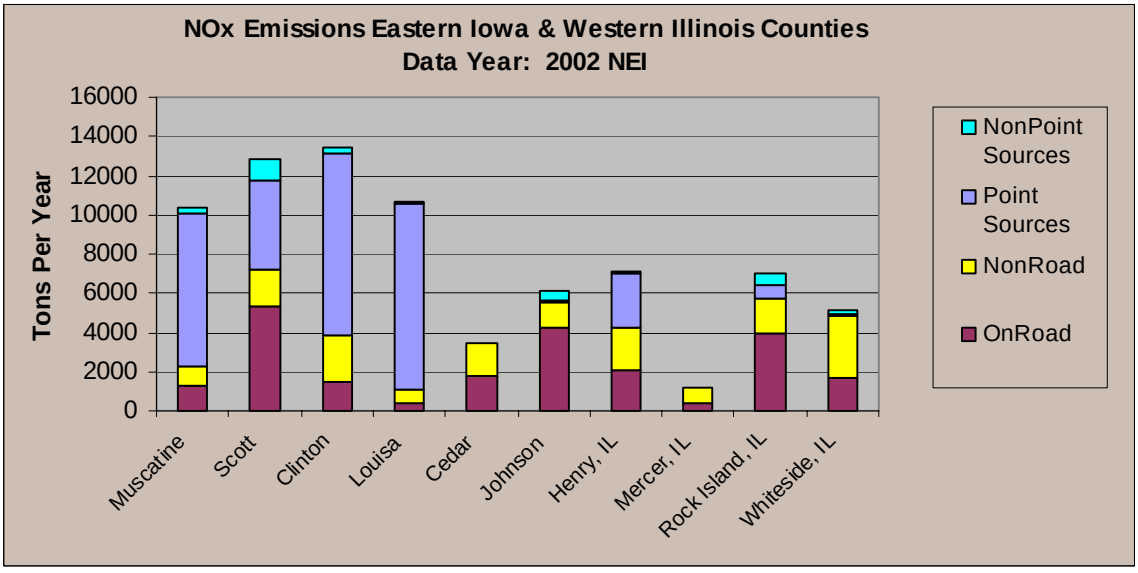

Figure 1.4- NO_x Emissions from Various Source Categories, Compiled from EPA's 2002 NEI.

The distribution of NO_x emissions among source categories is shown in Figure 1.4. Onroad and offroad NO_x emissions from vehicles contribute a significant percentage of the county emission inventory totals in the more urbanized area. In Scott County, approximately 54% of the NO_x emissions and VOC emissions are attributable to mobile

sources. Mobile source NO_x and VOC emissions are also discussed under Factor 4 of this document. The remainder of the NO_x is attributable to the point and nonpoint source categories. EPA's promulgated nonattainment area boundary for this area encompasses the urbanized area in and around Davenport, IA and therefore captures a majority of the mobile source NO_x and $PM_{2.5}$ emissions in Scott County. For example, approximately 64% of the total highway miles in the county are within the nonattainment area boundary.

C) Modeling

As discussed below modeling analysis is not required as part of the designation process. However, the State did conduct such analysis and did provide its analysis to the EPA for review in response to EPA's 120-day letter. To demonstrate the impact of a local emissions' contribution to the violating monitor in Scott and Muscatine counties, the State conducted dispersion modeling using AERMOD and photochemical modeling using CAMx. This detailed information was submitted to the EPA in October of 2008 for review. AERMOD was used to demonstrate the importance of nearby sources in contributing to monitored exceedances. The State ran separate AERMOD simulations to compare predicted concentrations with monitored data for the years 2005-2007. For each of the three years, a simulation was run for each of the three monitors in the Davenport area (Jefferson, Adams and 300 Wellman) totaling nine simulations. Each simulation included a 60 degree arc of receptors (the Blackhawk receptor arc), equidistant from Blackhawk Foundry's Cupola stack, centered on the 300 Wellman monitor. The State utilized emissions inputs based on the actual $PM_{2.5}$ emission rate estimates for sources at the Foundry only.

	Monitored Concentrations			Blackhawk's Predicted Concentration at Monitor Locations			Net Background Concentrations		Equivalent Average Background	Total Predicted Concentration	Difference Between Modeled and Observed Concentrations		Attributable to Blackhawk Foundry
Date	Blackhawk	Jefferson	Adams	Blackhawk	Jefferson	Adams	Jefferson	Adams			Magnitude	Percentage	Percentage
2/3/2005	40.0	37.0	34.9	4.0	1.9	0.1	35.1	34.8	35.0	39.0	-1.0	-3%	10%
6/24/2005	36.8	30.5	31.4	13.8	1.8	1.3	28.7	30.1	29.4	43.2	6.4	17%	32%
6/27/2005	41.7	37.6	37.5	10.5	0.5	0.7	37.1	36.8	37.0	47.5	5.8	14%	22%
8/2/2005	50.5	44.0	44.5	10.9	0.1	1.2	43.9	43.3	43.6	54.5	4.0	8%	20%
9/13/2005	41.2	24.2		9.3	2.1	1.1	22.1		22.1	31.4	-9.8	-24%	30%
11/25/2006	36.2	38.0	35.4	10.7	1.8	1.0	36.2	34.4	35.3	46.0	9.8	27%	23%
6/16/2007	35.6			4.1	0.1	0.0			32.0	36.1	0.5	1%	11%
7/26/2007	36.0	28.1	30.3	10.0	1.3	0.6	26.8	29.7	28.3	38.2	2.2	6%	26%
9/21/2007	37.4	23.9	24.2	12.8	1.8	1.1	22.1	23.1	22.6	35.3	-2.1	-6%	36%
11/19/2007	39.1	27.4		6.4	0.9	0.6	26.5		26.5	33.0	-6.1	-16%	20%
11/20/2007	38.3	35.8	34.3	3.7	0.4	0.4	35.4	33.9	34.7	38.3	0.0	0%	10%
12/17/2007	38.2	28.5	31.9	10.8	1.6	1.1	26.9	30.8	28.8	39.6	1.4	4%	27%

Table 1.2- Quantification of Blackhawk Foundry's contribution to total monitored $PM_{2.5}$ concentrations on exceedance days at the 300 Wellman monitor. Predicted concentrations from using AERMOD.

The State also conducted additional AERMOD runs to examine the impact from other local sources in the Davenport Area. The State noted that the highest-eighth-highest (H8H) AERMOD predicted value for all facilities combined is 16.26 $\mu g/m^3$, of which 95% is attributable to Blackhawk Foundry. If Blackhawk Foundry is removed from the analysis, the H8H occurs on a different day, and is reduced to 5.51 $\mu g/m^3$. If several other point sources located nearer the violating monitor (Rich Metals and Nestle Purina) are removed from the analysis, the H8H occurs on a different day, and is reduced to 1.60

$\mu g/m^3$. From these data the State asserts that the point sources in the Davenport area, other than the Blackhawk Foundry, have little contribution to the violating monitor.

EPA disagrees with the State's assertion for several reasons. The State's emissions inputs to the model are based on actual emissions estimates representing a single year, and thus do not represent potential impacts from a range of emissions activity at all of the sources that have occurred in the past and that are likely to continue in the future. Additionally, for the base elevation and downwash parameters used for all sources other than Blackhawk Foundry, the State used AERMAP and DEM files to determine the base elevations, excluding downwash, resulting in less conclusive results of impacts to the monitor. For these reasons, EPA concluded that due to these uncertainties it could not support the State's assertion that the contributions from sources other than Blackhawk Foundry are minimal. Therefore, EPA cannot support the State's proposed nonattainment area boundary and believes the appropriate boundary should include a much broader set of sources of PM2.5, NO_x, and SO_2 emissions in the local area.

In addition to AERMOD, the State conducted a CAMX modeling technique known as zero out to eliminate all anthropogenic emissions from sources from grid cells which correspond to geographic areas of interest such as Scott County, IA. This type of modeling was used to provide data regarding the impacts of longer-range transport, the importance of precursor gases, and the aggregate role of sources in the area. These models are not yet capable of reliably assessing the impacts of a single source at the source receptor distances encountered in Scott County (approximately 150 – 500 meters).

Round	Area	Source Sectors	Pollutants
Rock Island	Rock Island County	All Anthropogenic	NO_x,SO_2,Fine Primary
Scott County 1	Rural Scott County	All Anthropogenic	NO_x,SO_2,Fine Primary
Scott County 2	Quad Cities Metro	Onroad	All
Muscatine County	Rural Muscatine County	All Anthropogenic	NO_x,SO_2,Fine Primary

Table 1.3 -Description of Zero-out Modeling Sensitivity Runs.

In this analysis all anthropogenic SO_2, NO_x, and primary fine particle emissions outside the metro area in Scott County were zeroed out. Pollutant emissions from elevated point sources outside the city limits, namely Linwood Mining and Mineral Corp., John Deere-Davenport Works, Scott County Sanitary Landfill, and Lafarge North America, were also zeroed out. Using data from this analysis the State asserted that rural Scott County contributed on average 1-3% of the total $PM_{2.5}$ on modeled violating days.

A second photochemical modeling analysis provided by the State was based upon the use of the Particulate Source Apportionment Technique (PSAT) capability of the CAMx modeling system. This is a method for investigating how defined regions and selected sources contribute to particulate matter formation at any given receptor. EPA Region 7, with assistance from the Kansas Department of Health and Environment (KDHE), implemented a PSAT simulation to augment the zero-out modeling runs conducted by the State of Iowa. In this instance, the PSAT analysis is only intended to provide examination of the local contribution to secondary formation. The State analyzed the data provided by this simulation to develop its response to EPA's 120-day letter.

Figure 1.5 and Figure 1.6, show that PSAT estimates approximately 83% of particulate sulfate and 76% of particulate nitrate originate from emissions in the continental U.S. for concentrations at or above the 98th percentile at the 300 Wellman monitor receptor location. On these same days, less than 1% of the sulfates and less than 1% of the nitrates are attributable to Scott County. These results demonstrate that long-range transport is the dominant contributor to the high sulfate and nitrate concentrations. Based on this analysis, the State asserts that the contribution from Scott County to secondary formation is relatively low, on the order of 1 to 3 % for secondary sulfate and nitrate components of total $PM_{2.5}$ contributed by the Scott County point sources of $PM_{2.5}$ precursors.

The presence of long range transport to the Davenport area does not negate the fact that there is a violating monitor in the area, nor EPA's obligation under section 107(d) is to designate as nonattainment to the area that is violating, and the nearby areas that are contributing to that violation. Therefore, EPA must evaluate what nearby emissions and emissions activities in the Davenport area are contributing to violations based upon the facts and circumstances in this specific area. EPA concludes that the modeling results submitted by the State lend support to focusing primarily on the sources of direct $PM_{2.5}$ emissions that may contribute to the violations at the 300 Wellman site, and to a lesser extent on sources of NOx and SO2 in the surrounding area that may be contributing in addition to the amount from long-range transport. EPA concludes that the modeling provided by the State for the purpose of informing designations adds to the understanding of the potential local contribution to secondarily formed $PM_{2.5}$, and to the weight of evidence used by EPA to establish final boundaries. However, the results cannot be interpreted alone as being highly determinative because the databases and methods used in the State-submitted photochemical simulations (e.g. grid cell resolution and lack of performance evaluation) introduce significant uncertainties. EPA expects that these uncertainties can be addressed by more thorough modeling in a future $PM_{2.5}$ State Implementation Plan.

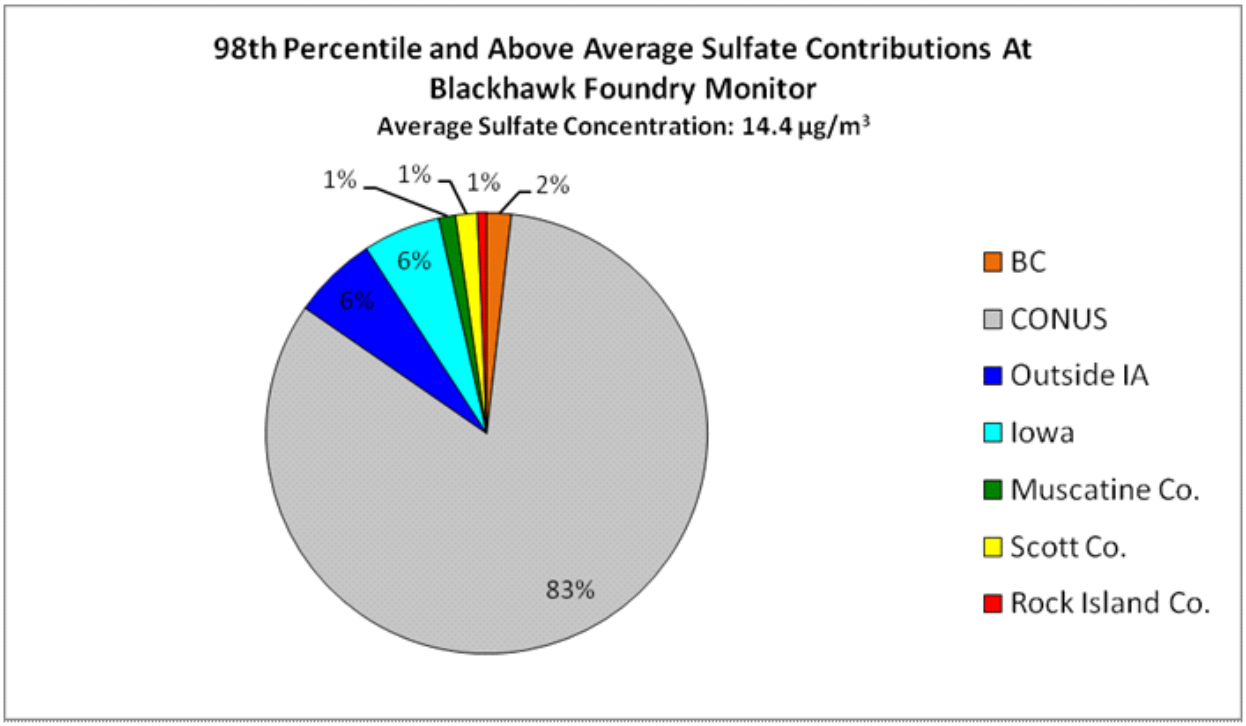

Figure 1.5 -Average sulfate contributions by source region at the Blackhawk Foundry (300 Wellman) monitor for 98th percentile and above sulfate concentrations estimated by CAMx PSAT.

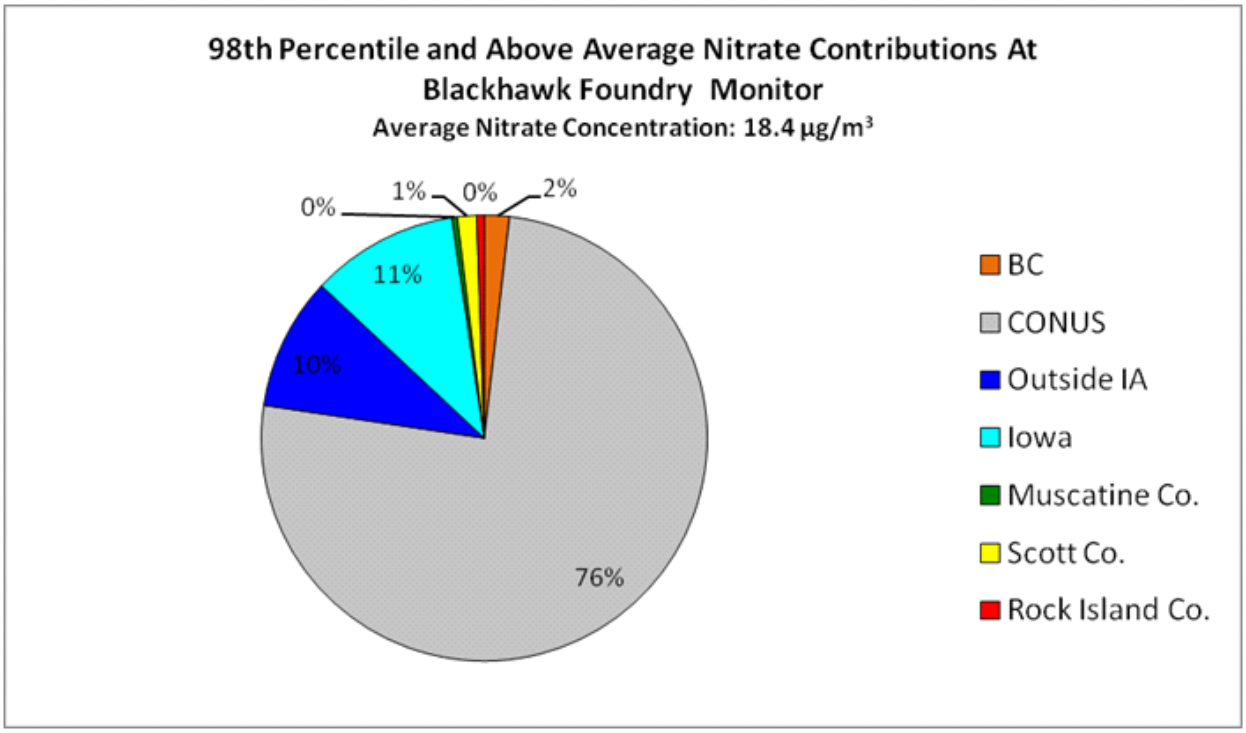

Figure 1.6-Average nitrate contributions by source region at the Blackhawk Foundry (300 Wellman) monitor for 98th percentile and above nitrate concentrations estimated by CAMx PSAT.

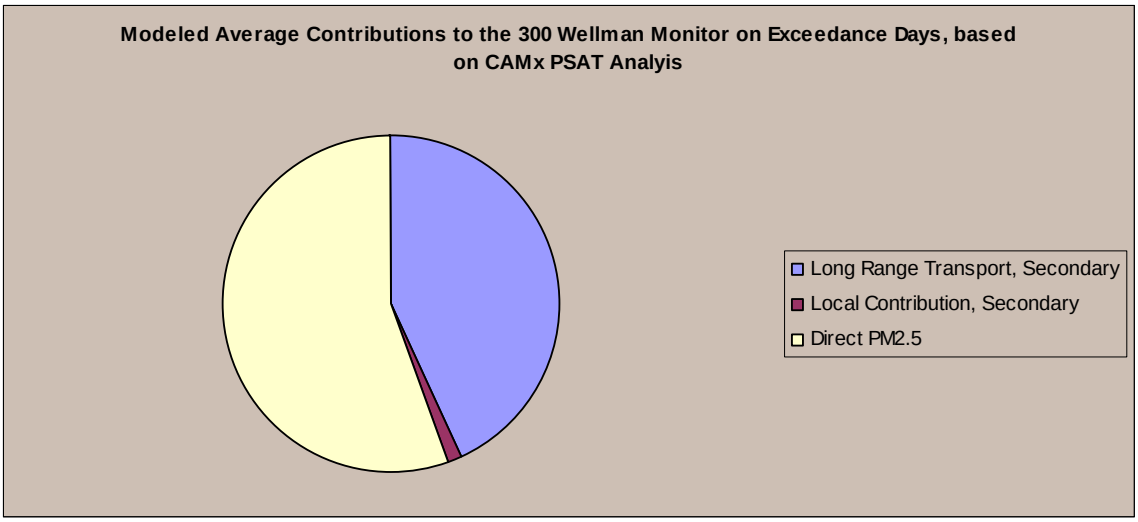

Figure 1.7- Modeled Average Contributions to the Blackhawk Foundry (300 Wellman) monitor.

Summary of Factor 1, Emissions Data

In summary, after review of emissions data, modeling data, and consideration of the dominant wind direction associated with the local exceedance events at the 300 Wellman monitor (see Factor 6), EPA has determined that nearby emissions of direct PM2.5 and sources of SO2 (sulfate) and NOx (nitrate), primarily from long-range transport, have a large impact on the violating monitor during exceedance events, and that the contribution from rural Scott County is low. EPA determined that inclusion of the local PM2.5 emissions, including point sources in the local area, is a highly significant consideration in establishing the nonattainment boundaries. For Scott County, the boundary includes all of the local point sources of direct PM2.5 and SO_2.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Davenport Area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met. The 24-hour $PM_{2.5}$ design values for counties in the Davenport Area are shown in Table 2.

County	State Recommended Nonattainment?	Design Values 2004-06(μg/m^3)	Design Values 2005-07(μg/m^3)
Scott, IA*	Partial	32	**37**
Rock Island, IL	No	30	31
Henry, IL	No	**	**
Mercer, IL	No	**	**
Muscatine, IA	Partial	34	**36**
Clinton, IA	No	34	32

*There are a total of three (3) $PM_{2.5}$ monitors in Scott County, IA. The only monitor reflected in this table is the violating monitor.
** There are no $PM_{2.5}$ monitoring stations in this county; therefore there are no monitoring values.

Table 2.-Air Quality Data

The 300 Wellman Street monitor in Scott County exceeds the 24-hour $PM_{2.5}$ standard with a design value of 37 μg/m^3. $PM_{2.5}$ monitoring at this site began in 2005, thus no trends in design values are available at this time. The design values at the 10th and Vine and Adams School monitors in Scott County are below the current level of the NAAQS. Although there is only one violating monitor in Scott County, IA, the absence of a violating monitor, alone, is not a sufficient reason to eliminate other areas, which may be contributing to the violation. Other areas are evaluated based on the weight of evidence of all nine factors and other relevant information.

Previous year design values for the Scott County monitors are shown in Table 2 and Figure 2. Design values at the 10th and Vine and Adams School monitors are, and have been, below the current level of the NAAQS. Design values between the 10th and Vine and Adams School monitors have differed by at most 2 μg/m^3 over the 2001–2007 period. The importance of direct $PM_{2.5}$ emissions from sources near the 300 Wellman monitor are easily discernable, given the proximity of the monitors and the range in the 2005-2007 design values (Figure 2.1). However, the ambient PM2.5 at that monitor is not exclusively the result of such emissions, and is the result of cumulative impacts from emissions elsewhere, including emissions of PM2.5 and PM2.5 precursors from other sources in the Davenport area as well as from more distant sources.

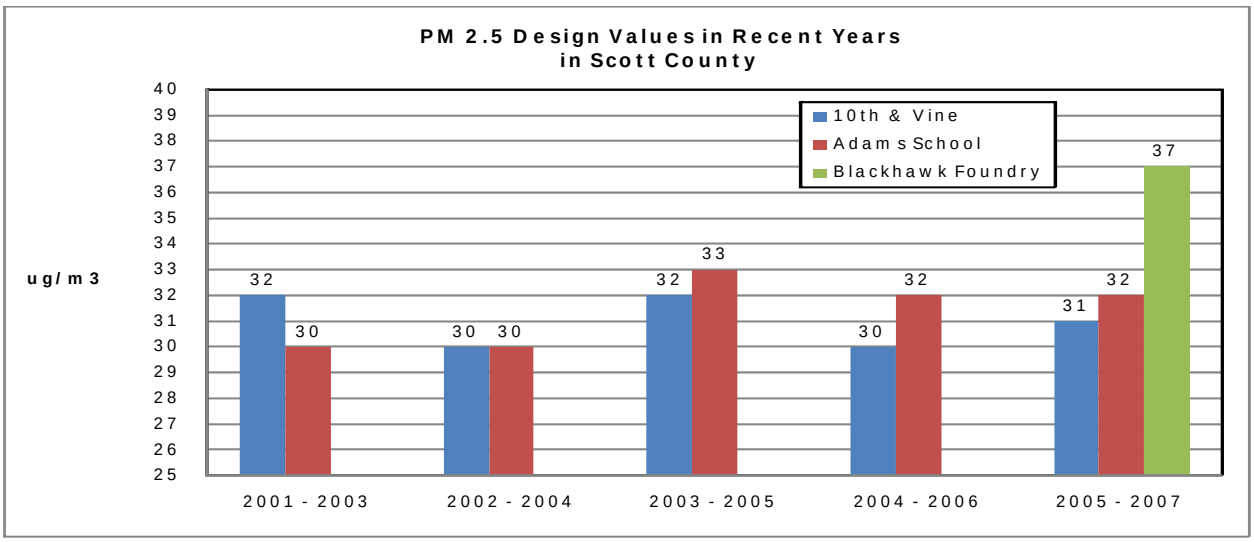

Figure 2-Comparison of Recent Design Values for the Scott County Monitors.

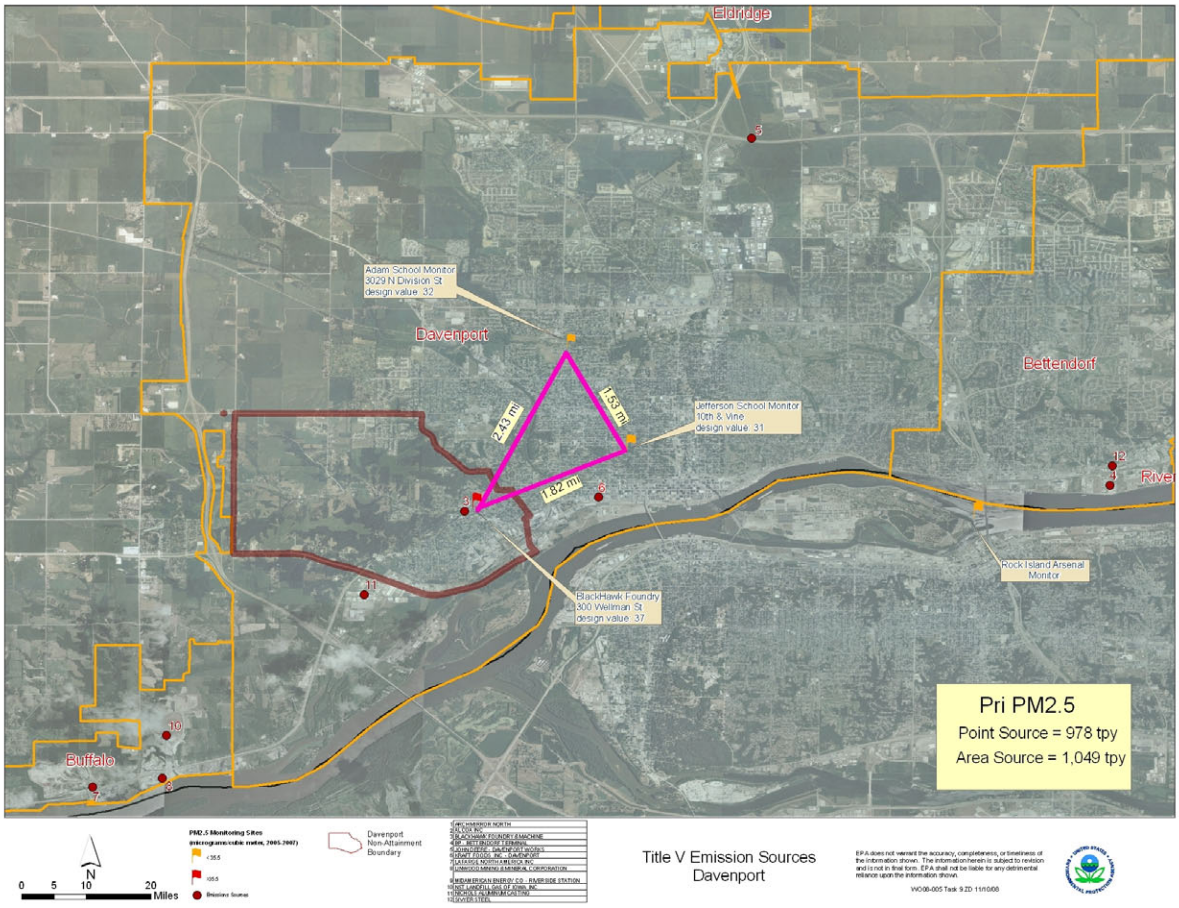

Figure 2.1 -Spatial distance of Davenport monitoring locations

A closer view of the three $PM_{2.5}$ monitor locations in Scott County, along with their respective design values, is provided in Figure 2.1. Figure 2.1 includes the location of Scott County's major point source facilities, shown by red dots, near the three monitor sites. A 5 μg/m3 difference in design value is observed between the 300 Wellman and the 10th & Vine monitor. The 10th and Vine monitor is situated approximately 1.8 miles to the northeast of the 300 Wellman monitor. Such differences in design values over a relatively small distance are usually indicative of localized contributions from sources near a monitor. As shown in Figure 2.1, the nearest major source to the 300 Wellman monitor is Blackhawk Foundry. It has been shown through modeling (under Factor 1) that the Foundry's emissions affect the 300 Wellman monitor, however contributions from other local sources cannot be excluded from consideration due to their proximity to the violating monitor and uncertainties in the modeling previously discussed. That emissions from the Blackhawk Foundry impact the monitor is not really in dispute; the question for purposes of designations is what other nearby areas are also contributing to the violation at that monitor. The potential for multiple sources to impact the violating monitor is part of EPA's basis for including a broader area partial county boundary. Inclusion of contributing sources will assure proper consideration of all such sources during the development of the nonattainment area SIP for this area.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the total concentrations of the chemical composition at the speciation monitor in Davenport located at 10th and Vine Streets, for the cold season, are as follows: 26% sulfate, 17% carbonaceous $PM_{2.5}$, 55% nitrate and 2% crustal. For the warm season, the total concentrations of the chemical composition at the speciation monitor in Davenport located at 10th and Vine Streets, are as follows: 77% sulfate, 20% carbonaceous $PM_{2.5}$, 0% nitrate and 2% crustal. The speciation data from this monitoring location indicate a strong precursor influence on the monitor, as discussed under Factor 1, which is primarily attributed to long range transport.

EPA also conducted positive matrix factorization (PMF) analysis from speciation data available the 10^{th} and Vine monitor located approximately 1.8 miles to the northeast of the violating 300 Wellman monitor. The 10^{th} and Vine monitor is also located near a significant point source. EPA conducted this analysis in an effort to evaluate the PSAT modeling analysis from the State (indicating large secondary formation component to the violating monitor) and to establish if source signatures were present at a monitor some distance from the violating monitor. The PMF data was analyzed for days when the 24-hour average at the violating monitor exceeded 35 ug/m3. As shown in Figure 2.2, on exceedance days secondary particulate matter (sulfate and nitrate) accounted for 74% of the filter mass, with totals potentially greater if one considers the contribution of secondarily formed organic carbon. Two unique sources, a calcium source and an iron/manganese source, contributed 2% and 3% respectively to the apportioned mass at the 10^{th} and Vine monitor. It is also likely that a portion of the organic carbon profile obtained from the PMF analysis is attributable to operations at the Blackhawk Foundry due to the presence of coking operations at the facility. From this analysis EPA concluded that the same calcium source(s) were likely to influence the nearby violating

monitor, indicating that point sources other than Blackhawk Foundry potentially influence the violating monitor.

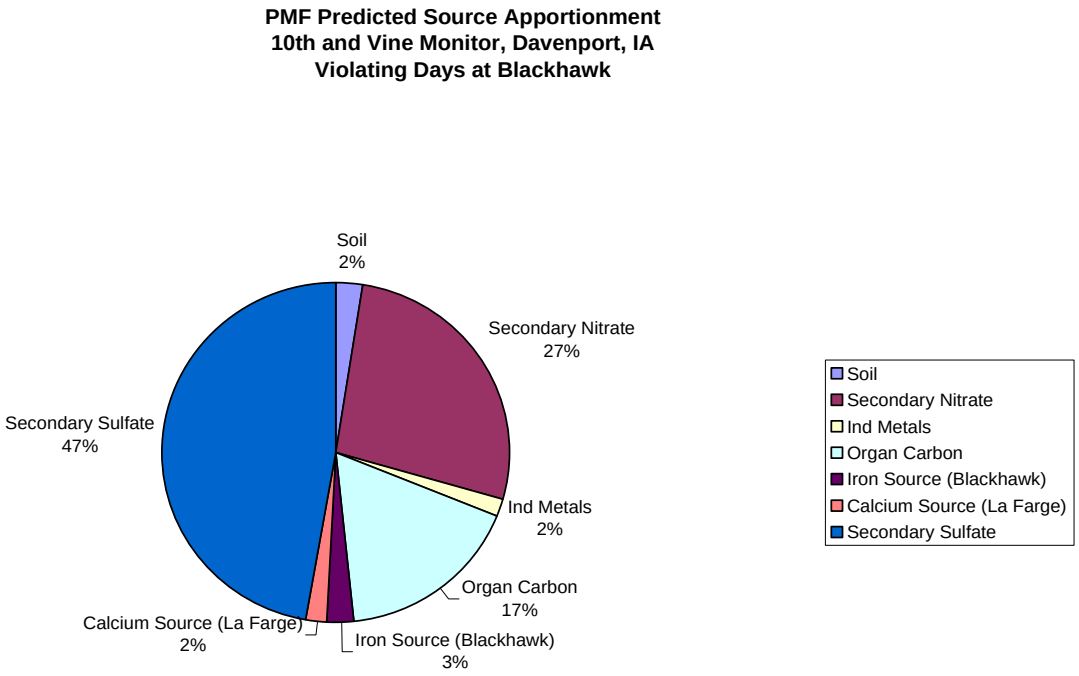

Figure 2.2 -PMF Predicted Source Apportionment at 10th and Vine.

In order to further understand the trends at the monitors in the area, the State and EPA evaluated information for individual days when an exceedance of the standard was monitored. Sorting the monitoring data in this manner can assist in discerning trends and is useful in further understanding of the nature of the monitored exceedances. The following table assists in the review of the individual days when a monitor recorded an exceedance. This information, in combination with the meteorological information, discussed in Factor 6, assists in the understanding of the trends in exceedances in the Davenport Area.

The daily averaged $PM_{2.5}$ concentrations in Table 2.1 are colored coded according to concentrations. Exceedances are highlighted in red, and indicate a daily average concentration greater than 35 μg/m3. Cells shown in yellow represent concentrations greater than 30μg/m3 and less than or equal to 35 g/m3. Green indicates daily averaged $PM_{2.5}$ concentrations less than or equal to 30 μg/m3. Blank cells indicate no measurements were made at a particular monitor on that day.

From Table 2.1, it is observed that there are days when multiple monitors record exceedances on the same day, and there are days when only a single monitor exceeds the standard. Out of the 21 exceedance days listed in Table 2.1, eight out of the 21 days are

days in which only the monitor at 300 Wellman (a.k.a. Blackhawk Foundry monitor) recorded exceedances of the standard. In contrast, out of the 21 days listed in Table 2.1, 4 out of the 21 days are days when only the 10th and Vine (a.k.a. Jefferson) monitor recorded exceedances of the standard. As such, there are 9 days when more than one monitor in the Davenport Area exceeds the standard.

	County	Muscatine	Scott	Scott	Scott	Rock Island	Clinton	Clinton	Johnson	Linn	Dominant
	Name	Garfield	Blackhawk	Jefferson	Adams	Arsenal	Rainbow	Chancy	Hoover	Cdr Rpds	Wind Direction
Season	Date	191390015	191630019	191630015	191630018	171613002	190450021	190450019	191032001	191130037	KDVN
winter	1/30/2005			37						40	65
winter	1/31/2005	37	33	31	31		34		48	45	99
winter	2/1/2005			40						48	83
winter	2/3/2005	36	40	37	35	35	41		41	35	260
summer	6/24/2005	31	37	31	31		31		33	30	217
summer	6/27/2005	37	42	38	38		39		36	35	188
summer	8/2/2005	44	51	44	45	46	45		41	41	176
fall	9/10/2005	34	37	35	35		35		33	34	171
fall	9/11/2005			41						39	187
fall	9/12/2005			40						38	193
fall	9/13/2005	23	41	24		23	24		23	22	228
winter	12/21/2005	37	33	31	11		40		39	33	248
winter	12/24/2005	34	36	36	37	39	37		30	26	356
fall	11/7/2006	19	31	29	27	27	37	36	20	18	193
fall	11/25/2006	33	36	38	35	20	51	51	37	37	154
winter	2/23/2007	44	11	10	9	10	9	10	9	10	108
winter	2/24/2007	53	10	9	9		9		11		103
winter	2/28/2007	55		19			21		19		110
spring	3/9/2007	42	44	42			37		42		228
spring	5/3/2007	42	9	9	8	9	8	10	9	10	99
spring	5/4/2007	61	16	15			16		19		99
spring	5/5/2007	63	23	23			22		27		100
spring	5/23/2007	20	33	23			23	37	17		180
spring	5/30/2007		28	27	27	27	29	37		22	181
summer	6/16/2007	32	36				30		33		291
summer	7/26/2007	32	36	28	30		31	31	29	26	223
fall	9/21/2007	22	37	24	24		27	29	22	20	204
fall	11/19/2007	26	39	27			26		26		205
fall	11/20/2007	28	38	36	34	25	33	33	37	25	57
winter	12/17/2007		38	29	32		32	36		30	217
winter	12/19/2007	55	57	57					55		191
winter	12/20/2007	48	48	45	46	46		44	47	53	111

Table 2.1- Air Quality Data for Individual $PM_{2.5}$ Monitors in Davenport-Moline-Rock Island, IA-IL, Muscatine, IA and Select Surrounding Counties Compared to Individual Days when Exceedances were monitored.

Of the 17 exceedance days recorded at the 300 Wellman monitor between 2005 and 2007, 7 events are classified as local events and the remaining 10 exceedance days are described as regional by the State. Additional review of the local events shown in Table 2.1 reveals that these events predominantly occur during the summer and early fall seasons. The local events are also tightly correlated to a southwesterly wind direction.

When EPA issued its 120-day letter, an analysis of speciation data was not available at the 300 Wellman monitor. Between August 2008 and October 2008 the State attempted to perform an exploratory analysis on archived FRM filters from several sites in Eastern Iowa in an attempt to more conclusively demonstrate ambient impacts of local sources on the violating monitor. The analysis included filters from the two violating FRM monitors (Muscatine-Garfield and 300 Wellman), FRM samplers collocated with speciation

samplers at Davenport (10th and Vine) and Lake Sugema (EPA's IMPROVE network), and a fifth site in the vicinity of the violating monitors chosen by the State. However, comparison of ion data measured on the archived FRM filters with ion data measured from speciation samplers did not demonstrate comparability and therefore were deemed unreliable for statistical analysis.

EPA reviewed the data submitted from this analysis and found that the data derived is not of sufficient quality for use. Furthermore, given the relatively short distance of 1.8 miles between the 300 Wellman monitor and the 10th & Vine monitor, it can be assumed that PMF speciation data for direct $PM_{2.5}$ at 10th & Vine could be considered representative of direct $PM_{2.5}$ conditions at the violating monitor. Because the PMF analysis showed a signature of multiple sources at a monitor that is downwind of the violating monitor, EPA can not support the State's recommended very small partial boundary that focuses on a single point source. Although there speciation data available at the nearby 10^{th} and Vine monitor, there is no speciation data from the violating monitoring site, nor is there data demonstrating that just one local point source has overwhelming contribution to the violating monitor. In addition, as discussed under Factor 1, the point source modeling, although not sufficient to show precisely the degree of contribution, does show that other point sources have some contribution to the violating monitor. Therefore all local point sources must be considered in establishing the boundary.

Summary of Factor 2, Air Quality Data

In summary, the other monitors in Scott County (10^{th} and Vine monitor and Adams School monitor) have 24-hour average readings above the level of the standard, but these do not result in a 3-year design value that exceeds the NAAQS. The design values at these monitors are 5–6 µg/m3 below the design value of the violating 300 Wellman monitor. Regional events do impact the area and the effects are seen on the two non-violating monitors as well as the 300 Wellman monitor, however the marked difference in monitor design values across the area suggests that local influences remain a critical component of the exceedance events at the 300 Wellman monitor. The available speciation data from a nearby location indicate that the local contribution to exceedance days originates from a collection of sources. Determining the area that is contributing to a violation is part of the designation process and supports a broader boundary than the very small boundary recommended by the State.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) are eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data may give an indication of whether it is likely that population-based emissions contribute to violations of the 24-hour $PM_{2.5}$ standards.

County	State Recommended Nonattainment?	2005 Population	2005 Population Density (pop/sq mi)
Scott, IA	Partial	161,170	345
Rock Island, IL	No	147,454	327
Henry, IL	No	50,508	61
Mercer, IL	No	16,840	30
Muscatine, IA	Partial	42,567	95
Clinton, IA	No	49,744	70

Table 3- Population

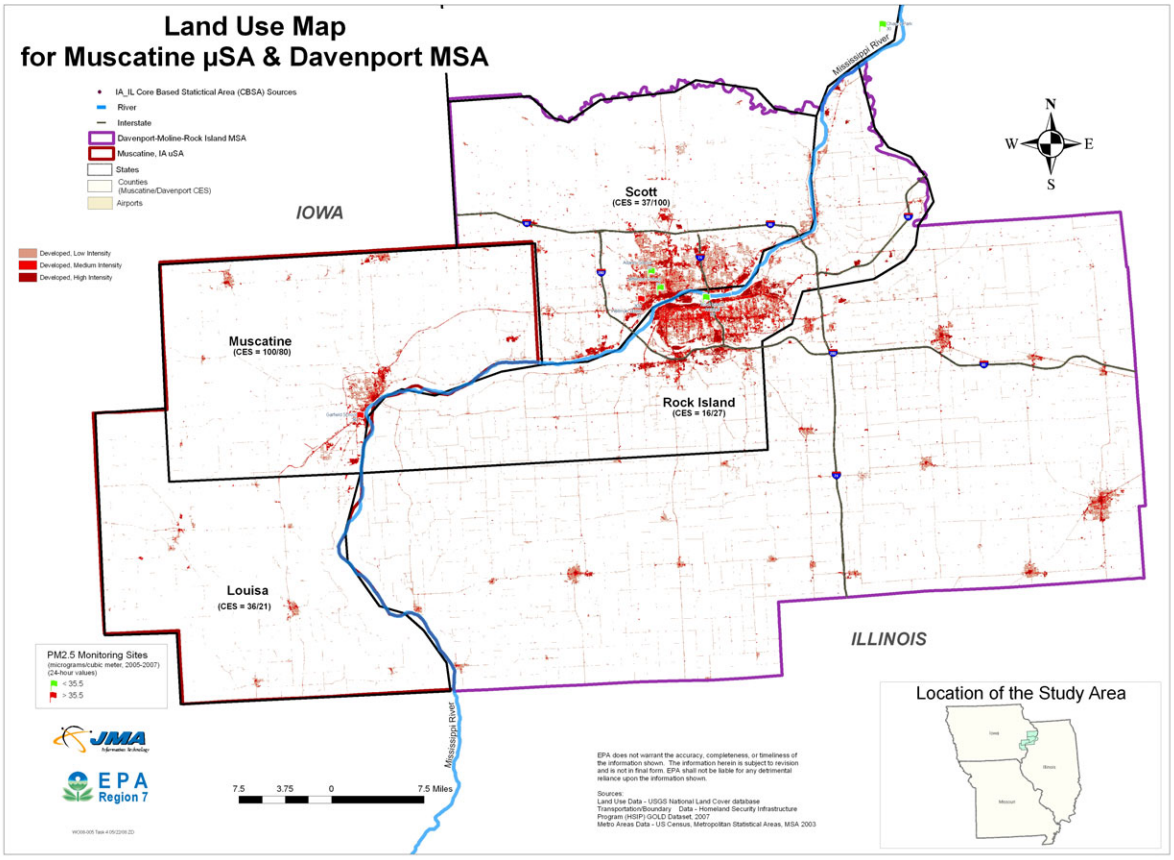

Figure 3- Land Use Map for the Counties in the Davenport-Moline-Rock Island IA-IL Area and Surrounding Counties

The urbanized portions of Scott and Rock Island counties are geographically located close to each other, i.e. the area is commonly known as the Quad Cities area. The Quad Cities area of Iowa includes the cities of Davenport and Bettendorf on the Iowa side, and

Moline and Rock Island on the Illinois side. As illustrated in Table 3 and Figure 3, the populations in the counties evaluated are predominantly concentrated in the urbanized portions of the counties in near proximity to the 300 Wellman monitor. Davenport City, which is approximately 8 miles wide and 13 miles long, comprises 23% of Scott County's total land area of 457 sq miles. The remaining 77% of the land area in Scott County is generally rural. The EPA designated nonattainment area is focused primarily on the urbanized area of Scott County, and captures approximately 89% of the county population.

Summary of Factor 3, Population Density

Figure 3 demonstrates the near proximity of the urbanized population in Scott County to the violating 300 Wellman monitor. Rural Scott County, which comprises a relatively small portion of the county's population, is associated with relatively low population-based area source emissions and potential contribution to the violating monitor. Similarly, Figure 3 demonstrates the near proximity of the urbanized population in Rock Island County to the violating monitor. This supports a boundary that is focused on the urbanized portions of Scott County and Rock Island County.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Davenport Area, total commuters in each county who commute to other counties within the Davenport Area, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 5). A county with numerous commuters indicates the potential for mobile-source related emissions to contribute to fine particle concentrations in the area analyzed, and may indicate the degree of economic integration of an area. As shown in Table 4, Scott County, IA and Rock Island County, IL have the greatest number commuting within the statistical area.

County	State Recommended Nonattainment?	2005 VMT (10^6 mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting within (and into) the statistical area	Percent Commuting within (and into) the statistical area
Scott, IA	Partial	1,614	61,500	79	74,020	95
Rock Island, IL	No	1,313	14,240	20	67,530	97
Henry, IL	No	695	1,870	8	22,340	91
Mercer, IL	No	135	1,200	15	6,570	85
Clinton, IA	No	423	2,610	11	3,600	15
Muscatine, IA	Partial	372	17,330	85	1,060	5

Table 4-Traffic and Commuting Patterns

The 2005 VMT data used for table 4 and 5 of the 9-factor analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile

National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

CAMX modeling (discussed under Factor 1) submitted by the State suggests a 1-3% contribution on exceedance days from mobile sources. The State also asserts that the zero-out modeling shows that NO_x precursor emissions from mobile sources are not significant to local $PM_{2.5}$ formation or toward the violation at the 300 Wellman monitor. Figures 4 and 4.1, (from the 2002 NEI) show that 56% of the total NO_x emissions in Scott County are attributable to mobile sources, and 49% of the total VOC emissions in Scott County are attributable to mobile sources. Direct $PM_{2.5}$ emissions from mobile sources are not a significant portion of local direct $PM_{2.5}$ emissions as shown previously in Figure 1.2. The NEI numbers suggest that a local secondary contribution to the violating monitor from mobile sources is probable

Summary Factor 4-Traffic and commuting patterns

As the metropolitan area is the most heavily vehicle-traversed part of the county, it is reasonable to include the contiguous metropolitan area in the nonattainment boundary. The partial county nonattainment area boundary promulgated by EPA is inclusive of the major metropolitan area.

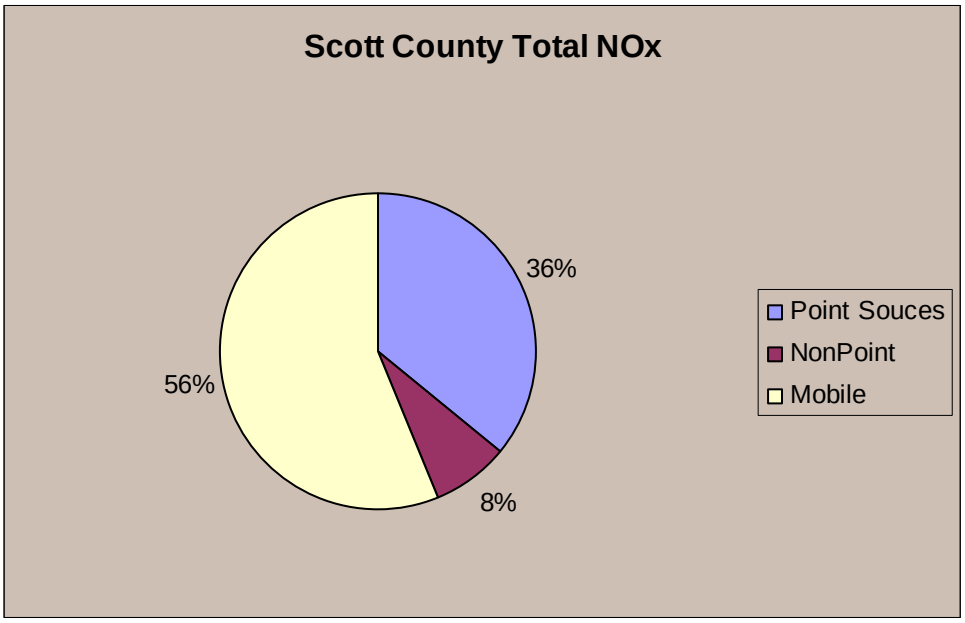

Figure 4-Total NO_X sources for all of Scott County

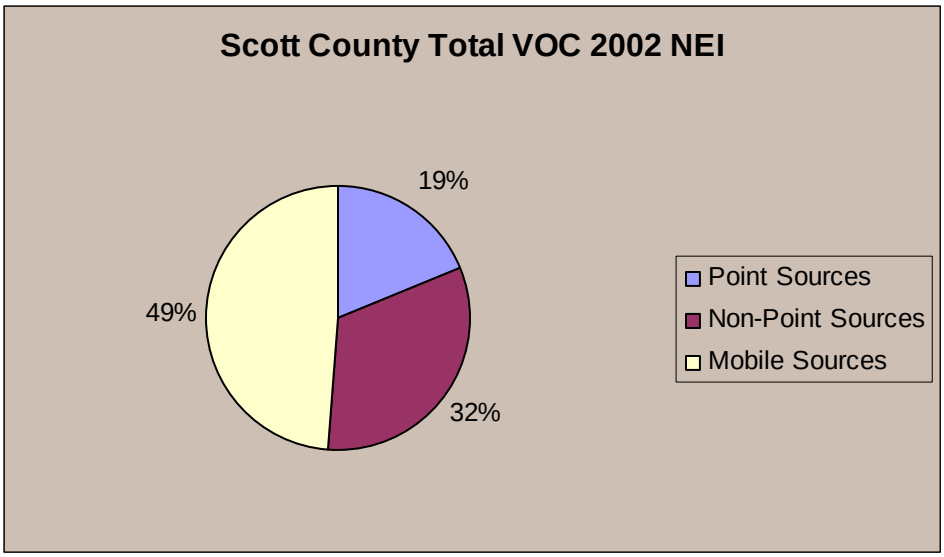

Figure 4.1-Total VOC sources for all of Scott County

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in VMT for 1996-2005 for counties in Davenport-Moline-Rock Island area, as well as patterns of population and VMT growth. Areas with rapid population or VMT growth indicate the potential for proportionate emissions growth from mobile sources and other emitting activities, such as construction of infrastructure, including roads, homes, and businesses. Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Davenport-Rock Island Area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

County	Population (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Muscatine, IA	42,567	2	372	43
Clinton, IA	49,744	-1	423	39
Scott, IA	161,170	2	1,614	25
Henry, IL	50,508	-1	695	7
Rock Island, IL	147,454	-1	1,313	3
Mercer, IL	16,840	-1	135	-12

Table 5- Population and VMT Values and Percent Change.

The State provided to EPA the population growth projections shown in Figure 5 as part of its technical support for the State's designation recommendation. This information was assembled from several data sources, such as U.S. Census Bureau, Iowa and Illinois Department of Commerce, Bi-State Regional Commission and nonpoint sources. This chart compliments Table 5 in that it illustrates, graphically, the growth that occurred in Scott County from 2000-2005 and displays trends from various counties in and surrounding the Davenport-Moline-Rock Island area. Scott County is the only county in EPA's evaluation area that is projected to have a growth in population in the coming years.

Summary of Factor 5- Growth rates and patterns

The area has not seen a very large increase in population in the recent past, and only Scott County is projected to have any future growth. This factor continues to point to Scott County as a primary area of interest for designations.

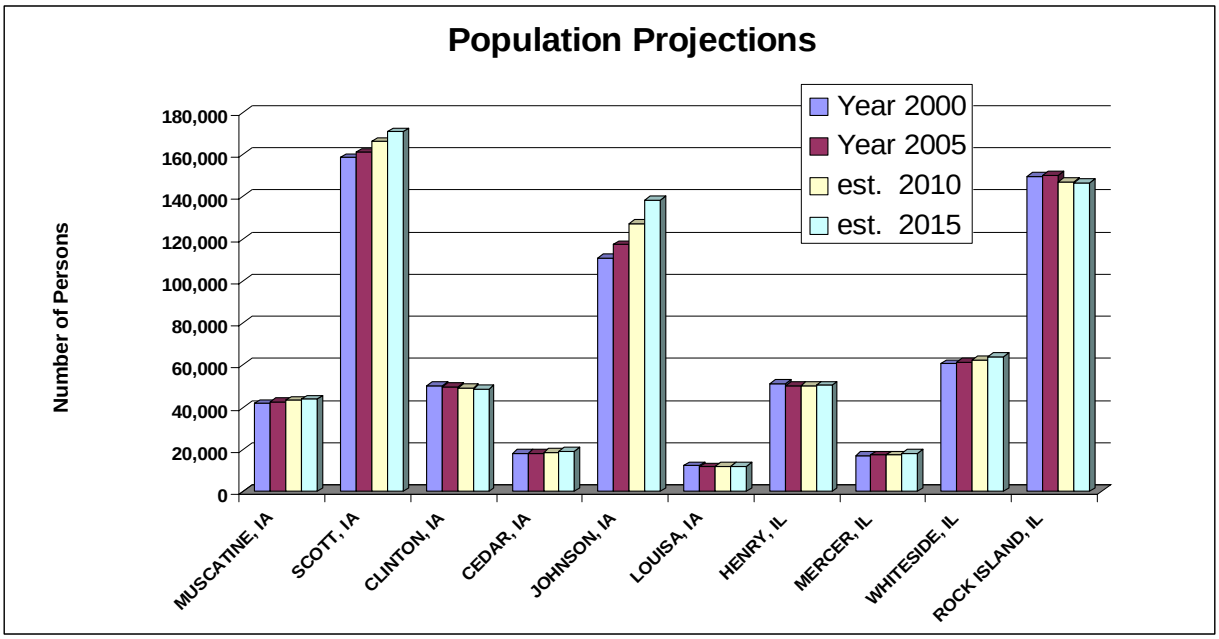

Figure 5-Population Projections Chart

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered the most representative National Weather Service wind direction and speed data throughout the year, with an emphasis on "high $PM_{2.5}$ days." These high days are defined as days where any FRM or FEM air-quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values. For this factor, EPA also considered each County's CES, which includes an analysis of trajectories of air masses for high $PM_{2.5}$ days.

EPA also relied upon information provided the State as part of its technical support for the State's designation recommendation. The purpose of this analysis is to determine contributing emissions in any particular direction relative to the violating monitor. The purpose of the analysis conducted by the State and EPA is to determine contributing emissions in any particular direction relative to the violating monitor.

The State provided wind rose plots generated using WRPLOT VIEW, developed by Lakes Environmental (http://www.lakes-environmental.com). The State asserted that wind speed and direction measured by the Davenport Municipal Airport (KDVN) is representative of the wind field at the violating monitor in Scott County, Iowa and is not unduly influenced by differences in surrounding terrain. The KDVN ASOS anemometer

had a 94% data capture for hourly wind speed and direction measurements collected near the top of the hour; its data was used in this analysis.

Figure 6 shows the wind rose for 383 hourly observations on at the KDVN ASOS location on exceedance days in 2005-2007. Each petal represents a measured surface-level wind direction (direction the wind is blowing from), which were archived in 10 degree intervals ranging from 10 to 360. The azimuth of each petal indicates the measured wind direction, and the length from the center of the plot measures the relative frequency each wind direction was observed. For a particular wind direction the length of the colored segments indicates the relative frequency of six wind speeds bins, which is shown in the lower right corner

Examining wind data in this manner only for days when the 300 Wellman violating monitor measures a 24-hour average $PM_{2.5}$ concentration greater than or equal to 35.5 $\mu g/m^3$ provides evidence that sources in a particular direction from the violating monitor may have contributed to the violation of the NAAQS. The wind rose in Figure 6 indicates that the prevailing winds can come from many different directions on exceedance days. The prevailing wind directions with the seven greatest frequencies are in an 80 degree arc from the southwest to the southeast, indicating the greatest potential for nearby sources in those directions to contribute to monitored violations. As shown by the length of the black petals, relatively light winds were not often associated with exceedance days. Most exceedance days occur when prevailing winds are greater than 7 knots (shown as red, blue or green).

Another analysis technique, provided by the State and used by EPA in determining the intended nonattainment boundary, is the pollution rose. A pollution rose assists in assessing the pollutant transport characteristics at the monitor location. This graphical plot is similar in interpretation to a wind rose, except binned wind speed is replaced by $PM_{2.5}$ concentrations measured by the Filter Dynamics Measurement System - Tapered Element Oscillating Microbalance (FDMS-TEOM) sampler located at the violating monitor. Hourly $PM_{2.5}$ concentrations are paired with hourly wind directions measured by the KDVN ASOS. This analysis shows the relative frequency of $PM_{2.5}$ concentrations measured while winds were observed from each direction. Note that the FDMS-TEOM instrumentation is used for continuous $PM_{2.5}$ measurements, but it is not the Federal Reference Method (FRM) for monitoring and calculating the $PM_{2.5}$ design value for the Blackhawk Foundry monitor. The hourly FDMS-TEOM measurements, when averaged daily, correlate well with the daily sampled FRM data ($r^2$of 0.9166), however, EPA has not defined a standard particle conditioning protocol for continuous monitors and therefore hourly values between different sampling methods may vary. For these reasons, this analysis is used only as a qualitative assessment of air quality at the monitor.

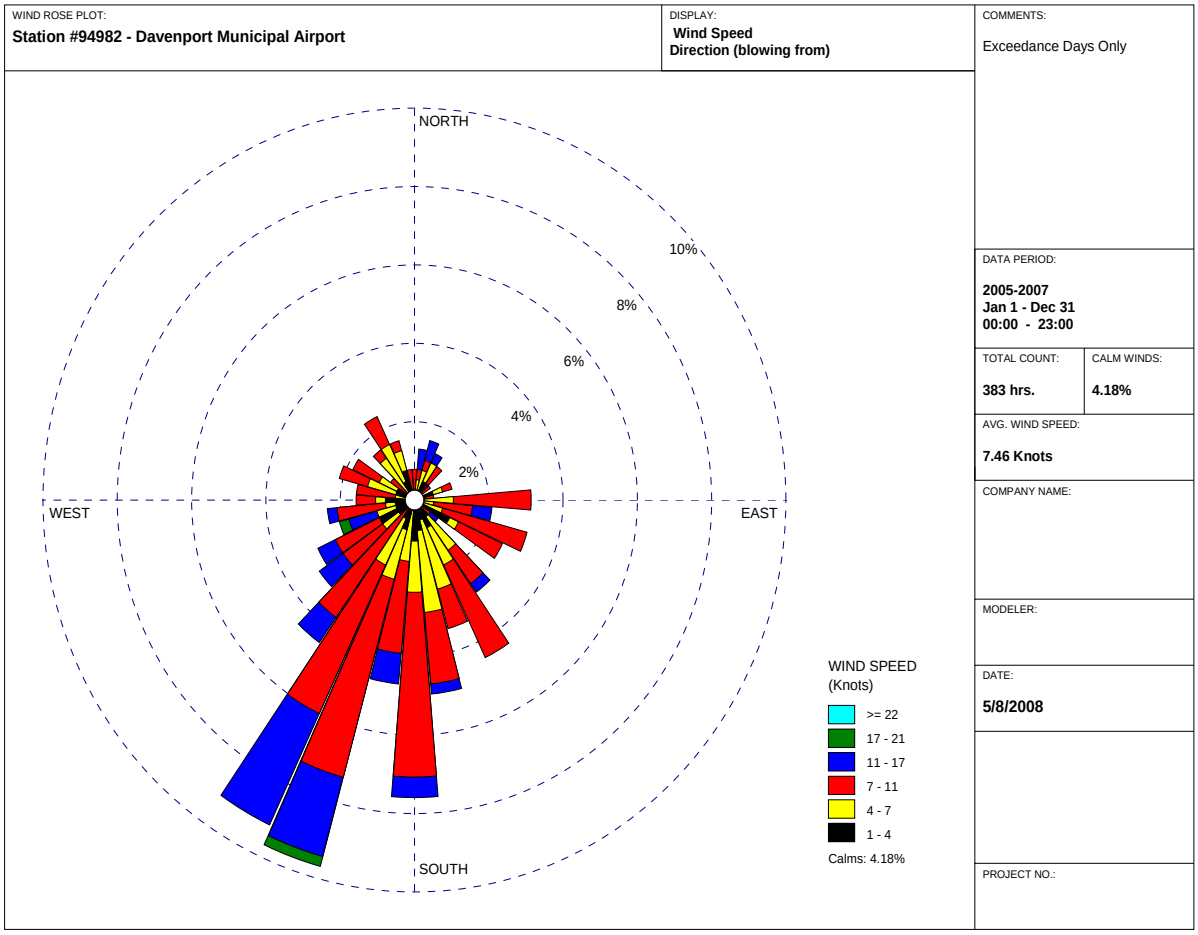

Figure 6 - Wind Rose for Davenport Municipal Airport for Exceedance Days in 2005-2007.

Figure 6.1 shows the pollution rose for the time period of 2005-2007. During this period the pollution rose shows that relatively high hourly $PM_{2.5}$ readings (above 30 ug/m3) occurred when winds came from nearly any direction, but were most frequent in nearly the same 80 degree arc from southwest to southeast shown in previous Figure 6. The cleanest air tended to be associated with a westerly to northwesterly direction, and also with the same southwest to southeast direction previously indicated.

Summary Factory 6- Meteorology

The wind rose indicates that winds most frequently occur from a generally southerly direction, from the southwest to the southeast, on high $PM_{2.5}$ days. This suggests relatively low contributions from areas located to the west, north, and east of the monitor, including Clinton County, northern portions of Rock Island County, and the most northerly portions of Muscatine County. EPA's nonattainment boundary includes potential emissions sources located upwind to the southwest, south, and southeast of the violating monitor.

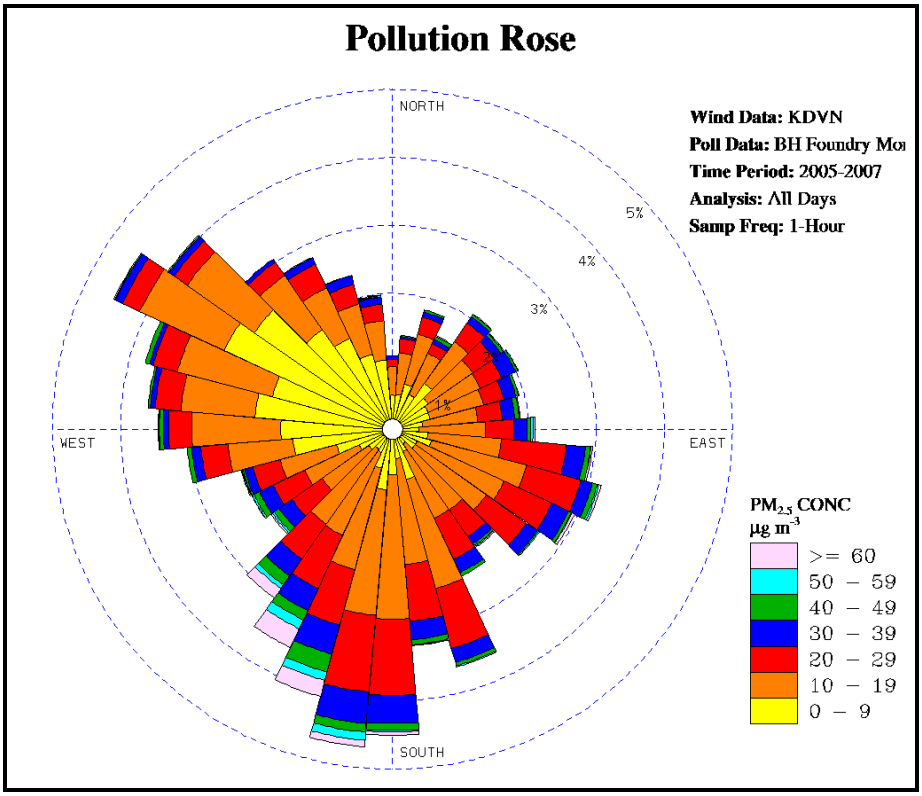

Figure 6.1- Pollution Rose for the Violating Monitor for 2005-2007

Note: The meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Davenport-Rock Island Area.

The Davenport Area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing $PM_{2.5}$ areas)

In evaluating the jurisdictional boundary factor, consideration was given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for $PM_{2.5}$ or 8-hour ozone standard) represent important boundaries for state air quality planning. In the case of the areas evaluated, none of the areas are

designated as nonattainment for any of the National Ambient Air Quality Standards. There was a review of the information regarding the Bi-State Regional Commission which represents the Metropolitan Planning Organization (MPO) for urbanized area transportation planning in the Quad Cities area. The MPO serves Henry, Mercer, and Rock Island Counties in Illinois, and Scott and Muscatine Counties in Iowa. Its web site is: www.bistateonline.org. However, the Bi-State planning area itself was not a key factor in determining the intended nonattainment boundary; other factors pointed to a more localized nonattainment area boundary.

Factor 9: Level of control of emission sources

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the States in the Davenport-Moline-Rock Island area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NO_x, and crustal $PM_{2.5}$). This is also the case for Clinton County, Iowa. As presented on Table 1, emissions in Clinton County were evaluated because of Clinton County's proximity to Scott County, the county with the violating monitor. Clinton County ranked as one of the highest counties with precursor emissions. However, upon closer evaluation and in working in the State, there was evidence that emissions reductions have occurred in Clinton County since 2005. In reviewing the emissions from Title V facilities in Clinton County, EPA noted that Archer Daniels Midland had a high percentage of the county's emissions especially for SO_2, NO_x, and VOC emissions. This facility was part of a national global settlement with ADM. As a result, the company has made, and will be making, substantial air pollution control upgrades at the plant, including installation of RTOs, scrubber enhancements, replacement of obsolete coal-fired boilers with state of the art FBC boilers, and fuel switches to natural gas. The control strategy is described in more detail in the "Control Technology Plan for Clinton, IA, Wet Corn Mill" attachment to the Consent Decree. Based on this more recent information, EPA has determined that the ADM reductions are an important factor to consider in determining nonattainment boundaries.

Conclusion

EPA is designating the partial county nonattainment area boundary described in the table located in the introduction, for the 2006 24-hour $PM_{2.5}$ standard after considering each of the nine factors, detailed in the body of this document. For this decision the EPA relied most heavily on emissions, air quality, meteorology, and population. The additional modeling data provided evidence that was used to determine that a majority of emissions from nearby sources that cause or contribute to the violation should be included in the nonattainment area. EPA determined that inclusion of the local source PM2.5 emissions is a highly significant consideration in establishing the nonattainment boundaries. For Scott County, the boundary includes all of the local point sources of PM2.5, and a substantial fraction of the county-wide area source sources. The EPA defined nonattainment includes the area violating the standard and the area that is contributing significantly to the violation.

EPA Technical Analysis for Muscatine Iowa

Area Designations For the 24-Hour Fine Particle National Ambient Air Quality Standard

The table below identifies the counties in Iowa that EPA has designated as not attaining the 2006 24-hour fine particle ($PM_{2.5}$) standard.[1] A county (or part thereof) is designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area:	Iowa Recommended Nonattainment County:	EPA's Designated Nonattainment County:
Muscatine, IA	Muscatine County (partial) A portion of the City of Muscatine described as follows: Northern Boundary = Lucas Street, to: Western Boundary = U.S. Highway 61; at the intersection of U.S. Highway 61 and State Highway 92, the western boundary extends south to 41st Street South, to: Southern Boundary = 41st Street South, to: Eastern Boundary = Western edge of the Mississippi River up to the point southeast of the intersection of Green Street and Mill Street, to Green Street (ending with Lucas Street)	Muscatine County (partial) Entire townships: Bloomington, Fruitland, Montpelier, Sweetland

EPA has designated the remaining counties in the state as "unclassifiable/attainment."

[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour $PM_{2.5}$standard was revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for $PM_{2.5}$remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to the violations. This technical analysis for, Muscatine Iowa identifies the counties with monitors that violate the 24-hour $PM_{2.5}$standard and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

EPA also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emission score (CES) to evaluate these areas. (See additional discussion of the CES under factor 1 below.)

Figure A is a map of the townships in the vicinity of the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

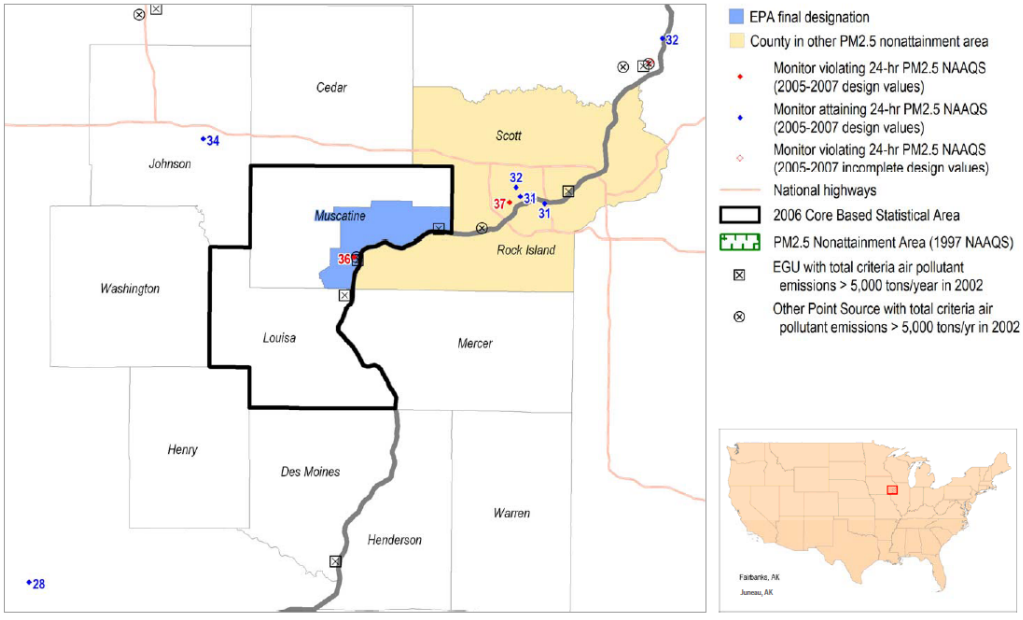

Figure A- Muscatine, IA 2006 24-hour $PM_{2.5}$ Nonattainment Area

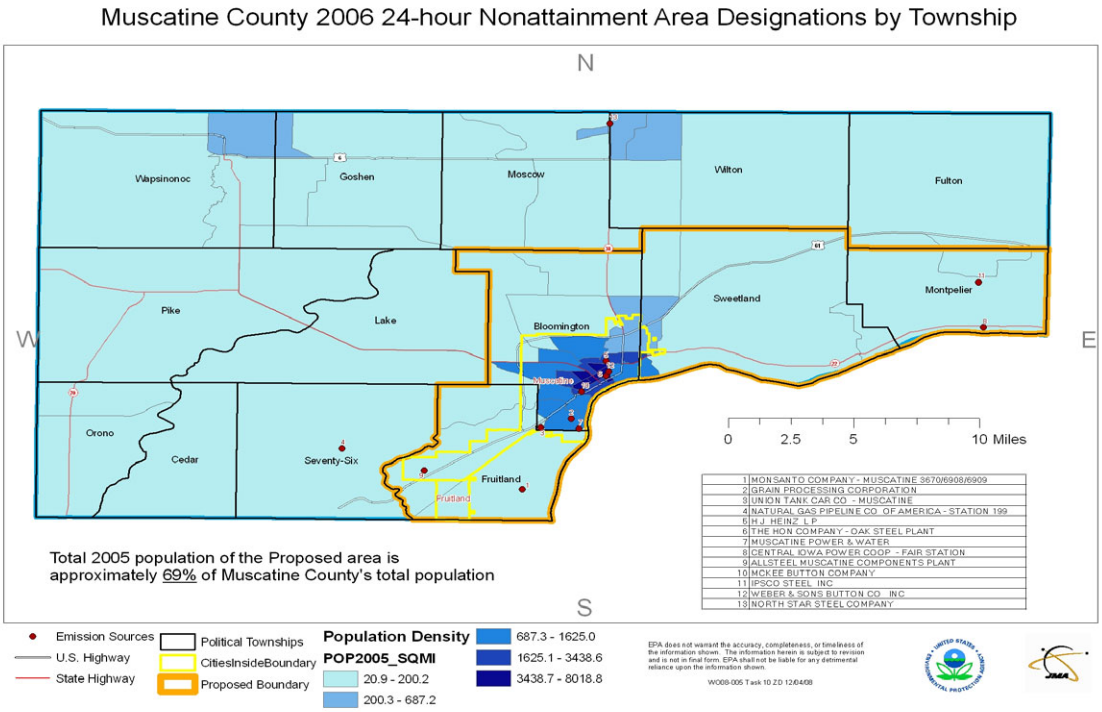

Figure B- Final Nonattainment Area Boundary.

In a letter dated November 2007, Iowa recommended that all of the counties in Iowa be designated as attainment based on air quality data from 2004-2006. EPA determined that a monitor located in Muscatine County, Iowa, had a violation of the 2006 24-hour $PM_{2.5}$ standards based on air quality data from 2005-2007. In response to EPA's notification of this new violation and the request for a designation recommendation, in a letter, dated May 30, 2008, Iowa recommended that EPA delay promulgating any designation for Muscatine County for one year. In a subsequent letter, dated July 29, 2008, Iowa requested that, if EPA could not grant a one-year extension of the designation, that EPA designate only a portion of Muscatine County as nonattainment for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2005-2007. All air quality data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state.

EPA found that there was sufficient information to make a designation determination. Extensions of the statutory deadline for initial designations are based on sufficiency of monitoring data, and sufficient monitoring data exists, as described in this Technical Support Document (TSD). EPA took Iowa's recommendation to designate nonattainment a portion of the City of Muscatine in Muscatine County under consideration, but found that the information provided does not adequately support the State's recommended designation. EPA believes the data support a larger partial county designation shown in the figure above. Section 107 of the Clean Air Act defines a nonattainment area as an area that is violating the standard or an area that is contributing to the violation. The following is a technical analysis for the Muscatine Iowa area.

Factor 1: Emissions Data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration. Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area with a monitored violation. Note that this metric is not the exclusive analytical tool used for considering data for these factors. A summary of the CES is included in attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Muscatine Area. Counties are listed in descending order by CES.

County	State Recommended Non-attainment?	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	**NO_x** (tpy)	VOCs (tpy)	NH_3 (tpy)
Muscatine County, IA	Partial	100	1702	283	1419	27020	10717	4910	1083
Louisa County, IA	No	36	868	198	670	12505	6521	1036	1509
Scott County, IA	Partial	37	2034	395	1639	9173	11317	9323	1986
Johnson County, IA	No	24	1321	420	901	3598	5509	7214	2806
Cedar County, IA	No	17	750	192	558	229	3084	1581	2053
Rock Island, IL	No	16	932	269	663	2169	6140	7359	664
Des Moines, IA	No	13	1168	209	960	6046	4662	2390	537

Table 1- $PM_{2.5}$ Related Emissions and Contributing Emissions Score

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants' components (given in tons per year (tpy)) and the CES for violating and potentially contributing counties in the Muscatine Area. A review of this data shows that Iowa counties contribute 68% of the total $PM_{2.5}$ emissions, 97% of the total SO_2 emissions, 71% of the total NO_x emissions and 68% of the total VOC emissions. Although emissions from Louisa County, IA (especially for SO_2 and NO_x) are relatively close to those of Muscatine County, IA, the EPA eliminated Johnson, Cedar, Des Moines and Louisa Counties from consideration for inclusion into the nonattainment area boundary based on a more detailed assessment of meteorology data, which is explained in greater detail under Factor 6, and information about significant reductions in emissions from sources in that area which is described under Factor 9 of this document.

In an August 2008 letter (the "120-day letter") EPA notified the State of its intent to designate separate nonattainment areas for Scott County, IA and Muscatine County, IA. EPA determined that these two counties are in separate Core Based Statistical Areas (CBSA) and should be separate nonattainment areas. A portion of Scott County, IA is being designated as a separate nonattainment area.

In addition to reviewing emissions data from a county-level, an evaluation of the emissions from local point and area source(s) near the violating monitor were also conducted. Because of the form of the standard (24-hour average) and the rural nature of the area surrounding Muscatine, local sources are critical in terms of contributions to ambient $PM_{2.5}$ concentrations on exceedance days.

A) Point Source Emissions

Direct $PM_{2.5}$ emissions from the major sources located in Muscatine County and nearby areas are categorized in Table 1.1. The emission rate from Iowa sources plotted in Table 1.1 was obtained from the 2002 NEI. Table 1.1 provides Muscatine County total emissions of direct $PM_{2.5}$ from major point sources, with emission totals in tpy. Table 1.1 shows a value of 931.48tpy of major $PM_{2.5}$ sources for all of Muscatine County. Figure 1 shows that all major point sources of direct $PM_{2.5}$ in Muscatine County are located within the nonattainment boundary identified above. The nonattainment area includes 93% of the total point sources of direct $PM_{2.5}$ emissions in Muscatine county compared to just 75% of the total direct $PM_{2.5}$ emissions contained in the State's recommended boundary (point sources included in the State's recommended boundary noted by an asterisk(*)).

Muscatine Point Sources NEI 2002 (tons per year)				
FACILITY NAME	**CITY**	**NOX**	**PM25**	**SO2**
MONSANTO COMPANY - MUSCATINE 3670/6908/6909	MUSCATINE	194.9	6.92	463.41
GRAIN PROCESSING CORPORATION (*)	MUSCATINE	1158	577	10900
UNION TANK CAR CO - MUSCATINE	MUSCATINE	21.12	8.11	0.01
NATURAL GAS PIPELINE CO OF AMERICA - STATION 199	LETTS	36.99	0.27	0.46
H J HEINZ L P	MUSCATINE	25.83	2.98	0.1121

THE HON COMPANY - OAK STEEL PLANT	MUSCATINE	12.54	13	0.0075
MUSCATINE POWER & WATER (*)	MUSCATINE	4676	123	3789.6
CENTRAL IOWA POWER COOP - FAIR STATION	MUSCATINE	1233	21.2	8983.3
ALLSTEEL MUSCATINE COMPONENTS PLANT	MUSCATINE	1.372	7.53	0.04
MCKEE BUTTON COMPANY	MUSCATINE	0	0.16	
IPSCO STEEL INC	MUSCATINE	264.8	111	202.8
WEBER & SONS BUTTON CO INC	MUSCATINE	0	0.16	
GERDAU AMERISTEEL US, INC	WILTON	213.8	59.7	82.759
	TOTAL	**7839**	**931**	**24422**

Table 1.1- Emissions from Major Point Sources in Muscatine County as Reported in the 2002 NEI.

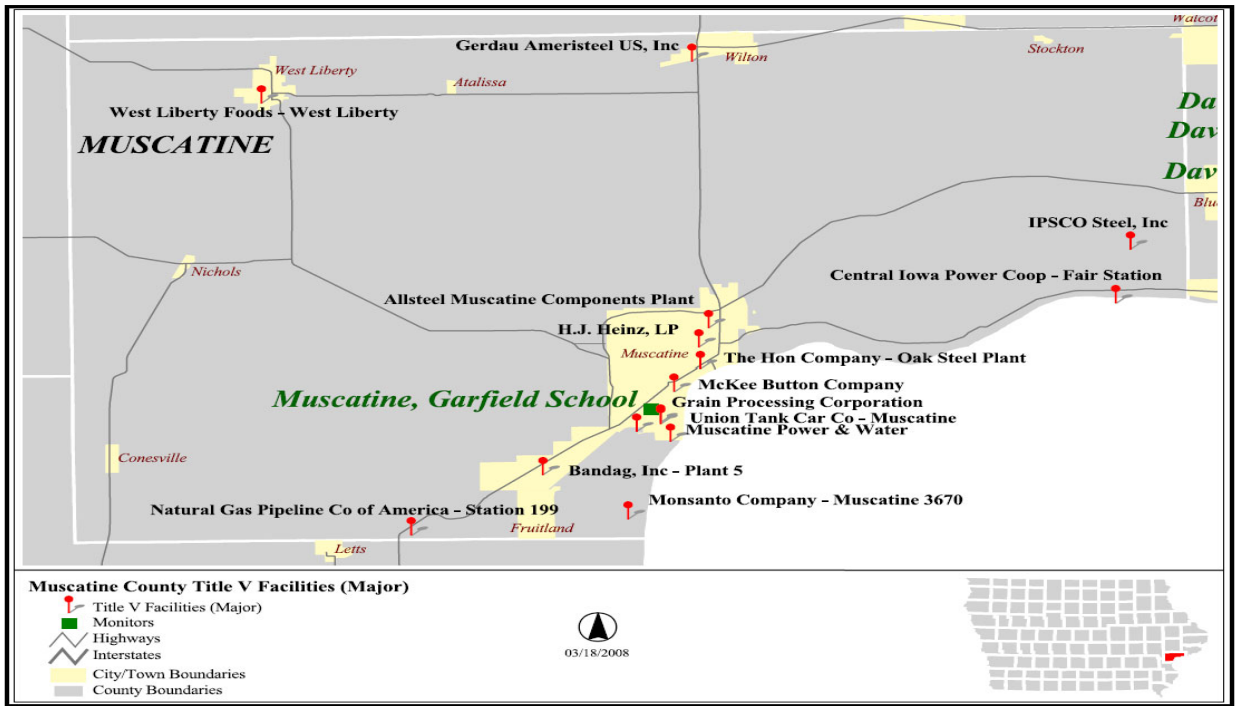

Figure 1.1- Location of Major (Title V) Point Source Facilities in Eastern Muscatine County.

The State conducted air dispersion modeling using AERMOD to demonstrate the potential of local point sources to contribute direct $PM_{2.5}$ to the violating monitor that will be described in detail below. Generally, the State asserts that the contribution from point sources other then the Grain Processing Corporation (GPC) and Muscatine Power and Water (MPW) are insignificant.

The EPA cannot support this position. The violating monitor location did not have speciated data available for study; therefore the State could not provide conclusive data from a filter analysis to demonstrate overwhelming contribution from either of the named point sources, or to confirm insignificant contributions from other nearby sources. Even if it were correct that certain point sources are contributing to the ambient $PM_{2.5}$ levels at the violating monitor, these sources are not the exclusive sources of contribution to the

total mass of ambient $PM_{2.5}$ at that monitor. EPA concludes that additional sources in this area are also contributing to the aggregate amount of ambient $PM_{2.5}$ at the violating areas, as section 107(d) contemplates that term.

B) Other Emission Sources

EPA also examined other sources of emissions were also examined utilizing 2002 NEI. The other emissions are grouped into three source categories: onroad, offroad, nonpoint sources (also known as area sources). In the charts and discussion below, these three categories are compared to the point source emissions already discussed. The onroad source generally characterizes the tailpipe emissions associated with typical interstate, highway, and secondary roadway traffic. Typical offroad sources include vehicular emissions from construction, mining, and agricultural equipment. The nonpoint source category is mostly based on population activity, dust from paved and unpaved roads, agricultural tilling, and construction projects (roads, buildings sites etc.).

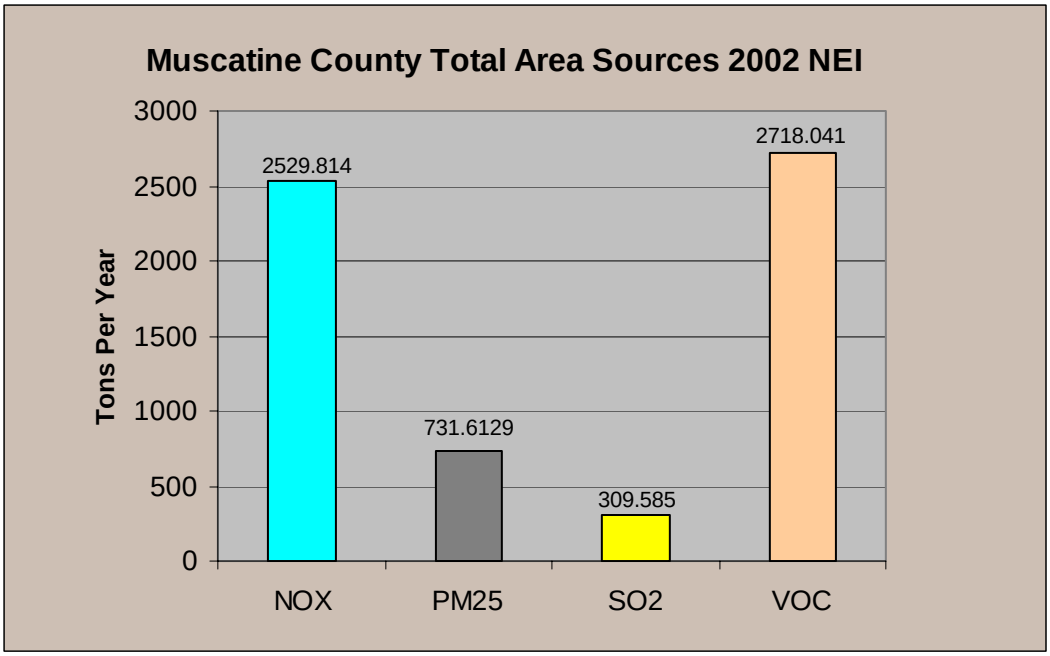

Figure 1.2- Area Source (also known as Nonpoint Source) Emissions in Muscatine County.

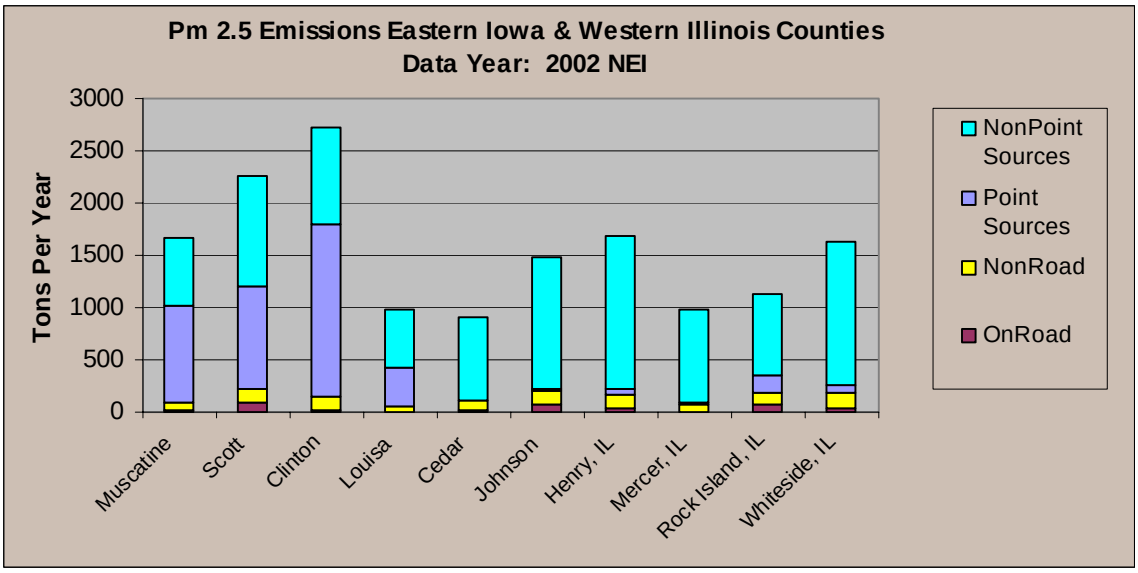

Figure 1.3- Direct $PM_{2.5}$ Emissions from Various Source Categories as Compiled for EPA's 2002 NEI

In Muscatine County, IA, point source emissions of direct $PM_{2.5}$ emissions are almost half of the total county emissions, as is shown in Figure 1.3. Although control of all of these point sources may not be needed to demonstrate attainment of the standard, a majority of these point sources are contained within the nonattainment area boundary promulgated by EPA. The nonpoint source category is roughly equivalent to the point source emissions. The nonpoint source category is largely derived by utilizing population density to determine emissions, but also includes dust from paved and unpaved roads, agricultural tilling, and construction projects (roads, buildings sites etc.). EPA's promulgated nonattainment area boundary captures 69% of the population in the Muscatine Area; a majority of the population based area sources are captured in the nonattainment area boundary.

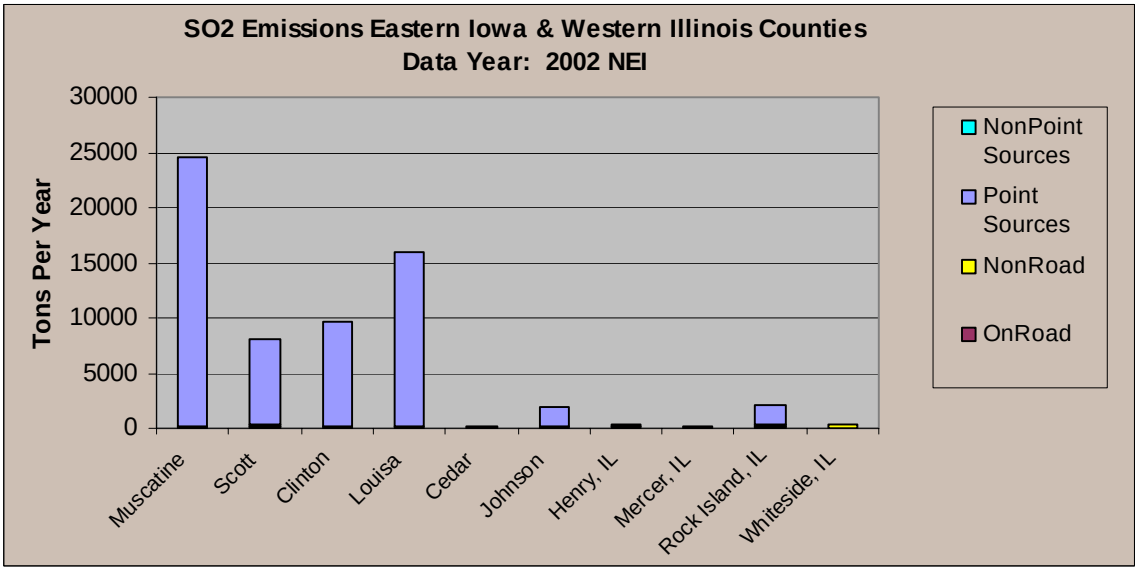

Figure-1.4. -SO_2 Emissions from Various Source Categories as Compiled from EPA's 2002 NEI

A review of the emission inventories reveals that SO_2 emissions are predominantly produced by electrical generating units and other industrial (major point source) coal-fired boilers. A majority of these Muscatine County point sources that may be contributing to violations in the area are contained within the boundary designated as nonattainment by the EPA, in order to ensure an adequate boundary for evaluation of potential control strategies for the area.

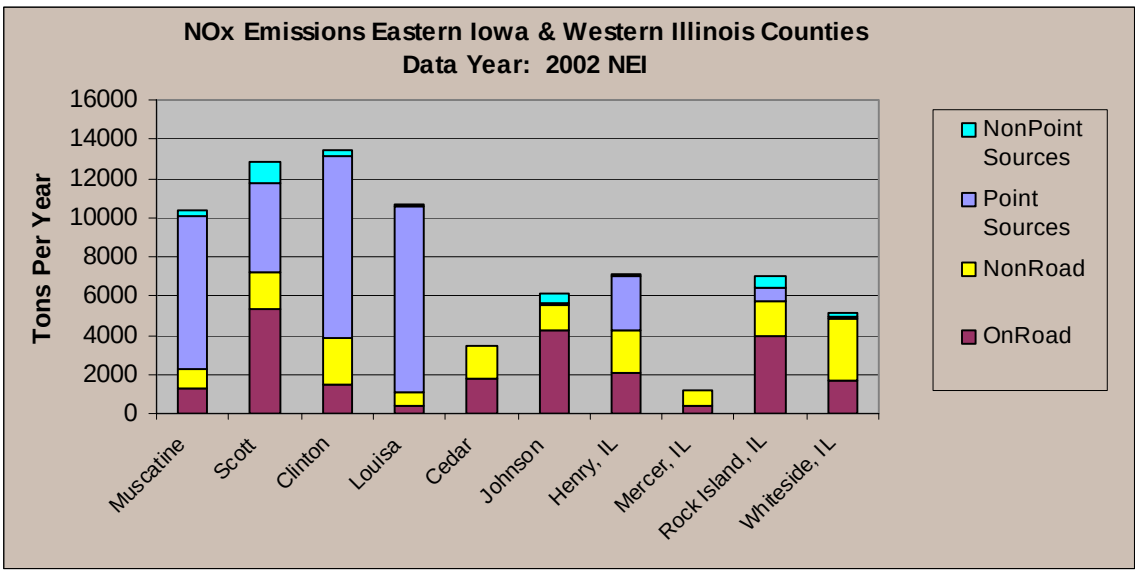

Figure 1.5- NOx Emissions from Various Source Categories as Compiled from EPA's 2002 NEI.

The distribution of NO_x emissions among source categories is shown in Figure 1.5. Onroad and offroad NO_x emissions from vehicles contribute a low percentage of the county totals. In Muscatine County, approximately 75% of the NO_x emissions are attributable to point sources. The remainder of the NO_x is attributed to mobile source emissions. EPA's promulgated nonattainment area boundary encompasses the urbanized area in and around Davenport, IA and thus captures a majority of the mobile source NO_x, VOC and $PM_{2.5}$ emissions in Muscatine County. The emissions estimates suggest that the potential exist for mobile source NO_x and VOC to contribute to the violating monitor. Mobile source emissions are discussed under Factor 4 in this document.

C) Modeling

To demonstrate the impact of a local emissions' contribution to the violating monitor in Muscatine County, the State conducted dispersion modeling using AERMOD and photochemical modeling using CAMx. This detailed information was submitted to the EPA in October of 2008 for review. AERMOD was used to demonstrate the importance of nearby sources in contributing to monitored exceedances. The State ran separate AERMOD simulations to compare predicted concentrations with monitored data for the years 2005-2007. Due to the size of GPC/MPW facility complex, and the uncertainty of the source(s) most significantly affecting the monitored concentrations, the orientation of the arc was determined based on the predominant wind directions observed during the

majority of the exceedance days. As such, the arc was created in such a way that each receptor would be equidistant from a point due East of the monitor and centered in the middle of the GPC sources in that area of the facility. GPC and MPW were modeled together due to their very close proximity. The State utilized emissions inputs based on actual $PM_{2.5}$ emission rate estimates for sources at GPC and MPW only

The average 24-hour values for each day are provided in Table 1.2. The results show a bias toward underestimation in the vicinity of the monitor, with a large portion of the days yielding concentrations around 30% to 40% less than the observed concentrations. But even with the underestimate bias, the analysis showed that when a local source signal was present, GPC/MPW could be contributing approximately $1/3^{rd}$ (32.0 %) of the total $PM_{2.5}$ concentration. Modeled 24-hour averaged impacts attributable to GPC/MPW on exceedance days average 11.3 $\mu g/m^3$ with a maximum up to 23.7 $\mu g/m^3$.

	Monitored Concentrations			GPC and MPW's Predicted Concentration	Background	Total Predicted Concentration	Difference Between Modeled and Observed Concentrations		Attributable to GPC/MPW
Date	Garfield	Jefferson	Adams	Garfield			Magnitude	Percentage	Percentage
1/31/2005	37	31	31	14.5	30.8	45.3	8.7	24%	32%
2/3/2005	36	37	35	0.0	36.0	36.0	0.3	1%	0%
6/27/2005	37	38	38	1.7	37.6	39.2	1.9	5%	4%
8/2/2005	44	44	45	2.2	44.3	46.4	2.8	6%	5%
12/21/2005	37	31	11	6.4	21.3	27.7	-9.1	-25%	23%
2/23/2007	44	10	9	14.7	9.3	24.0	-20.0	-45%	61%
2/24/2007	53	9	9	10.8	9.1	19.8	-33.4	-63%	54%
2/28/2007	55	19		14.7	19.1	33.8	-20.9	-38%	44%
3/9/2007	42	42		2.0	42.1	44.1	2.6	6%	5%
5/3/2007	42	9	8	16.1	8.6	24.7	-17.5	-41%	65%
5/4/2007	61	15		23.7	15.0	38.7	-22.3	-37%	61%
5/5/2007	63	23		18.7	23.3	42.0	-21.2	-34%	44%
12/19/2007	55	57		13.7	57.2	70.9	16.0	29%	19%
12/20/2007	48	45	46	18.8	45.7	64.4	16.8	35%	29%

Table 1.2- Quantification of GPC's and MPW's Contribution to Total Monitored $PM_{2.5}$ Concentrations on Exceedance Days at the Garfield Monitor. Predicted Concentrations Calculated Using AERMOD.

The State asserted that the underestimation bias is due to the lack of fugitive emissions inputs in the model. To test this theory the State analyzed the meteorological data used in the simulation. Meteorological data from the Muscatine Airport, located approximately 6 miles to the southwest of the facility, was obtained and run in a simulation. Large portions of the Muscatine Airport data were either incomplete or questionable, so the state only processed meteorology data for the exceedance days for use in AERMOD. The State concluded that when the Muscatine Airport meteorological data were input into the model, AERMOD predicted results that were very similar to those obtained when using the Cedar Rapids data. The State asserted that based on the similarity of the results of each analysis it seemed reasonable to conclude that the underestimation provided by the model is due to the lack of fugitive emissions from GPC and MPW. EPA disagrees

with this assertion, as there is no evidence to demonstrate that the bias was not a function of the meteorology data used.

The State concluded that even with the underestimation bias, the local source contributions attributable to GPC and MPW on more than half of the exceedance days was over 20%, with an average contribution for all exceedance days of 32% therefore other point sources in the area should be eliminated from consideration for inclusion in the nonattainment area boundary. EPA disagrees with the State's assertion. The State provided percentage does not explain the source of the remainder of the ambient $PM_{2.5}$ at the violating monitor, and hence does not encompass all of the area that may be contributing to violations in this area. The emissions utilized by the State in the model are based on actual emissions estimates representing a single year, and thus do not represent potential impacts from a range of emissions activity at all of the sources that have occurred in the past and that are likely to continue in the future. Only emissions from GPC and MPW were used by the State in the analysis. Therefore, the AERMOD results reflect only contributions of directly emitted $PM_{2.5}$ from two stationary sources to elevated ambient $PM_{2.5}$ concentrations, which omits potentially important emissions contributions from other nearby direct $PM_{2.5}$ sources. The modeling does not provide a sufficient basis for concluding sources other than GPC MPW do not contribute to the violating monitor. For these reasons, EPA concluded that due to these uncertainties it could not support the State's assertion that the contributions from sources other than GPC and MWP are minimal. Therefore, EPA cannot support the State's proposed boundary and is finalizing a nonattainment boundary that includes a majority of the emissions sources in the Muscatine area.

In addition to AERMOD analysis, the State conducted a CAMx modeling technique known as zero out to eliminate all anthropogenic emissions from sources from grid cells that correspond to geographic areas of interest such as Muscatine County, IA. This type of modeling was used to provide data regarding the impacts of longer- range transport, the importance of precursor gases, and the aggregate role of sources in the area. These models are not yet capable of reliably assessing the impacts of a single source at the source receptor distances encountered in Muscatine County.

Round	**Area**	**Source Sectors**	**Pollutants**
Rock Island	Rock Island County	All Anthropogenic	NO_x,SO_2,Fine Primary
Scott County 1	Rural Scott County	All Anthropogenic	NO_x,SO_2,Fine Primary
Scott County 2	Quad Cities Metro	Onroad	All
Muscatine County	Rural Muscatine County	All Anthropogenic	NO_x,SO_2,Fine Primary

Table 1.3. Description of Zero-out Modeling Sensitivity Runs.

In this analysis all anthropogenic SO_2, NO_x, and primary fine particle emissions outside the metro area in Muscatine County were zeroed out. Pollutant emissions from elevated point sources outside the city limits, namely Natural Gas Pipeline, Monsanto Company, Allsteel Muscatine Components Plant, North Star Steel Co., IPSCO, Inc., and Central

Power Cooperative, were also zeroed out. Using data from this analysis the State asserted that rural Muscatine County contributed on average 1-3% of the total $PM_{2.5}$ on modeled violating days.

The second photochemical modeling analysis provided by the State was based upon the use of the Particulate Source Apportionment Technique (PSAT) capability of the CAMx modeling system. This is a method for investigating how defined regions and selected sources contribute to particulate matter formation at any given receptor. EPA Region 7, with assistance from the Kansas Department of Health and Environment (KDHE), implemented a PSAT simulation to augment the zero out modeling runs conducted by the State of Iowa. The State analyzed the data provided by this simulation to develop its response to EPA's 120-day letter.

Figure 1.6 and Figure 1.7 show that PSAT estimates approximately 85% of the particulate sulfate and 79% of the particulate nitrate originate from emissions in the continental U.S. Approximately 1% of the particulate sulfate and 1% of the particulate nitrate, on average, originated from within Muscatine County. These results demonstrate that long-range transport is the dominant contributor to the high sulfate and nitrate concentrations at the violating monitor. Based on this analysis, the State asserts that the contribution from Muscatine County to secondary formation is relatively low, on the order of 1 to 3% for secondary sulfate and nitrate components of total $PM_{2.5}$.

The presence of long range transport to the Muscatine are does not negate the fact that there is a violating monitor in the area, nor EPA's obligation under section 107(d) to designate as nonattainment both the area that is violating, and the nearby areas that are contributing to that violation. Therefore, EPA must evaluate what nearby emissions and emissions activities in the Muscatine area are contributing to violations based on the facts and circumstances of this specific area. EPA concludes that the modeling results submitted by the State lend support to focusing primarily on the sources of direct $PM_{2.5}$ emissions that may contribute to the violations at the Garfield School monitor, and to a lesser extent on sources of NOx and SO2 in the surrounding area that may be contributing in addition to the amount from long-range transport. EPA concludes that the modeling provided by the State for the purpose of informing designations adds to the understanding of the potential local contribution to secondarily formed $PM_{2.5}$, and to the weight of evidence used by EPA to establish final boundaries. However, the results cannot be interpreted alone as being highly determinative because the databases and methods used in these photochemical simulations (e.g. grid cell resolution and lack of performance evaluation) introduce significant uncertainties. EPA expects that these uncertainties can be addressed by more thorough modeling in a future $PM_{2.5}$ State Implementation Plan.

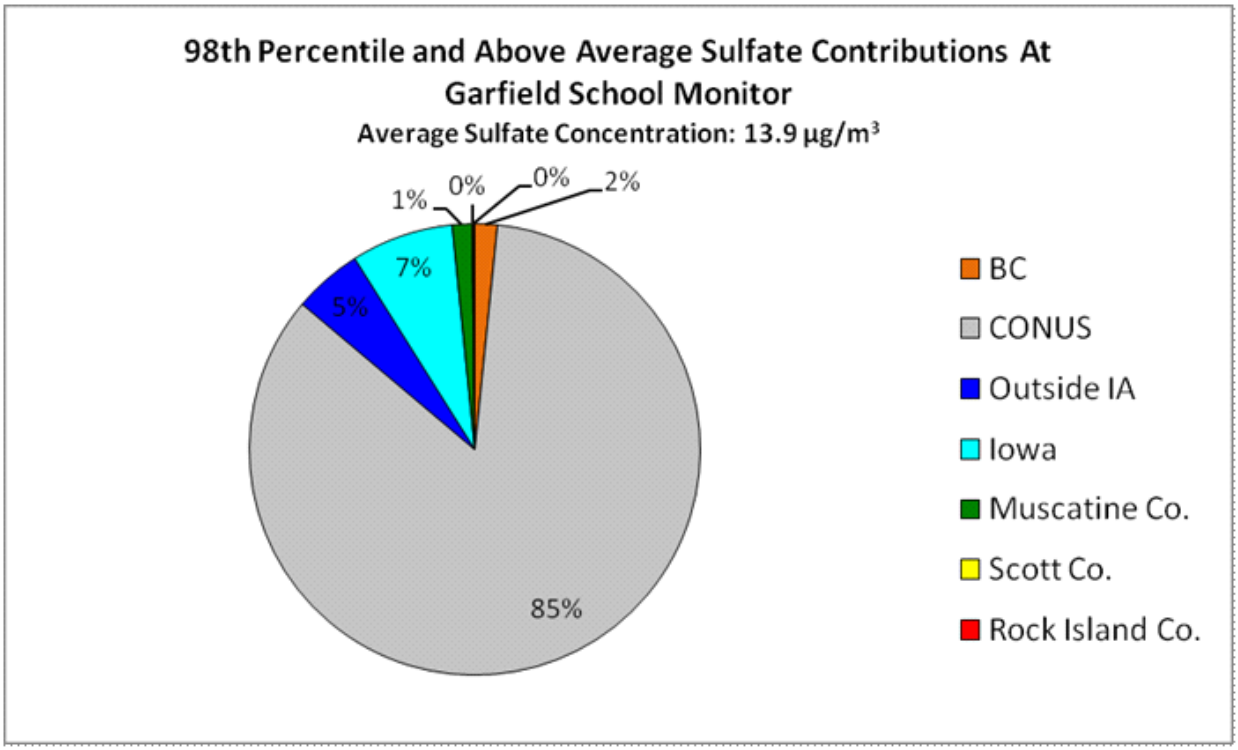

Figure 1.6- Average Sulfate Contributions by Source Region at the Garfield School Monitor for 98th Percentile and Above Sulfate Concentrations Estimated by CAMx PSAT.

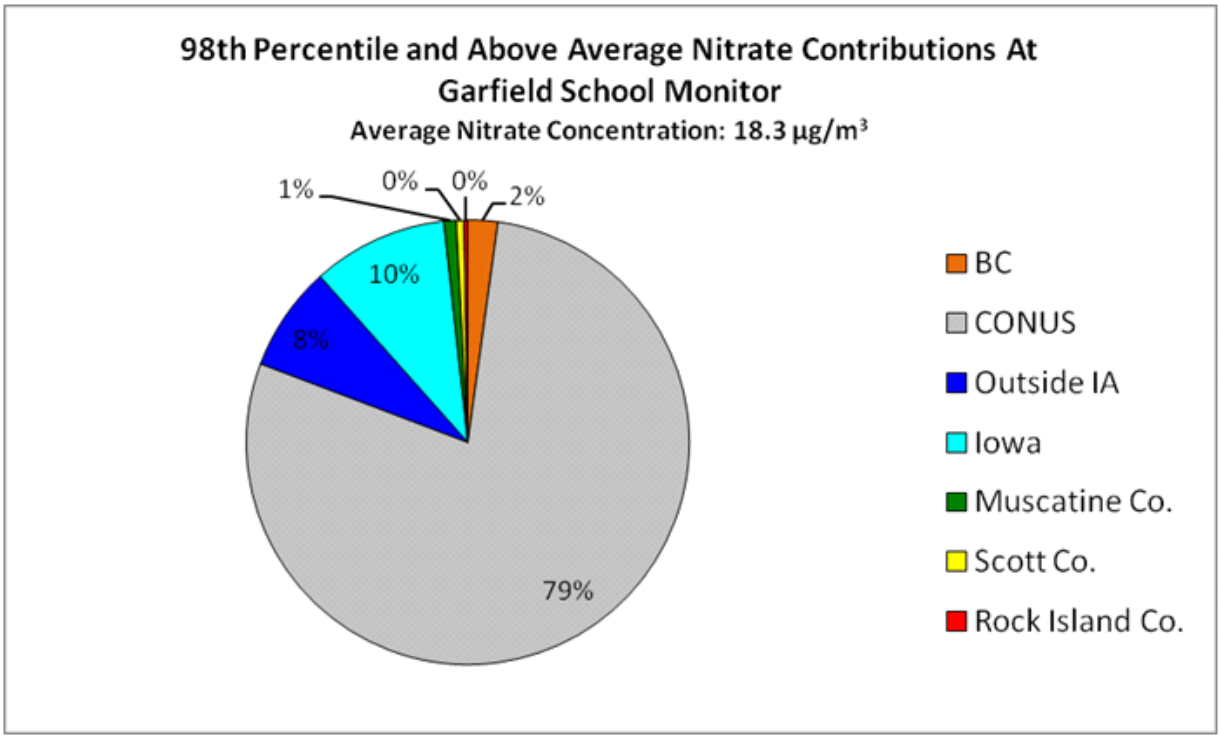

Figure 1.7- Average Nitrate Contributions by Source Region at the Garfield School Monitor for 98th percentile and Above Nitrate Concentrations Estimated by CAMx PSAT.

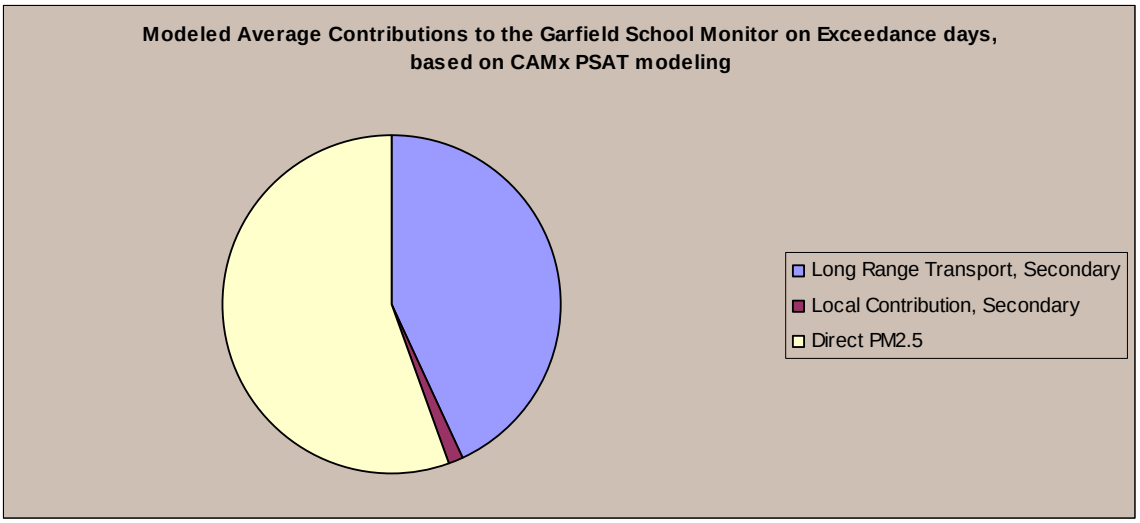

Figure 1.8- Modeled Average Contributions to the Garfield School monitor.

Summary of Factor 1, Emissions Data

In summary, after review of emissions data, modeling data, and consideration of the dominant wind direction associated with the local exceedance events at the Garfield School Monitor (see Factor 6), EPA has determined that nearby emissions of direct $PM_{2.5}$ and sources of SO2 (sulfate) and NOx (nitrate), primarily from long-range transport, have a large impact on the violating monitor during exceedance events, and that the contribution from rural Muscatine County is low. EPA determined that inclusion of the local $PM_{2.5}$ emissions, including point sources in the local area, is a highly significant consideration in establishing the nonattainment boundaries. For the Muscatine area, EPA has designated a boundary that includes most of the local point sources.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the Muscatine Area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standard is met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met. The 24-hour $PM_{2.5}$ design values for counties in the Muscatine Area are shown in Table 2.

County	Monitor Location	State Recommended Nonattainment?	24-hr $PM_{2.5}$ Design Values, 2004-2006 ($\mu g/m^3$)	24-hr $PM_{2.5}$ Design Values, 2005-2007 ($\mu g/m^3$)
Clinton	Roosevelt St.	No	34	32
Muscatine	1409 Wisconsin	Yes (partial)	34	**36**
Scott	10th & Vine	Yes (partial)	30	31
Scott	3029 N. Division St. (Adams School)	Yes (partial)	32	32
Scott	300 Wellman St.	Yes (partial)	N/A	**37**

Table 2- Air Quality Data

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the total concentrations of the chemical composition at the monitor in Muscatine County for the cold season are as follows: 26% sulfate, 17% carbonaceous $PM_{2.5}$, 55% nitrate and 2% crustal. For the warm season, the total concentrations of the chemical composition at the monitor in Muscatine County are as follows: 77% sulfate, 20% carbonaceous $PM_{2.5}$, 0% nitrate and 2% crustal. The speciation data for this monitoring location indicates a strong precursor influence on the monitor, as discussed under Factor 1, which is primarily attributed to long range transport.

In order to understand the trends at the monitor in Muscatine, the State and EPA evaluated information for individual days when an exceedance of the standard was monitored. Sorting the monitoring data in this manner can assist in discerning trends and is useful in further understanding of the nature of the monitored exceedances. The following table assists in the review of the individual days when a monitor recorded an exceedance. This information, in combination with the meteorological information, discussed in Factor 6, assists in the understanding of the trends in exceedances in the Muscatine, IA area.

The daily averaged $PM_{2.5}$ concentrations in Table 2.1 are colored coded according to concentrations. Exceedances are highlighted in red, and indicate a daily average concentration greater than 35 $\mu g/m^3$. Cells shown in yellow represent concentrations greater than 30 $\mu g/m^3$ and less than or equal to 35 $\mu g/m^3$. Green indicates daily averaged $PM_{2.5}$ concentrations less than or equal to 30 $\mu g/m^3$. Blank cells indicate no measurements were made at a particular monitor on that day.

From Table 2.1, it is observed that there are days when multiple monitors record exceedances on the same day, and there are days when only a single monitor exceeds the standard. Out of the 14 exceedance days listed in Table 2.1, six of the days are days in which only the Garfield School recorded an exceedance of the standard. These events are classified as local events and the remaining eight exceedance days are described as regional. Additional review of the local events shown in Table 2.1 reveals that these events predominantly occur during the summer and early fall seasons. The local events are also tightly correlated to an easterly wind direction.

Speciation data was not available at the Garfield School monitor. Without speciation data showing an overwhelming contribution from the point sources nearest the violating monitor (GPC and MPW) the State could not show the magnitude of their impact on exceedance days and validate a very small nonattainment boundary. EPA cannot support the State's recommended very small partial county boundary that encompasses only two point sources. There is no modeling analysis to show for sources other then GPC and MPW that other sources do not also contribute to the ambient $PM_{2.5}$ level at the violating monitor. Therefore, EPA instead designated an area that includes the majority of local sources in establishing the boundary.

	County	Muscatine	Scott	Scott	Scott	Rock Island	Clinton	Clinton	Johnson	Linn	Dominant
	Name	Garfield	Blackhawk	Jefferson	Adams	Arsenal	Rainbow	Chancy	Hoover	Cdr Rpds	Wind Direction
Season	Date	191390015	191630019	191630015	191630018	171613002	190450021	190450019	191032001	191130037	KDVN
winter	1/30/2005			37						40	65
winter	1/31/2005	37	33	31	31		34		48	45	99
winter	2/1/2005			40						48	83
winter	2/3/2005	36	40	37	35	35	41		41	35	260
summer	6/24/2005	31	37	31	31		31		33	30	217
summer	6/27/2005	37	42	38	38		39		36	35	188
summer	8/2/2005	44	51	44	45	46	45		41	41	176
fall	9/10/2005	34	37	35	35		35		33	34	171
fall	9/11/2005			41						39	187
fall	9/12/2005			40						38	193
fall	9/13/2005	23	41	24		23	24		23	22	228
winter	12/21/2005	37	33	31	11		40		39	33	248
winter	12/24/2005	34	36	36	37	39	37		30	26	356
fall	11/7/2006	19	31	29	27	27	37	36	20	18	193
fall	11/25/2006	33	36	38	35	20	51	51	37	37	154
winter	2/23/2007	44	11	10	9	10	9	10	9	10	108
winter	2/24/2007	53	10	9	9		9		11		103
winter	2/28/2007	55		19			21		19		110
spring	3/9/2007	42	44	42			37		42		228
spring	5/3/2007	42	9	9	8	9	8	10	9	10	99
spring	5/4/2007	61	16	15			16		19		99
spring	5/5/2007	63	23	23			22		27		100
spring	5/23/2007	20	33	23			23	37	17		180
spring	5/30/2007		28	27	27	27	29	37		22	181
summer	6/16/2007	32	36				30		33		291
summer	7/26/2007	32	36	28	30		31	31	29	26	223
fall	9/21/2007	22	37	24	24		27	29	22	20	204
fall	11/19/2007	26	39	27			26		26		205
fall	11/20/2007	28	38	36	34	25	33	33	37	25	57
winter	12/17/2007		38	29	32		32	36		30	217
winter	12/19/2007	55	57	57					55		191
winter	12/20/2007	48	48	45	46	46		44	47	53	111

Table 2.1- Air Quality Data for Individual $PM_{2.5}$ Monitors in Davenport-Moline-Rock Island, IA-IL, Muscatine, IA and Select Surrounding Counties Compared to Individual Days when Exceedances were monitored.

Summary of Factor 2, Air Quality Data

In summary, regional events do affect the violating monitor, however it has also been demonstrated that influences from other sources in the nearby areas of Muscatine County remain a critical component of the exceedance events at the Garfield School monitor. Determining the area that is contributing to a violation is part of the designation process and supports a broader boundary than the one recommended by the State.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) are eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data may give an indication of whether it is likely that population-based emissions contribute to violations of the 24-hour $PM_{2.5}$ standards.

County	State Recommended Nonattainment?	2005 Population	2005 Population Density (pop/sq mi)
Muscatine, IA	Partial	42,567	95
Louisa, IA	No	11,813	28
Scott, IA	Partial	161,170	345
Johnson, IA	No	117,194	188
Cedar, IA	No	18,240	31
Rock Island, IL	No	147,454	327
Des Moines, IA	No	40,975	95

Table 3- Population

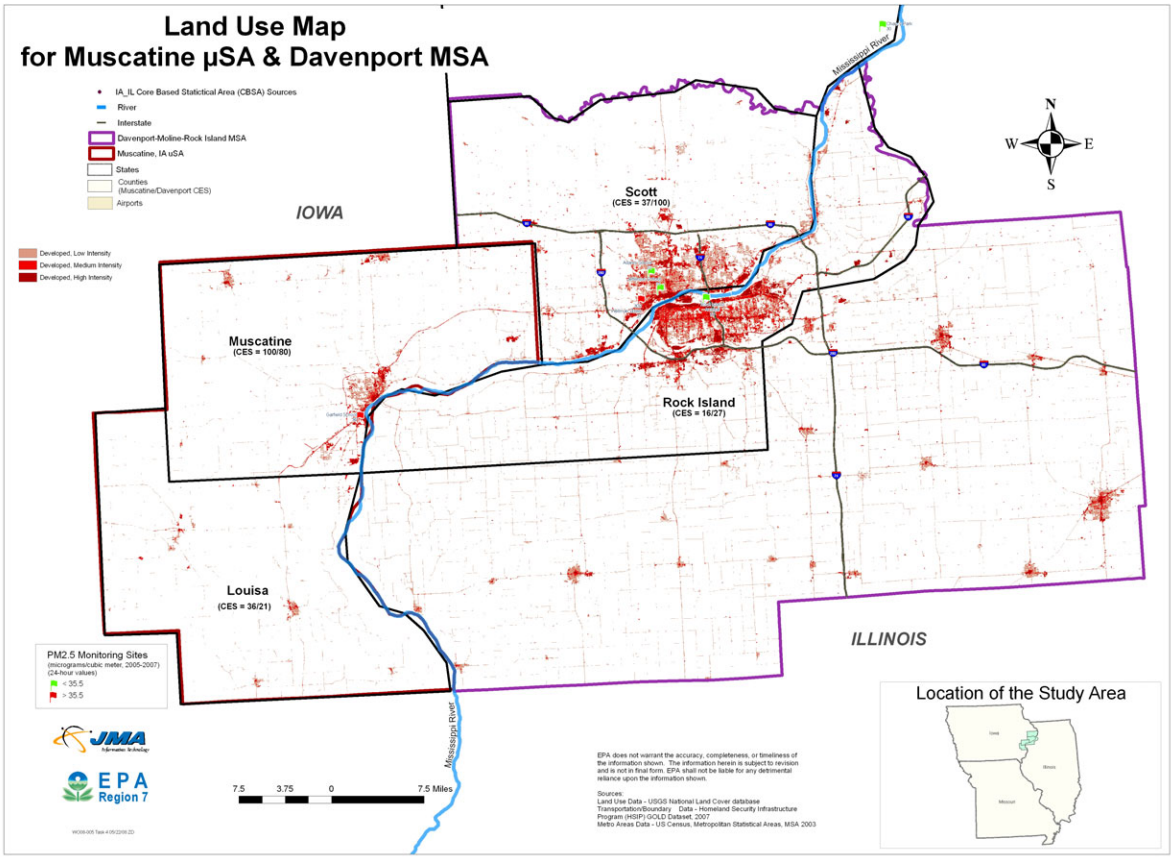

Figure 3- Land Use Map for the Counties in the Muscatine Metropolitan Area and Select Surrounding Counties

The urbanized area of Muscatine County is geographically located in the eastern portion of the county. As illustrated by Table 3 and Figure 3, the population of the county is predominantly concentrated in the City of Muscatine. The City of Muscatine comprised

just 4% of Muscatine County's total land area of 449 sq miles. The remaining 96% of the land area in Muscatine County is generally rural. The EPA designated nonattainment area is focused primarily on the urbanized area of Muscatine County, and captures approximately 69% of the total population.

Summary of Factor 3, Population Density

Figure 3 demonstrates the proximity of the urbanized population in Muscatine County to the violating Garfield School monitor. Rural Muscatine County, which comprises a very small portion of the county's total population, is associated with relatively low population-based area source emissions and potential contribution to the violating monitor. This supports a boundary that is focused on the urbanized portion of Muscatine County.

Factor 4: Traffic and Commuting Patterns

This factor considers the number of commuters in each county who drive to another county within the Muscatine Area, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 5). A county with numerous commuters indicates the potential for mobile-source related emissions to contribute to fine particle concentrations in the area analyzed, and may indicate the degree of economic integration of an area. As shown in Table 4, Muscatine County, IA has the greatest number commuting within the area.

County	State Recommended Nonattainment ?	2005 VMT (10^6 mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into (and within) the statistical area	Percent Commuting into (and within)the statistical area
Muscatine, IA	Partial	372	17,330	85	17,110	84
Louisa, IA	No	99	1,490	26	4,140	73
Scott, IA	Partial	1,614	61,500	79	1,540	2
Johnson, IA	No	1,268	650	1	450	1
Cedar, IA	No	422	1,550	16	940	10
Rock Island, IL	No	1,313	14,240	20	940	1
Des Moines, IA	No	322	80	0	210	1

Table 4 - Traffic and Commuting Patterns

The 2005 VMT data used for table 4 and 5 of the 9-factor analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

CAMX modeling (discussed under Factor 1) submitted by the State suggests a 1-3% contribution of precursor emissions on exceedance days from sources in rural Muscatine County. The State also asserted that the zero out modeling showed that NO_x precursor emissions from rural sources are not significant to local $PM_{2.5}$ formation or toward the violation at the monitor. Figures 4 and 4.1, (from the 2002 NEI) show that 75% of the total NO_x emissions in Muscatine County are attributable to point sources. NEI numbers suggest that a local secondary contribution to the violating monitor from mobile sources is probable. EPA has concluded that the nonattainment area boundary contains a majority of local point sources emissions of NO_x and VOC.

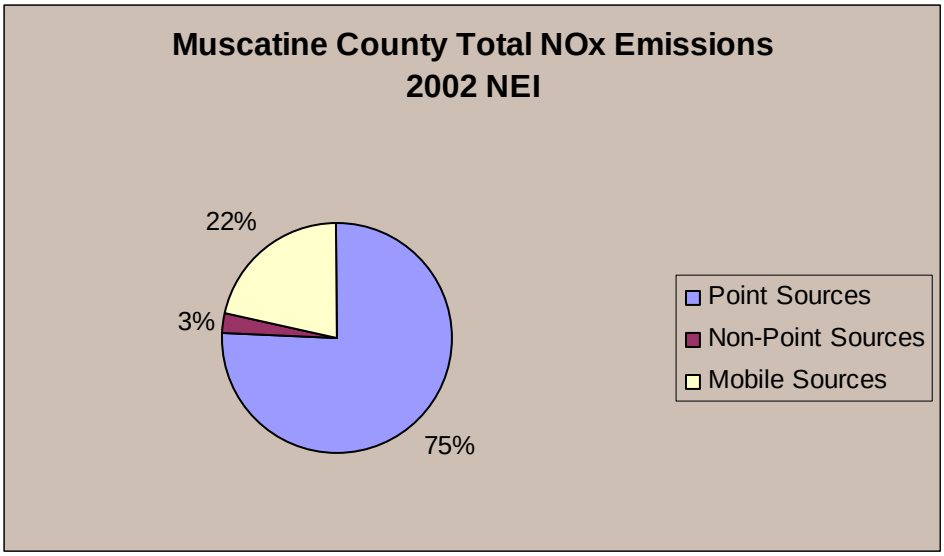

Figure 4- Total NO_x emissions Muscatine County.

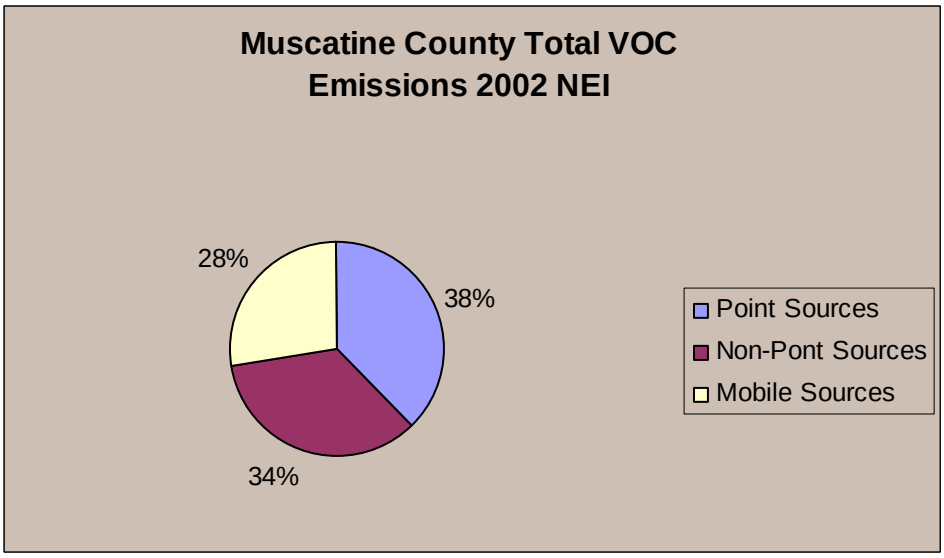

Figure 4.1- Total VOC emissions Muscatine County.

Summary Factor 4-Traffic and commuting patterns

As the metropolitan area is the most heavily vehicle-traversed part of the county, it is reasonable to include the contiguous metropolitan area in the nonattainment boundary. The partial county nonattainment area boundary promulgated by EPA is inclusive of the major metropolitan area.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in VMT for 1996-2005 for counties in the Muscatine Metropolitan Area, as well as patterns of population and VMT growth. Areas with rapid population or VMT growth indicate the potential for proportionate emissions growth from mobile sources and other emitting activities, such as construction of infrastructure, including roads, homes, and businesses. Table 5 shows population, population growth, VMT and VMT growth for counties that are included in the Muscatine Metropolitan Area and surrounding counties. Counties are listed in descending order based on VMT growth between 1996 and 2005.

County	Population (2005)	Population % change (2000 - 2005)	2005 VMT (millions mi annually)	VMT % change (1996 to 2005)
Muscatine, IA	42,567	2	372	43
Johnson, IA	117,194	5	1,268	42
Scott, IA	161,170	2	1,614	25
Cedar, IA	18,240		422	24
Des Moines, IA	40,975	-3	322	21
Rock Island, IL	147,454	-1	1,313	3
Louisa, IA	11,813	-3	99	-32

Table 5- Population and VMT Values and Percent Change.

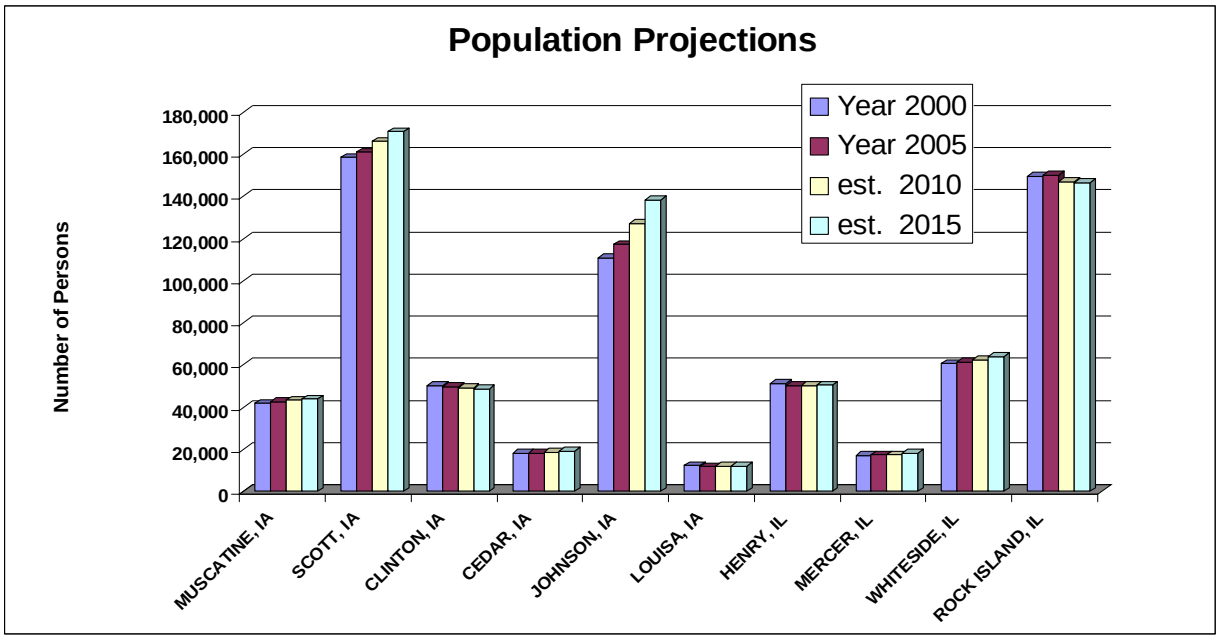

Figure 5- Population Projections Chart

The State provided to EPA the population growth projections shown in Figure 5 as part of its technical support for the State's designation recommendation. This information was assembled from several data sources, such as U.S. Census Bureau, Iowa and Illinois Department of Commerce, Bi-State Regional Commission and nonpoint sources. This chart compliments Table 5 in that it illustrates, graphically, the growth that occurred in Muscatine County from 2000-2005 and displays trends from various counties in and surrounding the Muscatine Area. Muscatine County is the only county in EPA's evaluation area that is projected to have any growth in population in the coming years.

Note: Johnson County is also shown to have significant growth potential but it is located in a separate CBSA and not part of EPA's evaluation area for Muscatine. Scott County is shown to have a growth potential and is being designated as a separate partial county nonattainment boundary.

Summary of Factor 5- Growth rates and patterns

The area has not seen a very large increase in population in the recent past, and only Muscatine County is projected to have any significant future growth. This factor continues to point to Muscatine County as a primary area of interest for designations.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered the most representative National Weather Service wind direction and speed data throughout the year, with an emphasis on "high $PM_{2.5}$ days." These high days are defined as days where any FRM or FEM air-quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values. For this factor, EPA also considered each County's CES, which includes an analysis of trajectories of air masses for high $PM_{2.5}$ days.

EPA also relied upon information provided by the State as part of its technical support for the State's designation recommendation. The purpose of the analysis conducted by the State and EPA was to determine contributing emissions in any particular direction relative to the violating monitor.

The State provided wind rose plots generated using WRPLOT VIEW, developed by Lakes Environmental (http://www.lakes-environmental.com). Wind roses are a graphical representation of prevailing wind directions. They show the relative frequency of each observed wind direction for the 3-year analysis period. Representative wind data used in this analysis were collected at meteorological observation stations, typically located at airports. The airport in Muscatine County, Muscatine Municipal Airport (KMUT), operates an Automated Weather Observing System (AWOS) station, which collects a variety of meteorological variables, including wind data. This is the source of the data for Figure 6.

Figure 6 shows the wind rose for 383 hourly observations on at the KMUT AWOS location on exceedance days in 2005-2007. Not shown are the observations with calm winds (about 34% of the total readings). Each petal represents a measured surface-level

wind direction (direction the wind is blowing from), which were archived in 10 degree intervals ranging from 10 to 360. The azimuth of each petal indicates the measured wind direction, and the length from the center of the plot measures the relative frequency each wind direction was observed. For a particular wind direction the length of the colored segments indicates the relative frequency of six wind speeds bins, which is shown in the lower right corner.

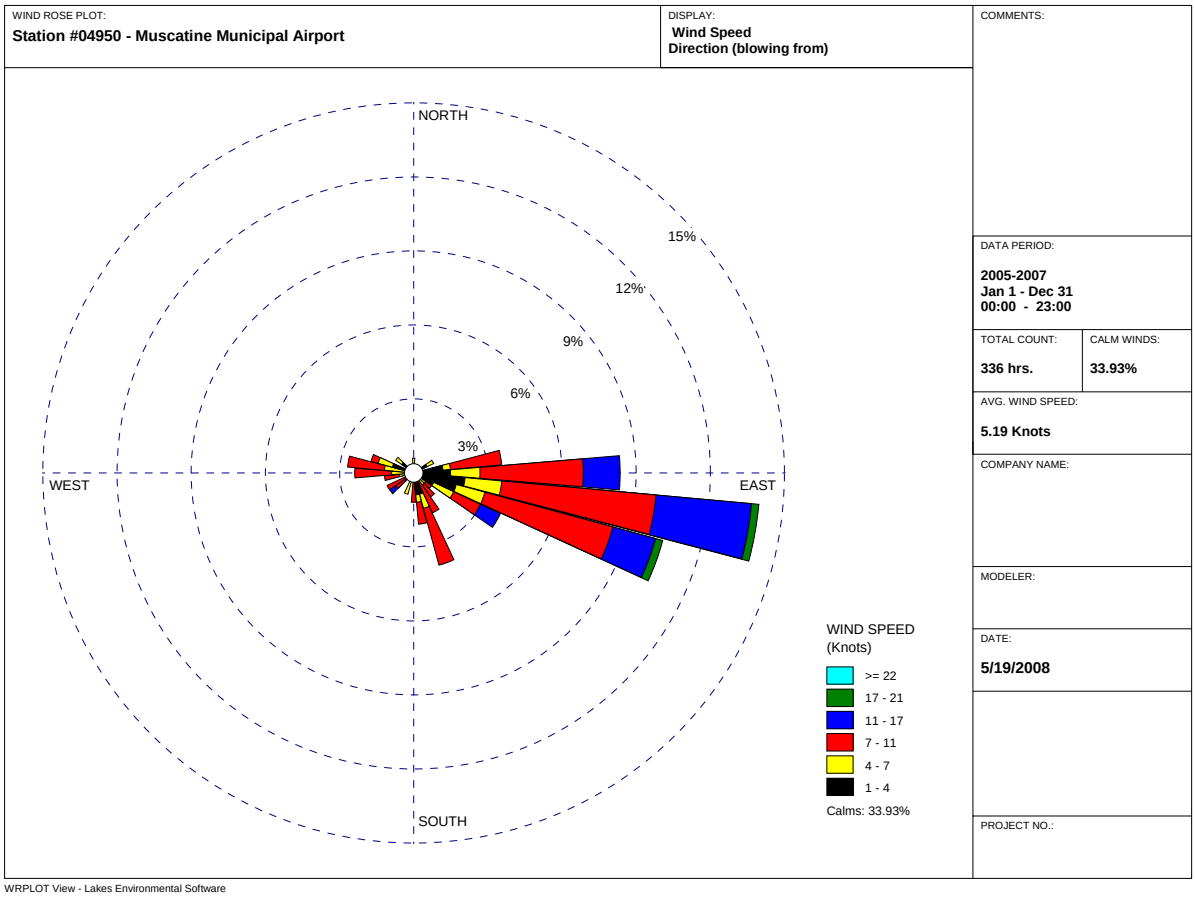

Figure 6- Wind rose for Muscatine Municipal Airport for Exceedance Days in 2005-2007

Figure 6 indicates that the prevailing winds can come from many different directions on exceedance days. The prevailing wind directions with the greatest frequencies are in an arc from the east to the southeast, indicating the greatest potential for nearby sources in those directions to contribute to monitored violations. As shown by the length of the black petals, relatively light winds were not often associated with exceedance days. Most exceedance days occur when prevailing winds are greater than 7 knots (shown as red, blue or green).

Summary Factory 6- Meteorology

The wind rose indicated that winds most frequently occur from the east-southeast on high $PM_{2.5}$ days. EPA's nonattainment boundary includes potential emissions sources located upwind to the east-southeast of the violating monitor. The boundary would exclude

Cedar, Johnson, and Louisa Counties, which are located from the north to south of Muscatine County in a counterclockwise direction. Due to their approximations from the violating monitor, EPA has concluded that there is very little contribution from these counties to the violating monitor.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Muscatine County area. The Muscatine County area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration was given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for $PM_{2.5}$ or 8-hour ozone standard) represent important boundaries for state air quality planning. In the case of the areas evaluated, none are currently designated as nonattainment for any of the National Ambient Air Quality Standards. There was a review of the information regarding the Bi-State Regional Commission which represents the Metropolitan Planning Organization (MPO) for urbanized area transportation planning in the Muscatine and Quad Cities' area. The MPO serves Henry, Mercer, and Rock Island Counties in Illinois, and Scott and Muscatine Counties in Iowa. Its web site is: www.bistateonline.org. However, the Bi-State planning area was not a key factor in determining the intended nonattainment boundary; other factors pointed to a more localized nonattainment area boundary.

Factor 9: Level of control of emission sources

The emission estimates on Table 1 (under Factor 1) included any control strategies implemented by the State in the Muscatine area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NO_x, and crustal $PM_{2.5}$). A source of interest in factor's evaluation was the MidAmerican Energy Co. - Louisa Station in Louisa County, IA. This unit has an EPA-issued PSD permit and is subject to NSPS Subpart D. The State also issued recent permits under its SIP-approved (52 FR 23981, June 26, 1987) construction permits program, establishing more stringent emissions rates and authorizing installation of a flue gas desulfurization device (FGD), low NO_x burners (LNB), and baghouse as a replacement for their existing ESP. The scrubber became operational earlier this year. As a result, emissions from this source have been decreased. All permitted emissions rates at the facility are federally enforceable. Based on this information, EPA has determined that the reductions are an important factor to consider in excluding Louisa County from the nonattainment boundary.

Conclusion

EPA is designating the partial county nonattainment area boundary described in the table located in the introduction, for the 2006 24-hour $PM_{2.5}$ standard after considering each of the nine factors, detailed in the body of this document. For this decision the EPA relied most heavily on emissions, air quality, meteorology, and population. The additional modeling data provided evidence that was used to determine that a majority of emissions from nearby sources that cause or contribute to the violation should be included in the nonattainment area. EPA determined that inclusion of the local source $PM_{2.5}$ emissions is a highly significant consideration in establishing the nonattainment boundaries. For Muscatine, the boundary includes most of the nearby point sources, and a substantial fraction of the county-wide area source emissions. The EPA defined nonattainment includes the area violating the standard and the area that is contributing significantly to the violation.

Attachment 2
Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- $PM_{2.5}$ emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.